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Dickey-Lincoln School Lakes Project Transmission Studies Environmental Impact Statement: Appendix B: Alternative Power Transmission Corridors

United States Department of Energy

United States Department of the Interior

ENVIRONMENTAL IMPACT STATEMENT

ALTERNATIVE POWER TRANSMISSION CORRIDORS

DICKEY-LINCOLN SCHOOL LAKES PROJECT

TRANSMISSION STUDIES

U. S. Department of Energy
Federal Building
Bangor, Maine 04401
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APPENDIX B
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Dickey-Lincoln School Lakes Project
Transmission EIS Study Team
Federal Building, Room 209
Bangor, Maine 04401

ALTERNATIVE POWER TRANSMISSION CORRIDORS

PREFACE

On October 1, 1977, the responsibility for marketing federally generated power (under provisions of the Flood Control Act of 1944) was transferred from the Department of the Interior to the newly formed Department of Energy. The power transmission portions of the Dickey-Lincoln School Lakes Project were included in that transfer.

The U.S. Departments of the Interior and Energy have conducted system planning, location, and environmental studies for the transmission facilities required for the Dickey-Lincoln School Hydroelectric Project. These studies of many alternate routes have resulted in identification of a proposed transmission line route and an environmental impact statement, as required by the National Environmental Policy Act of 1969. This report, one of several prepared under contract to the DOE by various consultants, is published as an appendix to that statement.

Appendix B, Alternative Power Transmission Corridors (three volumes) documents an environmental study performed by VTN Consolidated, Inc., Boston, Massachusetts. The contract for this work was awarded in April 1976, and was completed a year later. This was a regional study to identify, assess, and rank broad corridors (up to ten miles wide) which could be most suitable for transmission line locations. These corridors provide alternative locations for transmission facilities required by electrical system integration plans identified in the Transmission System Planning Studies. The Department's decision to proceed with detailed environmental studies for System Plan E facilities was based on the results of this study, the Transmission System Planning Study, and a significant amount of field reconnaissance and location work.

VTN Consolidated was selected to perform this study through a comprehensive evaluation process which considered, among other factors, past performance on similar studies, technical qualifications, management capabilities and familiarity with the Northern New England region. VTN was found to possess excellent qualifications in all respects.

Harry D. Hurless
Project Manager

Recommendations of Alternative System Plans and Transmission Corridors for the Dickey/Lincoln School Hydroelectric Project

prepared for:
the United States Department of the Interior

by:
VTN Consolidated Inc.
in association with
Comitta Frederick Associates

1976

VTN would like to express their gratitude for the close working relationship and constant interaction and review provided by the staff of the Department of the Interior project team in Bangor, Maine.

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This project was conducted in association with:

Comitta Frederick Associates (CFA) of West Chester, Pennsylvania, who served as subcontractors to VTN and participated in all aspects of the project as part of the project team.

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CHAPTER I
TRANSMISSION CORRIDOR ASSESSMENT: INTRODUCTION

The Dickey/Lincoln School Hydroelectric Project

Location of a hydroelectric dam in northern Maine has long interested planners and engineers. Such a dam, by generating electrical power from the St. John River and integrating it into the New England Transmission System, could provide both low-cost power and flood control in Maine and power to meet peak-period demands in the rest of New England. Construction of a federally-funded hydroelectric dam in Dickey, Maine, near the confluence of the St. John and Allagash Rivers, has been authorized by Congress under the Flood Control Act (PL 89-198); a subsidiary dam would also be required for flood control and would be located nearby, at the site of the old Lincoln School. Feasibility and environmental impact studies for this project are now being conducted by the U.S. Department of the Interior (USDI) and the U.S. Army Corps of Engineers, New England Division.

If the proposed dams are constructed, transmission facilities will be needed to transmit the power generated at the dams to various points in New England where it will be either used or further distributed. Possible destination points identified by the USDI are nine substations (eight of them already existing) located in Maine, New Hampshire, and Vermont. The facilities required to connect these substations to the generating facility include: 1) electrical transmission lines and a series of supporting structures, which will consist of either wood poles or steel towers; 2) a cleared right-of-way beneath the lines; and 3) access roads required for construction and maintenance. Most lines would carry 345 kV (345,000 volt) alternating current, the highest transmission voltage now used in northern New England. An optional ±400 volt direct current line between two of the substations is being considered by the USDI.

This report identifies alternative corridors of land within which transmission lines could be routed and details various impacts on the environment which would be associated with introduction of transmission facilities. Many alternative corridor locations were identified (see Figure 1-1). Identification of these alternative transmission corridors was a complex process, since the number of potential corridors capable of connecting the various substations was myriad; the 'least desirable' potential corridors, i.e., those where transmission facilities might have entailed severest impacts on the environment, had to be eliminated from consideration before alternative corridors could be delineated. Identified alternative corridor locations were subsequently evaluated to determine 'most desirable' corridors.

On the basis of environmental and engineering criteria, specific corridors connecting Dickey, Maine to the various substations are recommended for further consideration by the USDI. Recommended corridors (each 1-10 miles wide) are not final sites for transmission lines but generally attractive areas that should be investigated in more detail. Subsequent studies will identify, within the recommended corridors, alternative routes (¼-½ mile wide) for transmission lines and rights-of-way. A single corridor, thus, can include several potential transmission routes; a route, several rights-of-way (see Figure 1-2). Only one right-of-way (approximately 150 feet wide)* would ultimately be cleared within a recommended corridor.

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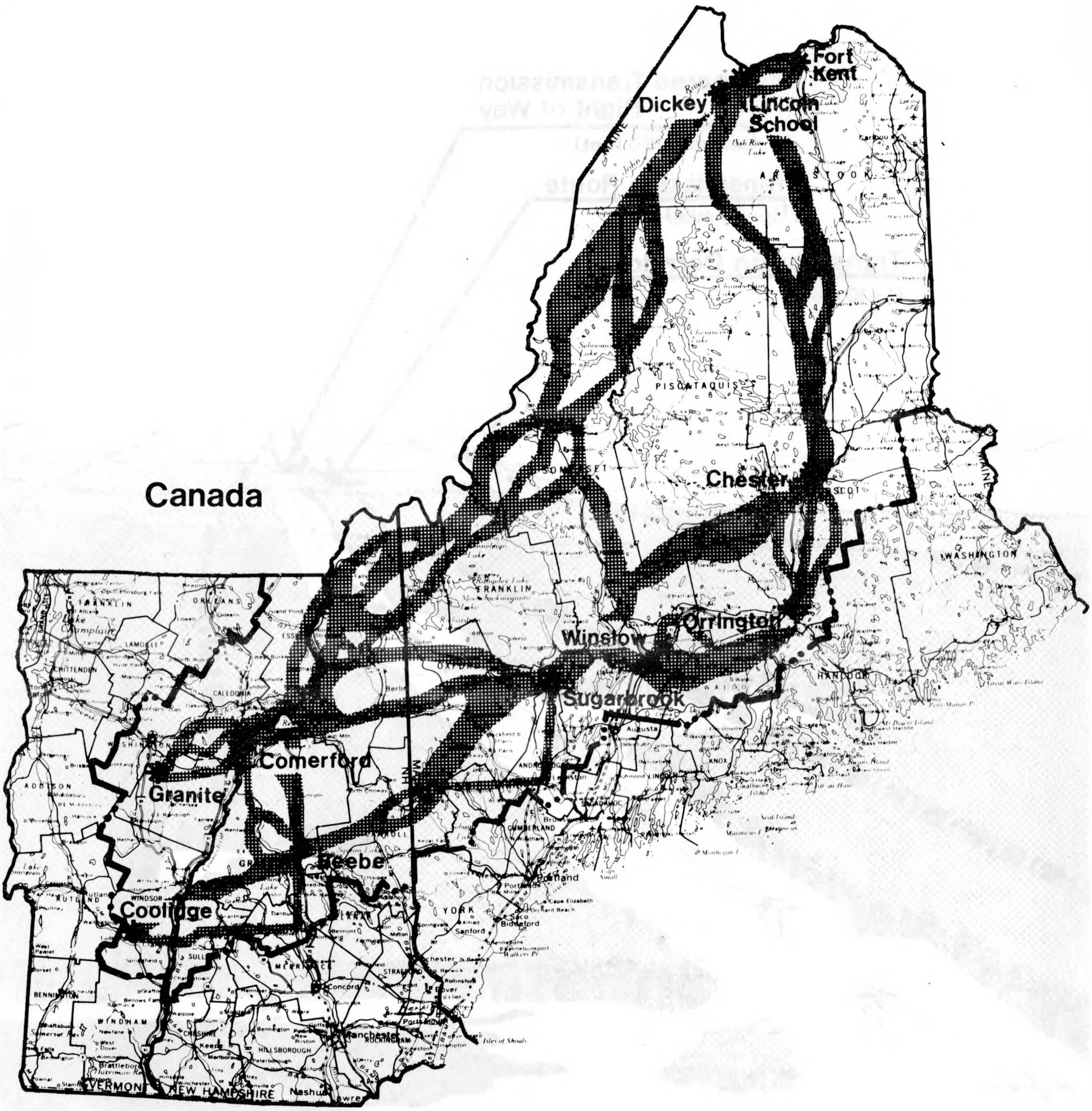
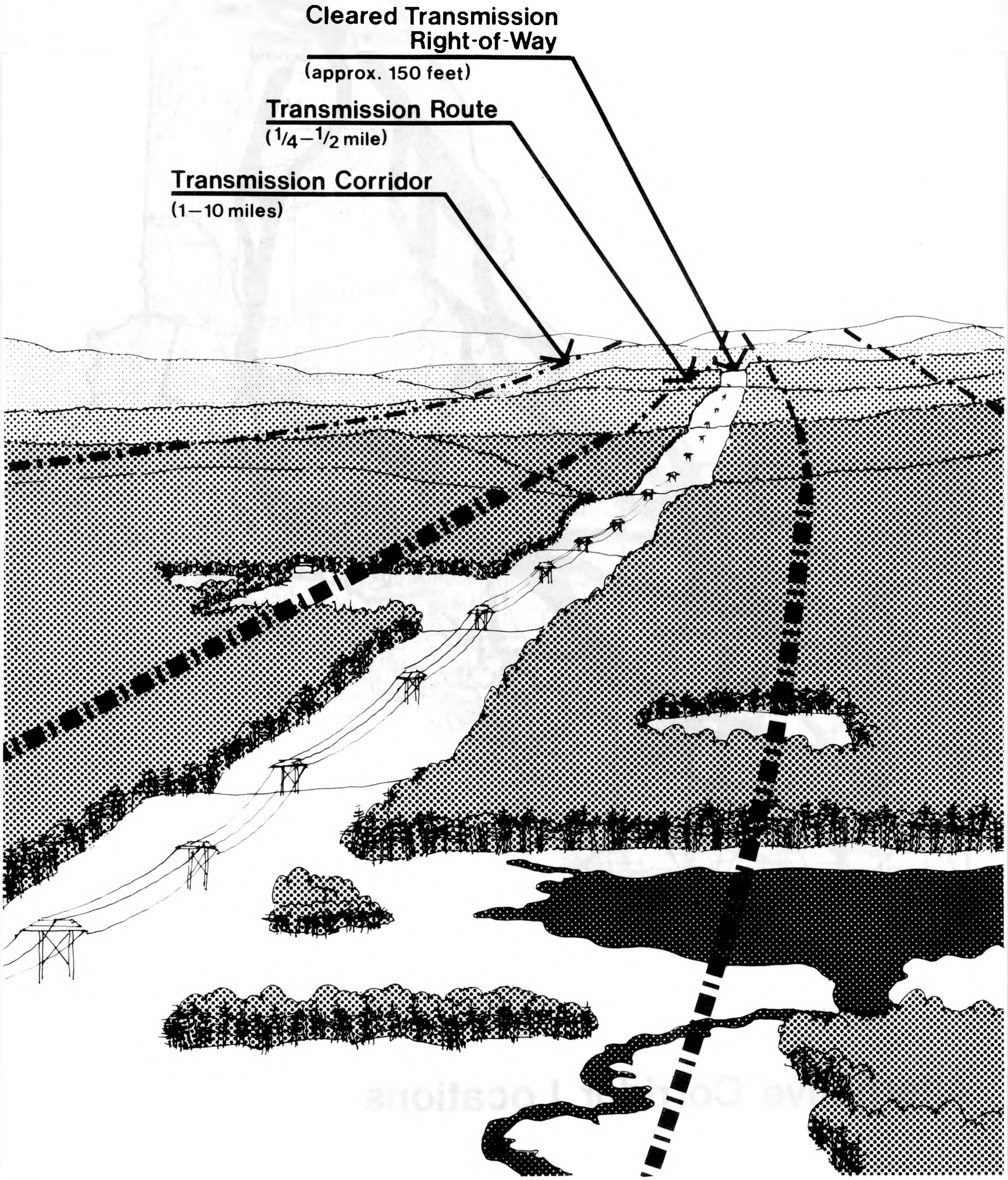
*The precise right-of-way width may vary, depending on the type of supporting structure chosen.



Alternative Corridor Locations

figure 1·1



Corridor, Routes, & Rights-of-Way

figure 1·2

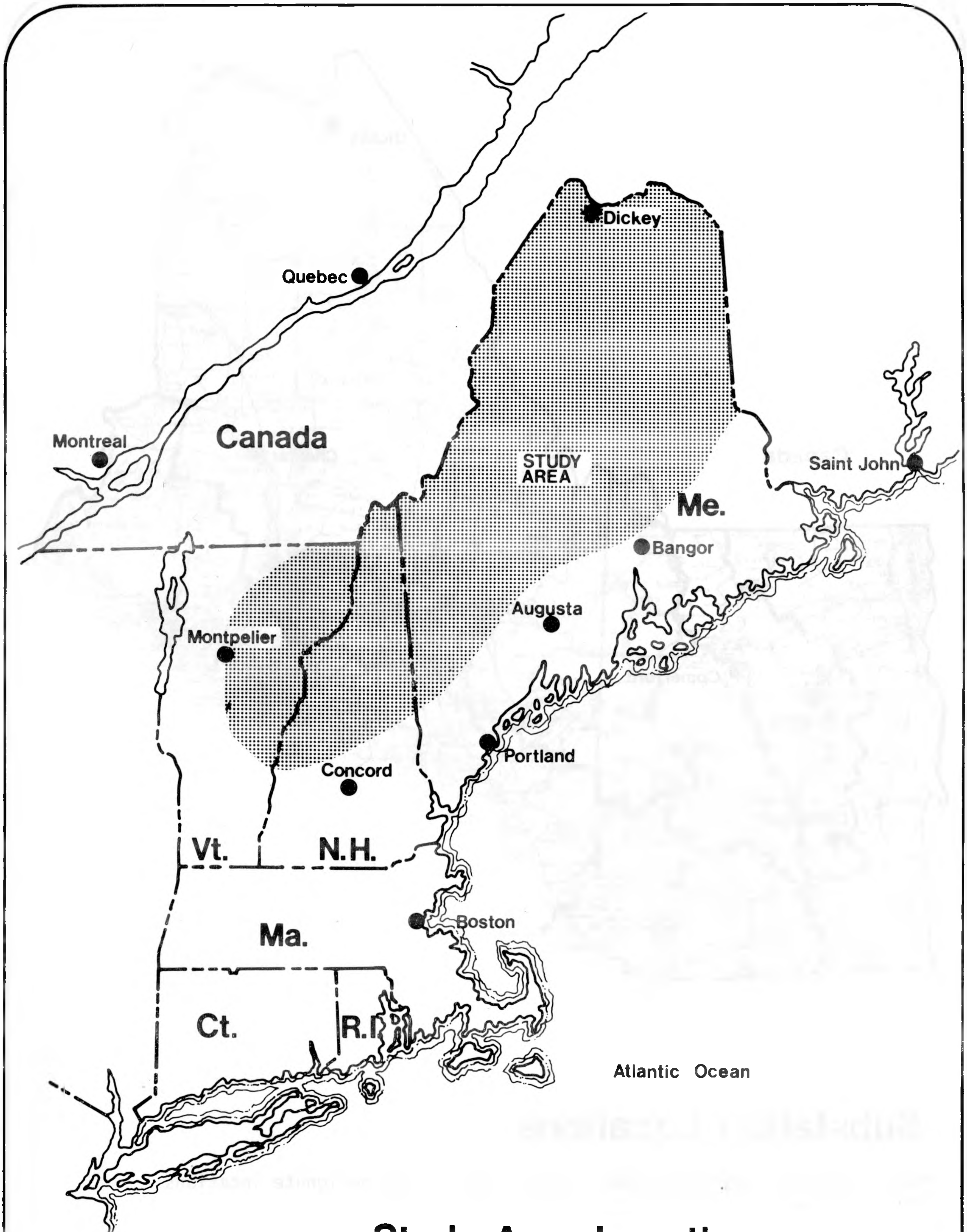
The Transmission Corridor Assessment represents a single aspect of the total effort to identify impacts associated with the proposed Dickey/ Lincoln School project. Impacts associated with construction of the dams and ancillary facilities are now being assessed by the Corps of Engineers; transmission and marketing of the power are being studied by the USDI. To conduct these studies, the USDI has established an office in Bangor, Maine. The results of all studies will be published in an environmental impact statement. A draft environmental impact report on the USDI portion of the project is due by November 30, 1977; a final one, by June 30, 1978. All potential impacts associated with construction, operation, and maintenance of the dams and of transmission facilities will be considered in determining whether the Dickey/Lincoln School project should be constructed.

Alternative Plans of Electrical Service Within the Study Area

The geographic area within which environmental resources were studied most intensively was delineated to include all reasonable locations for transmission corridors between the origin of electrical power at Dickey, Maine and the various substations. Only one aspect of the Transmission Corridor Assessment was predetermined. The number and locations of the substations were identified by USDI electrical-system planners. The number and locations of transmission corridors, however, were not restricted in any way.

The study area encompassed roughly 33,000 square miles in northern portions of Maine, New Hampshire, and Vermont. Figures 1-3 and 1-4 indicate the general location of the study area and of the substations; Figure 1-5 shows a typical substation. Note that the generating facility at Dickey is included among the nine substations indicated; note also that the only substation that does not currently exist is the Sugarbrook substation, located near Chesterville, Maine.

Delineation of the study area was based on several factors: 1) USDI-recommended plans of electrical service (or "system plans") for integrating the power generated at the proposed dam site, via a network of existing transmission lines and substations, into the New England Transmission System; 2) political boundaries such as the Canadian border as well as county and town lines within the three-state region; and 3) natural boundaries created by physiographic features such as the Atlantic coastline of Maine, the White Mountains of New Hampshire, and large bodies of water in southern New Hampshire and Maine. Delineation of the study area boundaries was in itself a complex process. Boundaries underwent several stages of refinement as data on the region's environmental resources were collected.



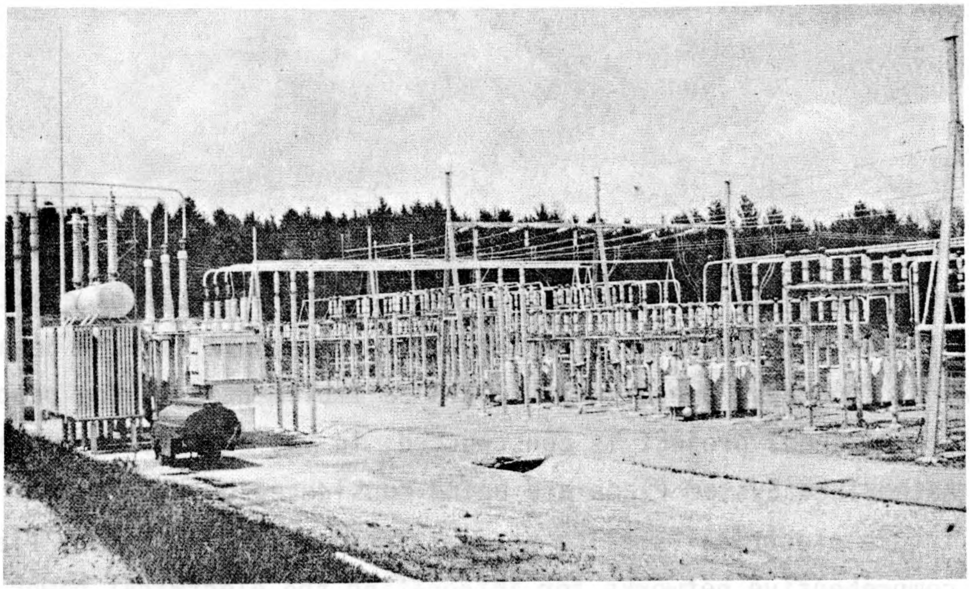
Study Area Location

figure 1·3

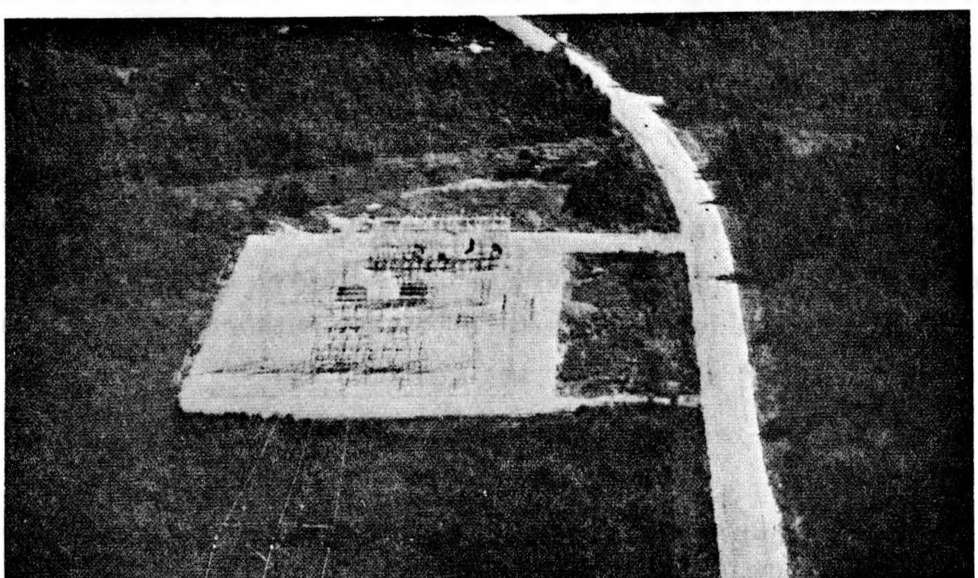
Substation Locations

*Note that the substation names do not necessarily designate locations such as towns.

figure 1·4



CLOSEUP OF
MODERN
SUBSTATION



CHESTER
SUBSTATION
(Maine)

Typical Substation

figure 1·5

Two sets of USDI system plans, or a total of six system plans, were provided in order to allow for both short- and long-term levels of electrical service. In the first set, three alternative plans have already been authorized by Congress, one of which would be implemented if the proposed Dickey/Lincoln School project is constructed; in the second, three variants of these Authorized System Plans are being considered by the USDI to provide for future electrical-service needs. These Ultimate System Plans, the most comprehensive networks for integrating the electrical power generated at the proposed dam site, have not yet received Congressional authorization.

The Authorized and corresponding Ultimate System Plans are labeled A, B, and C and presented in Figures 1-6 through 1-8.* In the Transmission Corridor Assessment, both Authorized and Ultimate plans were initially reviewed to delineate the study area boundaries and later used in assessing alternative corridor locations. Alternative transmission corridors were located within all six system plans and were ranked relative to each other according to their impact on the environment. Authorized and Ultimate plans were not, however, ranked relative to each other. Of the three plans at each level of service (either Authorized or Ultimate), a single 'least impact' system plan was recommended.

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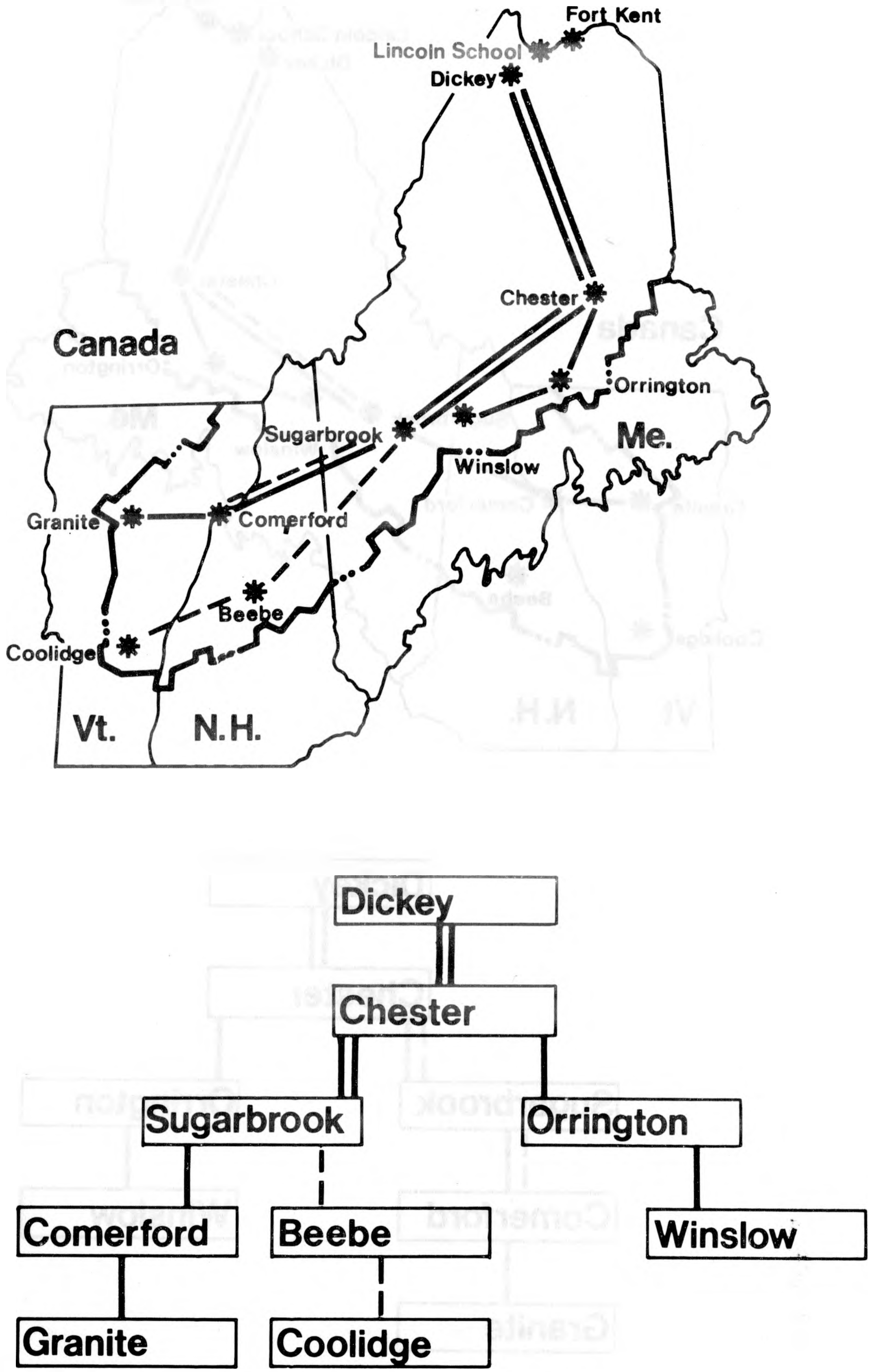
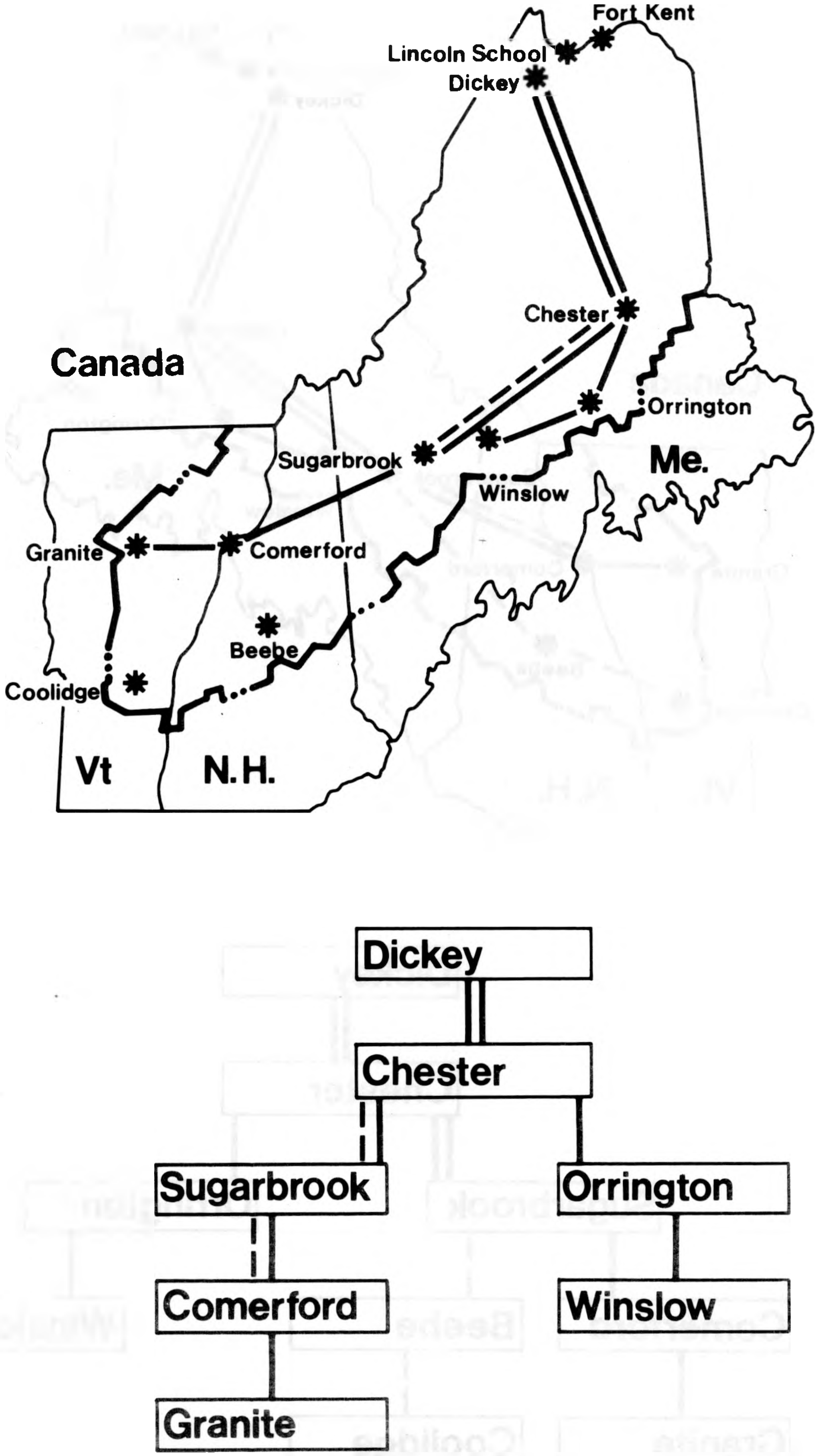
*Note that the lines between substations that are shown on these figures indicate the direction of electrical transmission rather than transmission corridor locations. In addition to the nine substations (including the generating facility at Dickey) that are indicated, the figures also show substations at the Lincoln School site and at Fort Kent. Because these two substations are common to all six system plans, their presence was indicated on the figure without requiring lines showing the direction of transmission. In both cases, the transmission voltage would be 138 kV.



System Plan A : Authorized & Ultimate

——— authorized
– – – ultimate

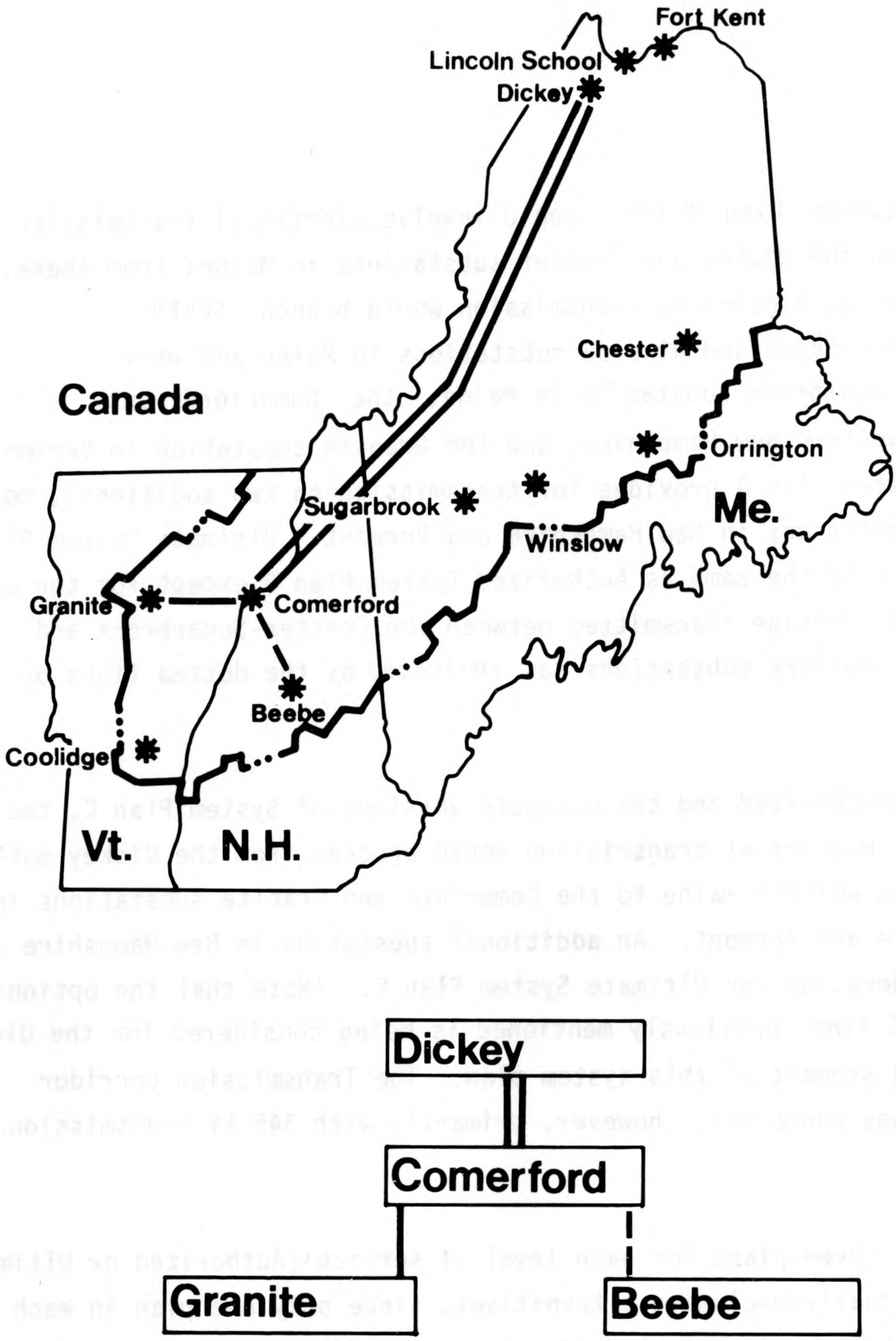
figure 1·6



System Plan B : Authorized & Ultimate

——— authorized
– – – ultimate

figure 1·7



System Plan C : Authorized & Ultimate

——— authorized

— — — ultimate

figure 1·8

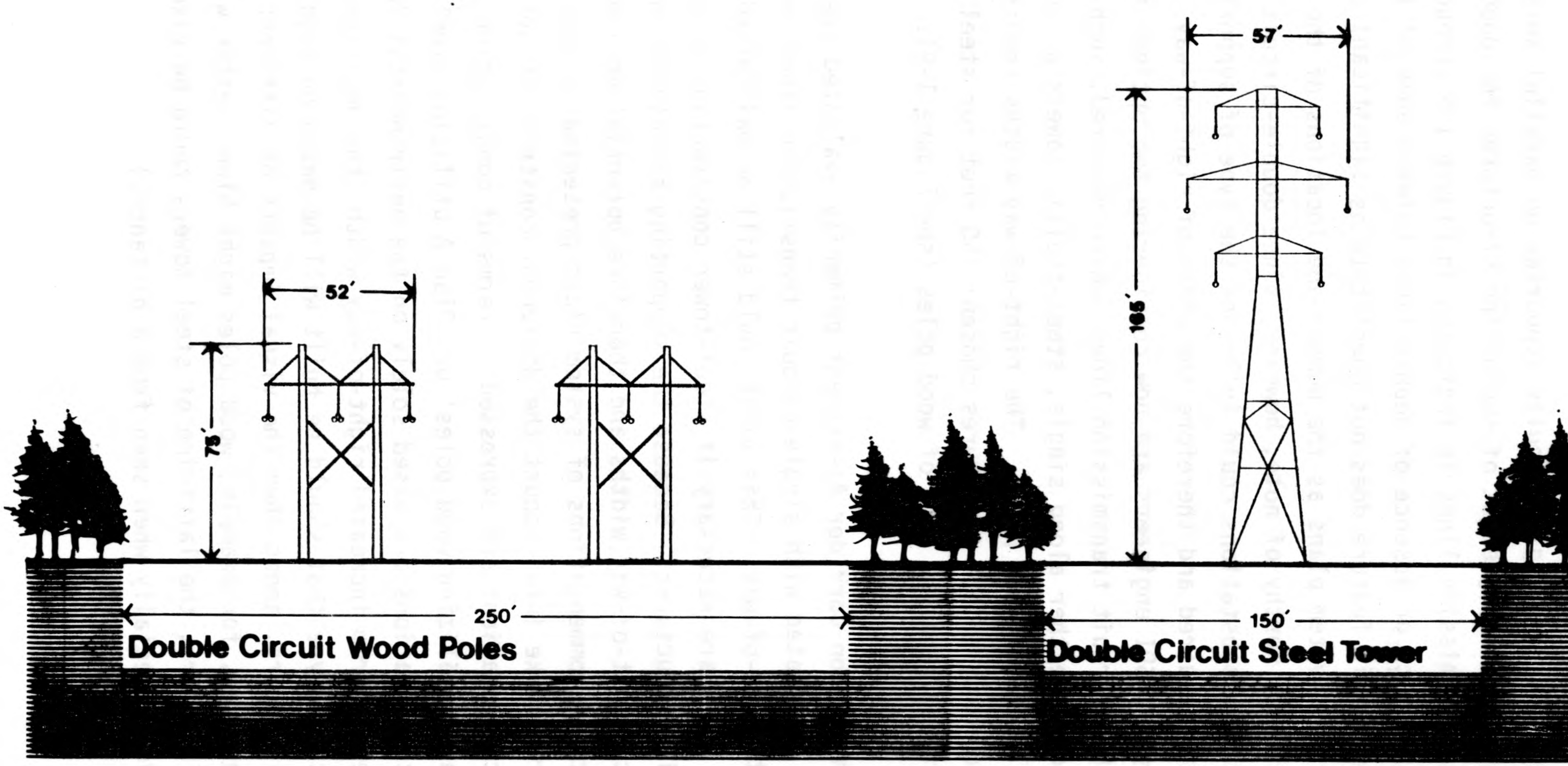
Authorized System Plan A and B would involve electrical transmission lines between the Dickey and Chester substations in Maine; from there, the direction of electrical transmission would branch south toward the Orrington and Winslow substations in Maine and west toward the Sugarbrook substation in Maine, the Comerford substation in western New Hampshire, and the Granite substation in Vermont. Ultimate System Plan A provides for transmission to two additional, more southern substations in New Hampshire and Vermont. Ultimate System Plan B is essentially the same as Authorized System Plan B except for the amount of electrical voltage transmitted between the Chester-Sugarbrook and Sugarbrook-Comerford substations (as indicated by the dotted lines on Figure 1-7).

In both the Authorized and the Ultimate versions of System Plan C, the direction of electrical transmission would proceed from the Dickey substation along western Maine to the Comerford and Granite substations in New Hampshire and Vermont. An additional substation in New Hampshire is under consideration for Ultimate System Plan C. (Note that the optional ±400 volt DC line previously mentioned is being considered for the Dickey to Comerford segment of this system plan. The Transmission Corridor Assessment was concerned, however, primarily with 345 kV transmission voltage).

Although the three plans for each level of service (Authorized or Ultimate) represent mutually exclusive alternatives, since only one plan in each set would ultimately be implemented, for the purposed of analysis Authorized System Plans A and B are identical and will hitherto be designated "Authorized Plan A-B." The substations in both plans are the same . The option of supporting double-circuit lines with parallel sets of supporting structures in the segment between Chester and Sugarbrook in Plan A as opposed to the single set of supporting structures required for single-circuit lines in the same segment of Plan B is the only point of distinction.

The option of two single-circuits supported on parallel sets of structures or a single set of supporting structures for double-circuit transmission lines is indicated in Figure 1-6 through 1-8 by the presence or absence of double lines between some of the substations. This feature does not constitute as significant a difference between the system plans as the number and locations of the substations. The option is worthy of note, however, since double-circuit lines between some substations could influence the type of supporting structure required and therefore the width of right-of-way clearings. USDI engineers are now considering two options for supporting double-circuit transmission lines; where required, such lines could be supported either along single, steel-trellis towers or between parallel sets of wood poles. The right-of-way widths required would vary according to the structures chosen: 150 feet for steel tower; 250 feet for parallel sets of wood poles (see Figure 1-9).

The Transmission Corridor Assessment primarily evaluated the environmental impacts associated with single-circuit transmission lines requiring a 150-foot right-of-way. This width could still be maintained where double-circuit lines are necessary if steel-tower construction is used for the supporting structures. Because the supporting structures chosen would influence right-of-way widths and therefore potential environmental impacts, the recommendations of system plans presented in this report necessarily take into account the different construction options. System plan recommendations are expressed in terms of construction types--e.g., for 'Plan A utilizing wood poles' or 'Plan A utilizing steel towers.' Such recommendations are based solely on the environmental impacts that might result from increased right-of-way width; the decision about the construction type that should be built will be based on a variety of additional factors, among them the visual impacts of different structures. (In some areas, for example, wood poles might blend better with the landscape; in others, the latticing of steel towers could be visually less obtrusive, especially when seen from a distance.)



Supporting Structures for Transmission Lines

figure 1·9

Because the criteria for siting alternative transmission corridors and for recommending 'least-impact' corridors and system plans are based on environmental conditions within the study area, a number of salient features of the three-state region should be noted.

Relative to a population density of 188 people per square mile in New England as a whole, the population density in Vermont, New Hampshire, and Maine averages 38, 30, and 21 people per square mile, respectively. Within the study area, population centers are mostly small towns and villages surrounded by forests. Only 13 towns have populations greater than 10,000; commercial, industrial, and residential centers are generally on the fringes of the study area. The remote northern parts of the three states, owned largely by private timber companies, have few year-round residents and few roads. They are accessible mainly by the tote roads used for hauling timber. As a rough rule of thumb, the farther south one goes in the study area, the higher the percentage of settled land and the greater the number of paved roads. The more densely populated portions of the study area are located along the Atlantic coast and in southern Maine and New Hampshire; however, even in these more settled areas, due to heavy concentration of vacation homes and resorts, the number of year-round residents is not substantial.

Forest is the predominant land cover in the three states, representing 73, 86, and 90 percent of Vermont, New Hampshire, and Maine respectively. These forests are important for reducing the impact of flooding during the spring thaw. In addition, the large proportion of forest land owned by the timber, pulp and paper, and wood products industries contributes significantly to the economies of the states. The 8.3 million acres of commercial forest in Maine, for example, comprise roughly 44 percent of the state; one out of every four manufacturing employees works in forest industries, which account for $929 million annually, or about 38 percent of the total value of all products manufactured in the state.

Agriculture is similarly important, more so in Vermont and Maine than in New Hampshire. Dairy and cattle farms comprise much of eastern Vermont along the Connecticut River; potato farming in Maine's Aroostook Valley and poultry farming toward the southern coastline are large and growing industries.

The region's combination of scenic beauty, varied species of fish and wildlife, and historic sites attracts large numbers of recreation-seekers from all parts of the country, particularly the major metropolitan areas in southern New England. The economic contribution of recreation-related industries--tourism, travel services, vacation home construction, cross country and downhill skiing, and many other summer and winter activities--is second only to that of the forest industries. In Maine, for example, hunting and fishing alone accounted for $450 million in 1970.

The region's landscape is diverse--rugged mountain ranges, dissected peneplains, alluvial terraces, old lake bottoms. Water is abundant; Maine alone has over 5,000 lakes and ponds and more than 25,000 wetlands. The range of outstanding scenic attractions is unique: in Vermont, the rustic villages, covered bridges, historic buildings, and fall folliage; in New Hampshire and Maine, the White Mountains; in Maine, the climbers' trails of Mt. Katahdin, the fish and wildlife of the North Woods Wilderness, and the famed white waters of the Allagash Wilderness Waterway.

Corridor-Location Criteria and Determinants

The primary objective of the Transmission Corridor Assessment was to identify alternative corridor locations where introduction of transmission facilities would entail least impact on the study area's existing environment. In defining 'best' locations in terms of 'least impact' rather than seeking out 'most attractive' locations for transmission corridors, the Transmission Corridor Assessment assumed that avoiding the most detrimental consequences that could be associated with transmission facilities would, in effect, produce alternative corridors most compatible with the existing environment.

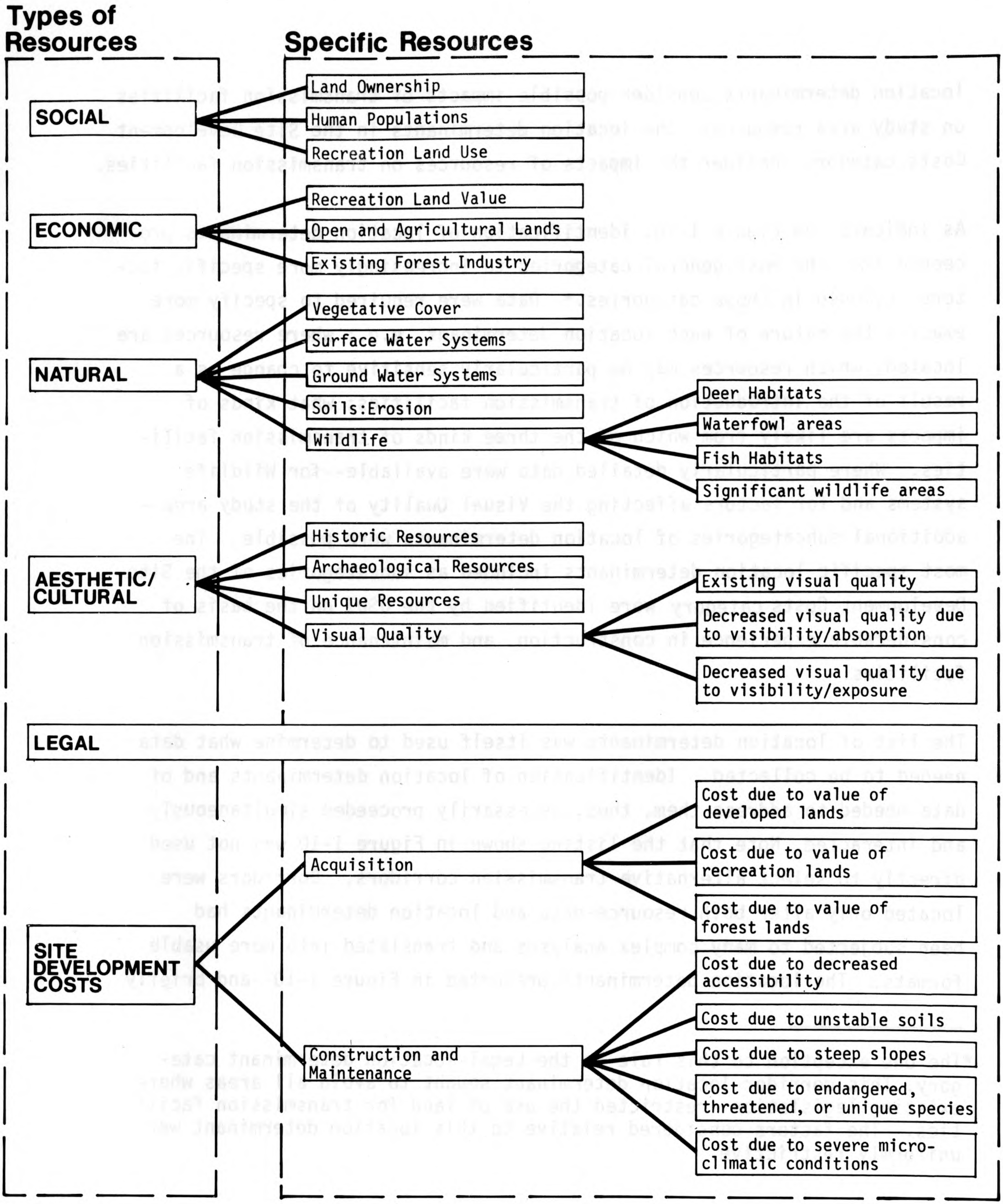
As criteria for siting alternative transmission corridors, both qualitative and quantitative standards of measurement were used. The kinds of impacts which the Transmission Corridor Assessment sought to avoid included, on one hand, severe impacts on the quality of any given environmental resource; on the other hand, multiple impacts in a given geographic area, or limited impacts on many resources.

Ideally, all such impacts should be avoided. The Transmission Corridor Assessment operated on the assumption that proper siting of transmission corridors will avoid the majority of the negative impacts that might be associated with the introduction of transmission facilities--and furthermore, that such impacts should be avoided at the corridor-location stage, prior to the phases of the Dickey/Lincoln School project that will identify alternative route and right-of-way locations within identified transmission corridors. Because avoiding severe impacts at this early stage was assumed to be within the purview of the Transmission Corridor Assessment, the terminology of this report often does not distinguish between impacts associated with transmission corridors and those associated with transmission facilities that might eventually be introduced within the identified corridors.

More realistically, the Transmission Corridor Assessment recognized that some impacts associated with transmission facilities may be unavoidable, that some environmental resources and locations within the study area may be more sensitive to impacts than others, and that precise degrees of impact can, in fact, be assessed only be studying right-of-way locations relative to the study area's resources. Analytical procedures were therefore needed to identify resources and areas within the study area that could be considered more critical than others to maintaining the existing quality of the environment. Since degrees of impact could not be specified at this stage it was assumed that any impact on a critical resource or in a sensitive area could be considered severe and should be avoided during siting of alternative transmission corridors.

Many factors were considered in determining locations of alternative transmission corridors. Figure 1-10 lists 28 different "corridor location determinants"--i.e., factors considered as constraints, in one way or another, to introduction of transmission facilities. The items on the list generally represent groups of environmental resources that may be subject to impacts resulting from introduction of transmission lines and from associated construction and maintenance practices. On the figure, these selected study area resources are presented in logical categories according to the general kinds of resources (or existing resource "systems")--Social, Economic, Natural, or Aesthetic/Cultural--that might be affected. Corridors were sited to avoid, insofar as possible, impacts on these resource systems. In other words, the possibility of environmental impacts on these resources limited the possible locations of transmission corridors.

Since an additional objective of the Transmission Corridor Assessment was to locate alternative corridors that would entail fewest costs, another general category of location determinants--Site Development Costs--is included on the figure to indicate where study area resources could pose constraints to acquisition of land for transmission facilities and to construction and maintenance practices. In other words, while most of the



Corridor-Location Determinants

figure 1·10

location determinants consider possible impacts of transmission facilities on study area resources, the location determinants in the Site Development Costs category consider the impacts of resources on transmission facilities.

As indicated on Figure 1-10, identification of location determinants proceeded from the most general categories to increasingly more specific factors included in those categories.* Data were required to specify more exactly the nature of each location determinant, e.g.: where resources are located; which resources may be particularly sensitive to change as a result of the introduction of transmission facilities; what kinds of impacts are likely from which of the three kinds of transmission facilities. Where particularly detailed data were available--for Wildlife systems and for factors affecting the Visual Quality of the study area--additional subcategories of location determinants were possible. The most specific location determinants included as subcategories of the Site Development Costs category were identified by the USDI on the basis of considerable experience in construction and maintenance of transmission facilities.

The list of location determinants was itself used to determine what data needed to be collected. Identification of location determinants and of data needed to address them, thus, necessarily proceeded simultaneously and interacted. Note that the listing shown in Figure 1-10 was not used directly to select alternative transmission corridors. Corridors were located only after both resource-data and location determinants had been subjected to many complex analyses and translated into more usable formats. The location determinants presented in Figure 1-10--and briefly

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*The one exception to this rule is the Legal location determinant category. This corridor-location determinant sought to avoid all areas where existing legislation restricted the use of land for transmission facilities. The factors considered relative to this location determinant were uniformly restrictive.

described in the ensuing text according to the different resource 'systems' or categories--do represent the most comprehensive set of location determinants which data availability would allow to be incorporated within the Transmission Corridor Assessment.

Social Systems. To avoid infringing on social values, the Transmission Corridor Assessment sought to avoid corridor locations where large numbers of people would be exposed to transmission facilities, more specifically: in areas having large numbers of land owners (either public or private); in proximity to residential or other settled lands; or in recreation areas where transmission facilities would be incompatible with the kind or quality of recreation experience sought.

If corridors were located in such areas, a number of impacts might result. Land owners could be displaced because of installation of transmission facilities and acquisition of easements on the land required for construction and for rights-of-way. Installation of facilities near settled areas could not only represent a major aesthetic intrusion but might also decrease land values. In recreation areas whose primary attraction is escape from the earmarks of society, introduction of transmission facilities could discourage recreation-seekers.

Economic Systems. The Transmission Corridor Assessment sought to avoid reducing economic values of recreation areas and of agricultural and forest industry lands. The data considered relative to this category of location determinants therefore included information on different kinds of land uses that generate revenues. Varied economic impacts could result from location of transmission facilities in such areas. The presence of transmission facilities could, by reducing the attractiveness of some recreation areas (particularly those in remote, primitive locations), decrease the number of visitors and thus reduce the economic viability of the areas affected. Depending on the type of agricultural land use, construction of access roads could remove agricultural land from cultivation, reduce available pasture land, or limit a farmer's mobility in using harvesting or irrigation equipment. Right-of-way clearing could remove substantial amounts of land from forest-industry production.

Natural Systems. The Transmission Corridor Assessment sought to avoid interference with the existing ecological quality of the study area's many natural systems. Impacts of transmission facilities on various soil and water systems could range from upsetting the ecological stability of vegetation and increasing soil erosion to altering water quality. For example, loss of some vegetation, in the path of a right-of-way, would certainly result during right-of-way clearing; the degree of impact by transmission facilities on the remaining vegetative cover (both plants and trees) could vary, e.g., according to the age or hardiness of a plant species or the ecological stability of a forest association (i.e., type of tree, such as northern hardwoods). Increased soil erosion would likely result--primarily because of construction but to some degree because of maintenance practices--in areas that have steep slopes.

Some surface water bodies and water basins in the study area could be susceptible to impacts associated with transmission facilities. A decrease in water quality could result from: siltation during construction; increased water temperatures associated with loss of vegetative cover; herbicide spraying to maintain vegetation in rights-of-way; or alteration of flows when access roads cross streams and small rivers. As a result of various construction and maintenance practices, ground water pollution could occur in areas where high soil permeability permits ready infiltration of rain water into the ground water system. Municipal and/or domestic drinking supplies that depend on ground water would also be affected.

To avoid interference of transmission facilities with existing wildlife populations (especially with known and probably habitats of deer, waterfowl, and fish), habitats were identified and various sources and kinds of impacts anticipated. Right-of-way clearing near deer wintering yards could, by decreasing vegetative cover, increase exposure of the animals to severe winter weather (although it might also benefit deer if clearing increased their food supplies and provided travel paths). By affecting water bodies and wetlands, transmission line installation and maintenance could indirectly reduce the quality of waterfowl nesting and rearing habitats and/or temporary resting places, while transmission lines themselves could present direct hazards to the birds (if towers interfered with their flight). The quality of fish habitats could be impaired by increased water temperatures, herbicide spraying, and access roads crossing streams and small rivers.

Transmission facilities would presumably have similar effects on other species of wildlife and vegetation, all of which could not be separately quantified in this study. Examples of areas which the corridor identification process sought to avoid include: identified wildlife habitats, refuges, and management areas; critical wildlife habitats and restoration areas; and locations of "Endangered and Threatened Species" (both wildlife and vegetation) and of recognized "Species of Special Concern."

Aesthetic/Cultural Systems. To preserve the aesthetic and/or cultural integrity of study-area resources, the corridor identification process sought to avoid location of transmission facilities in or near: known historic sites; known and probable areas of archaeological significance; and areas where facilities would be incompatible with any other unique resources, especially those considered important by study-area residents. Proximity of transmission facilities to historic sites could impair the aesthetic quality of such areas. Construction practices might damage the foundations of historic structures or destroy valuable archaeological artifacts.

Because the appearance of transmission lines was assumed to be one of their more negative aspects, factors affecting visibility were examined in detail. The Transmission Corridor Assessment aimed to avoid placement of facilities: in or near the most visually attractive sections of the study area; in locations lacking land forms or other physiographic elements which could conceal the lines or allow them to blend with the landscape; and in areas where large numbers of people attracted by particular land uses (such as recreation activities) would be exposed to negative visual impacts.

Legal Systems. As previously noted, this corridor-location determinant sought to avoid all areas where existing legislation restricted the use of land for transmission facilities. When resources were considered significant enough to warrant federal or state protection--e.g., locations of "Endangered and Threatened Species" of wildlife and vegetation--they constituted an obvious constraint to transmission corridor locations. Other resources subject to legal restrictions included, for example, airports and navigable waterways. Transmission corridor locations in proximity to such areas could be potentially hazardous to air traffic and radio communications between aircraft and landing areas.

Site Development Costs. Given the aim to minimize the acquisition costs of land required for transmission rights-of-way, corridor location should be avoided in areas where costs of acquiring land or easements on land are high. Such costs will be greatest where land in urbanized areas is already developed and land values high; where recreation is the primary designated land use; and where property is presently owned by the commercial forest industry, who might ask--in addition to the land value--some form of remuneration for lost forest production. To assess the impact of such locations on acquisition costs, data were used to identify where such high-cost areas exist within the study area and to rate each area according to its degree of influence on acquisition costs. For commercial forest areas, assessment of the productivity of forest lands was also required.

Similarly, to keep construction costs within bounds, corridor locations should be avoided in certain areas or where certain site conditions exist. A substantial portion of the cost of transmission facilities goes toward construction and maintenance of access roads. Inaccessible areas, or those where existing access is minimal, require construction of many miles of new roads; steep slopes increase the difficulty of constructing transmission facilities as well as access roads. When soils are unstable, special, more expensive techniques are required not only to install lines and build roads but also to avoid structural failures that incur additional repair costs.

Maintenance of transmission lines can be facilitated and repair costs reduced by avoiding corridor locations: in areas where endangered, threatened, or unique species of fauna and flora exist; and in those subject to severe microclimatic conditions such as winds and ice loads. In the former case, preservation of such areas and of especially fragile species within them could require adjustments in construction and maintenance procedures (entailing costs, e.g., for special equipment). Such adjustments could include installation of transmission lines and supporting structures by helicopter rather than by conventional vehicles, or utilization of manual labor to apply herbicides in or remove vegetation from rights-of-way. In the latter case, winter conditions could damage facilities and, while increasing their need for repairs, reduce their accessibility to maintenance crews. Such interruptions in transmission service would result in cost increases due to the amount of service lost.

During identification of location determinants, public input was solicited so that the factors governing corridor location might reflect issues of concern to people within and immediately adjacent to the study area. In a two-way exchange of information, members of the multidisciplinary team working on the Transmission Corridor Assessment also informed the public of the existence of the project, its purpose, progress, and implications. The public addressed included private citizens, organized private interest groups, and public and semi-public agencies.

Project team members gained information on public attitudes by various means: 1) conducting numerous meetings and personal interviews with both individuals and agencies across the three states; 2) reading newspaper and magazine articles as well as press releases put out by individuals, organized interest groups, and public agencies; and 3) participating directly in meetings conducted by the USDI to acquaint the public with various aspects of the Dickey/Lincoln School project. Contact with officials working in state and federal agencies in the study area was particularly important since such people were usually most knowledgeable about resource management within the study area. An additional source of information was a preliminary assessment of the study area performed by Comitta Frederick Associates; while the study was intended primarily for data reconnaissance, it also gauged public awareness of issues associated with construction of transmission facilities.

Public involvement was encouraged before alternative transmission corridors were sited and comment was, in fact, incorporated in the decision-making processes. The listing of location determinants that was identified included resources about which the public had demonstrated concern. Additional location determinants included some that were identified by reviewing similar corridor selection studies and some judged to be important by members of the project team and by USDI representatives. Important issues that were identified by these means corresponded closely with many of the expressed concerns of study area residents.

Among the most frequently voiced concerns were: 1) proximity of transmission lines to urbanized areas; 2) visual and aesthetic impacts of transmission facilities on the landscape; 3) the relation of transmission planning to existing or proposed land-use planning; 4) possible impacts on unique natural resources; 5) impacts on 'wilderness' and therefore on revenues generated by recreation in such areas; 6) possible loss of commercial timberland and of employment generated by the forest industries; and 7) displacement of wildlife and fish from their habitats.

One of the overriding feelings was that transmission lines should not be located close to settled areas and traveled roads, either because of the visual unattractiveness of lines and supporting structures or because of potential conflicts in land use if transmission facilities are located in areas where the amount of 'buildable' land available for future construction is limited. Most concerns focused on the former impact; the latter was predominant in specific towns, such as Berlin, New Hampshire, where buildable land is limited. A related issue of land-use conflict concerned the possibility of infringement on state- and federally-owned lands,* particularly those considered to be scenic resources.

A similarly overriding feeling was that numerous unique natural resources--e.g., the Allagash Wilderness Waterway, the unorganized townships, and Baxter State Park in Maine, or White Mountain National Forest in New Hampshire--are considered critical to the three-state region and should remain unaltered, in their natural state. While some such areas are not heavily used at present, the very lack of use--or human intrusion on the landscape--is one of the prime attractive features that accounts for their 'uniqueness'. The unorganized townships in northern Maine are widely perceived as one of the last extensive tracts of wilderness in the northeastern United States.

Impacts on wilderness were of dual concern, since both the states and various recreation-related industries depend on the tourist dollar generated in such areas by various activities (camping, canoeing, hiking, hunting, fishing, etc.). While the unorganized townships do not conform to the classic definition of 'wilderness' as virgin forest--because such activities are 'land uses' that constitute a certain amount of existing development--the area does include many miles of uninhabited land, and is renowned as a retreat from the trappings of urban life. Any

*Among the many government land-use plans and studies that would require consideration during the course of transmission planning are: Maine, New Hampshire, and Vermont SCORP Plans; LURC Comprehensive Plan; Allagash Wilderness Waterway Concept Plan; Penobscot Wild and Scenic River Study; Forest Plan for White Mountain National Forest; Connecticut Lakes Study; New Hampshire Guide Plan; New England Heritage (Connecticut River National Recreation Study Area); Regional Planning Program (Lamouille County Development Council); and town plans of the North Country Council.

change in the natural state might easily dissuade tourists and recreation-seekers.* Of similar economic concern was the possible loss of timber (a primary source of forest-industry revenues and of employment in the study area) over both the short and the long terms.

A related issue of ecological and economic concern was possible displacement of wildlife (particularly deer) from their habitats and possible detrimental impacts on fish. In both cases, impacts could affect revenues generated by hunting and fishing--revenues which all three states depend upon. Of special concern were impacts on anadromous fish such as Atlantic salmon (which inhabit either warm or cold waters at different stages of their life cycles), since the states spend significant funds annually on stocking programs. Some potentially detrimental impacts, already noted, could result from: the spraying programs required to maintain vegetation in rights-of-way; increased water temperatures; and sedimentation in rivers and streams. The survival of deer if transmisssion facilities infringed on known wintering yards was considered similarly important, as were impacts on already endangered wildlife species.**

In addition to gauging public concerns--by the means and through the sources mentioned--over potentially affected resources and geographic areas within the study area, the Transmission Corridor Assessment sought public input on the importance of different resources relative to each

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*The impact of transmission facilities on wilderness recreation would, of course, depend on: the type of recreation sought (e.g., scenic retreat or licensed hunting and fishing) and impacts of facilities on wildlife and fish in the vicinity; the visual proximity of facilities; and the amount of existing development.

**It should be noted that many people felt clearing of rights-of-way could have positive effects on wildlife habitats (depending, of course, on the species affected and the exact location of rights-of-way) if food supply in the clearings is increased or travel routes are opened.

other. VTN project team members distributed response sheets--called "Ratings of Concern" (see Figure 1-11)--at the public meetings conducted by the USDI during very early stages of the transmission corridor planning process, before transmission corridors were sited. Six such meetings were concentrated during mid-July, 1976 in: Presque Isle, Bangor, and Augusta, Maine; Concord and Berlin, New Hampshire; and Montpelier, Vermont. During these meetings, the USDI presented: information on the Dickey/Lincoln School hydroelectric project and the division of responsibilities relative to the project; examples of construction, operation, and maintenance practices associated with transmission lines; and explanation of the Transmission Corridor Assessment phase of the total project.

The response sheets distributed were a preliminary list of some of the resources ultimately included as location determinants in the Transmission Corridor Assessment. The forms were used as a checklist later in the Transmission Corridor Assessment. The limited public response received through the forms corresponded closely with ratings of importance of different location determinants that were assigned by project team members at that later stage.

It should be noted that during this early stage of public involvement, impacts associated with transmission facilities were often not in the forefront of public awareness but were considered--especially by residents in the vicinity of Dickey, Maine--to be subordinate to potential impacts associated with construction of the dams. (The extent of impoundment of water behind the dams was, in that regard, a primary concern.) Often, the only potential impacts anticipated from transmission lines were visual/aesthetic effects on the landscape.

The lesser degree of awareness may be the result of a lack of equivalent publicity for transmission planning as opposed to dam construction; transmission planning was begun only after studies related to dam construction were well underway. The subordinate importance assigned by the public

Area of Concern: The shaded area on the map above represents the area within which locations for power transmission corridors related to the proposed Dickey/Lincoln Dam are being considered. We would appreciate your help in indicating any area on the above map where the location of transmission lines might impact or be incompatible with the existing environment. Please circle any places within the shaded area on the above map where you feel this is the case. Please place an "X" over the place where you presently live.

If you choose to circle any places on the above map, please indicate why you feel these areas are incompatible or sensitive with respect to the location of power transmission lines. Space has been provided on the reverse side of this page for your explanations or any comments you might have. Your help and comments on this matter are greatly appreciated.

Public Concerns: Response Sheet

figure 1·11

Comments: ____

____

____

____

____

____

Rating of Concerns

How important would you consider each of the concerns listed below if you were planning the route to be followed by a power transmission line. Please check the appropriate space for each concern.

	VISUAL/ESTHETIC QUALITY OF THE LANDSCAPE	WILDLIFE HABITAT	EXISTING FOREST INDUSTRY (FOREST PRODUCTIVITY)	LAND OWNERSHIP	EXISTING AGRICULTURAL LAND USE	RECREATIONAL LAND USE	SURFACE WATER SYSTEMS (STREAMS, RIVERS, LAKES, PONDS & WETLANDS)	HISTORIC PLACES	AREAS OF ARCHAEOLOGIC SIGNIFICANCE	HUMAN SETTLEMENT	SPORT FISHING & FISH HABITAT	OTHER: ____ (SPECIFY)
VERY IMPORTANT												
MODERATELY IMPORTANT												
SLIGHTLY IMPORTANT												
NOT IMPORTANT AT ALL												

Public Concerns: Response Sheet

figure 1·11

to potential impacts associated with transmission facilities may be explained by two factors. 1) If potential problems associated with dam construction are serious enough to stop the proposed project, transmission facilities for the power generated would clearly not be needed. 2) Impacts associated with transmission facilities, though not necessarily as minimal as the strictly visual/aesthetic impacts anticipated by some people, would be relatively minor compared with those associated with dam construction.

A number of confusions also arose concerning division of responsibilities for the overall Dickey/Lincoln School project. For example, people expressed concern about potential impacts associated with dam construction to members of the USDI project team, or about those associated with power transmission to representatives from the Army Corps of Engineers. Fact sheets distributed by both the USDI and the Corps of Engineers to relate progress on the individual aspects of the project helped to remedy such misunderstandings.

A Framework for Analysis

The procedures for using corridor-location determinants to identify and evaluate alternative transmission corridors were implemented by a multidisciplinary team of professionals with expertise and experience in working with the study area resources. Disciplines represented by this team included: regional planning; engineering; landscape architecture; history and archaeology; economics; sociology; and biology.

One of the unique features of the approach employed was comprehensiveness. Other transmission planning studies frequently approach the task of siting transmission corridors by limiting from the outset both the study area and potential corridor locations within it. According to this approach, 'fatal flaws'--i.e., visible constraints to corridor locations--are identified and not subsequently analyzed. Such constraints might include: certain legally designated land uses such as state parks or intensively used recreation areas; high elevations and steeply sloping, mountainous terrain; and large bodies of surface water such as lakes and rivers.

By contrast, the land-use planning process employed in the Transmission Corridor Assessment is a more "regional" approach. In establishing peripheries for the study area, the Transmission Corridor Assessment moved from reconnaissance information on the general region within which a study area might be established to data on specific sites and resources within that region. Study area boundaries were finally established only after available data had been analyzed and, even then, the boundaries were not automatically drawn with respect solely to physiographic features. Where political jurisdictions such as town and county lines existed in proximity to such visible features, boundary lines followed the jurisdictions rather than the physiography so as to respect towns or counties that function as integrated political or cultural systems.

Within the delineated study area, resources were similarly analyzed more comprehensively than in a traditional approach in order to assess potential environmental impacts. Because of the assumption that the alternative corridors identified should exclude the possibility of severest environmental impacts before subsequent studies of alternative routes and rights-of-way are conducted, a large number of resources and location determinants required consideration, and a more complicated set of analysis procedures than would normally be used in transmission corridor planning was accordingly needed. The Transmission Corridor Assessment employed a dual framework for analysis, entailing different methodological steps during "corridor identification" and "corridor evaluation" phases.

Corridor identification procedures were designed to eliminate from consideration possible locations that would entail 'most negative' impacts; these locations were eliminated via a separate corridor "allocation" process before the alternative corridors that were shown in Figure 1-1 were "delineated." The largest part of the analytical procedures employed in the Transmission Corridor Assessment was intended to insure: that study area resources critical to maintaining the existing quality of the environment would not fall within the path of alternative transmission corridors; and that resources that might fall within any alternative corridor would be those least susceptible to environmental impacts. These analyses constituted an interim stage of the Transmission Corridor Assessment, required as input to the allocation and delineation processes (i.e., to corridor identification). The analyses required a complex mapping procedure that operated much like a computer program simulating the study areas' existing environment.

Corridor evaluation procedures were designed to rank the alternative corridors according to 'most desirable' corridors that should be examined in more detail for possible route and right-of-way locations, and to use these rankings in recommending USDI electrical-system plans.

The objectives during the corridor identification phase were to:

- Delineate study area boundaries within which resources would be intensively investigated, and refine those boundaries as specific resource-data were collected.
- Identify location determinants to be considered in siting alternative transmission corridors within the study area, and establish criteria for using them in the Transmission Corridor Assessment.
- Identify data needed to specify the nature of the location determinants; collect relevant, available data on selected environmental resources within the study area; and develop an inventory system for maintaining recorded resource-data in usable form.
- Develop a mapping system to depict the results of analyzing resource-data in a form usable during subsequent analyses.
- Develop analytical tools for arriving at interim products of analysis, including procedures to identify and evaluate 'critical' resources and environmentally 'sensitive' areas within the study area.
- Develop analytical tools to be used directly in allocation of alternative transmission corridors, by classifying location determinants at different levels of aggregation and judging the importance of individual location determinants relative to each other.
- Allocate transmission corridors by avoiding locations where 'critical' resources or environmentally 'sensitive' areas exist; delineate alternative transmission corridors in areas where resources are less susceptible to environmental impacts associated with introduction of transmission facilities.

The objectives during the corridor evaluation phase were to:

- Evaluate the alternative corridors, subdivided by corridor links and system-plan segments, to rank 'most desirable' corridors within which future studies should consider locating alternative transmission routes and rights-of-way.
- Use the top-ranked corridors to evaluate each set of USDI electrical-system plans, Authorized or Ultimate, and recommend most favorable plans considered in terms of alternative construction types.

At several points during the corridor identification and evaluation procedures, ground truth was established. During collection and inventory of the environmental resource-data that served throughout the Transmission Corridor Assessment to depict the study area's existing environment, field surveys established the accuracy of the data. These surveys were conducted both on the ground and from fixed-wing aircraft by project team members. Following delineation of alternative corridors, surveying by helicopter verified ground conditions and established the overall feasibility of the identified corridor locations. Finally, corridors and system plans were observed from fixed-wing aircraft to confirm the detailed results of the corridor rankings. Each of these procedures will be detailed where relevant in subsequent chapters of this report.

The interim analysis procedures employed before delineating alternative transmission corridors are presented in Chapter II of the report, including procedures to refine the study area boundaries, to analyze study area environmental resources, and to map both resources and products of analysis. Interim findings, or products of analysis, derived from using these procedures are detailed at the end of Chapter II; procedures used more directly to allocate and delineate alternative corridors, as well as evaluation of identified corridors and recommendation of top-ranked corridors, are described in Chapter III. In the final chapter, specific USDI system plans are recommended. Several appendices include many of the different products of the mapping system that served as key features of the Transmission Corridor Assessment.

CHAPTER 2

CHAPTER II
INTERIM ANALYSIS PROCEDURES AND FINDINGS

INTERIM ANALYSIS PROCEDURES

The interim analysis step was designed to insure that least desirable corridor locations--those entailing potentially severest impacts--could be eliminated from consideration before alternative transmission corridors were delineated. Various analysis steps were required to assess the study area's sensitivity to potential impacts associated with introduction of transmission facilities. 'Sensitivity' can be defined in terms of two major components: locations of 'critical' resources, any impacts upon which were assumed to be severe; and locations of environmentally 'sensitive' areas in which a number of resources share the same space within the study area. In order to avoid environmental impacts on such resources or within such areas, the Transmission Corridor Assessment required a geographic indication, relative to the study area boundaries, of where such resources and areas exist.

Refining the Study Area Boundaries

Boundaries for the area within which environmental resources were studied most intensively are shown in Figure 2-1. These boundaries were delineated to allow for all reasonable transmission corridor locations that could connect the substations in each USDI-recommended system plan. Several immediately apparent restrictions to the study area have already been noted. The international border separating Canada from Maine,

Study Area Boundaries

figure 2·1

New Hampshire, and Vermont comprised a significant portion of the northern boundary. The Atlantic Ocean and several large bodies of water in Maine and New Hampshire defined major portions of the eastern and southern boundaries.

To delineate the western boundary and further refine the boundaries to the north, south, and east, the Transmission Corridor Assessment collected site-specific data on environmental resources within the three-state region, including information on:

- Lands used primarily for recreation, both public and privately-owned recreation areas as well as those used only on a seasonal basis.
- Urbanized areas, classified according to population density and extent of urbanization.
- Large expanses of open water, such as rivers, lakes, and bays.
- Large wetlands.
- Topographic features such as steeply sloping, mountainous terrain.
- Physiographic features such as river systems, watershed basins, mountain ridges, and high elevations as well as groupings of such features.

The locations of all such features are readily visible and were, in fact, surveyed by project team members and USDI staff from fixed-wing aircraft and helicopter during the data collection process.

In a more traditional approach to corridor location, such features would be considered apparent constraints to transmission corridor locations and would therefore be automatically eliminated from further consideration. In the Transmission Corridor Assessment, data on these features were collected, mapped, and analyzed before delineating the final study area boundaries shown in Figure 2-1. The same data were also used, along with many other resource-data items, to assess 'least impact' corridor locations.

Other, less readily visible features within the region also influenced delineation of the study area boundaries--most notably, political/cultural jurisdictions such as town and county lines and existing or proposed land-use plans. In some areas, clear-cut boundaries could have been delineated to follow the visible landscape patterns; however, these boundary lines would have cut across towns and counties that function as integrated political or cultural systems. Therefore, where political boundaries existed in proximity to more visible physiographic features, the study area boundaries were drawn to include the political jurisdictions. Delineating the study area boundaries in this way insured that the resource-data collected relative to any such political/cultural unit would be available for inspection in uniform format.

The factors considered in refining the study area boundaries are shown in Figure 2-2 in relation to the criteria used to evaluate them. Aesthetic, legal, cost, and engineering criteria governed the decision whether to exclude a given resource from the study area. The boxes marked in Figure 2-2 indicate where barriers to the introduction of transmission facilities exist, i.e., areas which delineation of the study area boundaries sought to avoid.

Introduction of transmission facilities would entail visual/aesthetic impacts on most of the resources listed. In some cases, transmission planning would encounter legal barriers as well. For example, in Maine, a transmission line running across or adjacent to a "great pond"--which is legally defined as a body of water larger than 10 acres (if natural) or 30 acres (if man-made)--is subject to the legal restriction that no "dredged spoil, fill, or structure may fall or be washed into the great pond." *

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*Great Pond Laws. Department of Environmental Protection, State of Maine. Maine Revised Statutes, Annotated Title 38, Chapter 3. October, 1975.

CONSIDERATIONS	CRITERIA					
	LEGAL			COST	ENGINEERING	AESTHETIC
	Me.	N.H.	Vt.			
Political/Cultural Jurisdictions	*	*	*			
Recreation Lands	*	*	*	*		*
Urbanized Areas	*	*	*	*		*
Large, Open Bodies of Water	*			*	*	*
Large Wetlands	*	*	*	*	*	*
Topography				*	*	*
Physiography			*	*	*	*

Refining The Study Area Boundaries

figure 2·2

In other cases, construction of transmission facilities would be costly or would entail engineering difficulties. For example, where lines might cross large bodies of water, wetlands, or topographic and physiographic features, both cost and engineering factors would require consideration. Near urbanized areas or within legally-designated recreation areas, the cost of acquiring land for transmission facilities and rights-of-way would be high.

A combination of criteria determined where the final boundary lines were drawn. While boundary delineation usually sought to exclude areas or resources that posed barriers to the introduction of transmission facilities, some geographic areas were included within the boundaries because they provided opportunities for locations of transmission facilities. For example, because a transmission line already crosses the Penobscot River near Buckport, Maine and right-of-way clearing as well as negative visual impacts already exist, the study area boundary was delineated to include the immediate vicinity of the existing river crossing. Similarly, other geographical areas were included since they contained existing transmission right-of-way or substation locations.

The study area boundaries are detailed in an Appendix to this report according to town and county lines in the three states. Excluding the Canadian border and the Atlantic Ocean, the boundaries begin in eastern Maine (on the shore of Lake Chiputneticook) at the intersection of Aroostook and Washington Counties and proceed west across New Hampshire and Vermont. Several considerations were preeminent in delineating the southern and western boundaries. First, the frequency of large bodies of water and wetlands increases to the south of Bangor, Maine. Second, urban population densities and related infrastructures (such as highways), which would impose considerable legal and economic constraints on transmission corridor sites, also increase to the south. Finally, in delineating the westernmost study area boundary in Vermont, major mountain ridges and urbanized areas were excluded, and recreation lands (especially ski areas) were avoided because of their significant contribution to the state's economy.

Analyzing the Study Area's Resources

Although the study area functions as an integrated ecosystem, its sensitivity to potential environmental impacts associated with the introduction of transmission facilities would have been difficult to assess other than by examining the component parts of the larger system. The Transmission Corridor Assessment sought to avoid locating alternative transmission corridors where transmission facilities might alter the existing environmental condition of the study area--either within environmentally 'sensitive' areas having multiple resources or in proximity to 'critical' resources where any impacts would, in turn, severely affect the quality of an entire resource-system.

Data on the study area's environmental resources were needed to determine where corridor locations might entail the largest number of environmental impacts (i.e., where many different resources share the same space within the study area). As the determination required was a "spatial" one, data had to be recorded spatially--or mapped--to show the location, distribution, and concentration of the study area's resources.

Analysis of data on environmental resources was required to determine the kinds of possible impacts and the susceptibility of different resources and groups of resources to impacts. Interim analyses conducted during the corridor-identification phase of the Transmission Corridor Assessment entailed a series of logically interrelated procedures:

- Evaluating resources in relation to the resource-systems (or 'location determinants') designated for consideration in determining alternative corridor locations.
- Evaluating resource-data to identify the study area's most 'critical' resources.
- Evaluating the distribution and concentration of study area resources to identify environmentally 'sensitive' areas.

All such procedures were needed in order to avoid 'least desirable' potential corridor locations (i.e., corridors that could connect the various substations but would entail detrimental environmental impacts.

before delineating alternative transmission corridors. The results of the analysis procedures were also depicted on maps.

A unique mapping system was required in order to depict both the study area's resources and the products of the study's analysis. Before examining how this system translated both kinds of data into a format usable for subsequent analyses in the Transmission Corridor Assessment, the interrelationship between data available for analysis and interim analyses performed requires clarification.

Available resource-data. Data used in the Transmission Corridor Assessment are listed in Figure 2-3; 73 individual data items, each associated with an environmental resource (or some facet of a resource) that is located within the study area, have been grouped for convenience under 16 topics that indicate the general nature of the resources. The topics generally relate either to natural or to man-made resources. Since the individual data items were analyzed in a mapped rather than a list format, the order of presentation of the topics in Figure 2-3 was not required to follow a strictly logical pattern.

The list shown is not as comprehensive as an original list of data requirements that was prepared at an earlier stage of the Transmission Corridor Assessment.* Initially, data requirements were defined in an idealized way, relative to an equally idealistic list of location

*The more exhaustive list of data needs incorporated input from various sources: reconnaissance by Comitta Frederick Associates on resources existing and data available in the study area; testimony of experts on the project team and consultants in the study area; and related literature on data used in other corridor-location studies. Areas where data were found to be deficient as well as qualification of the data used in the Transmission Corridor Assessment (including sources, scale of presentation, and other relevant explanation) are discussed in a separate volume of this report. The qualification of resource-data contained in Volume II was used as an operational tool throughout the Transmission Corridor Assessment.

LAND USE
- Urban Centers
- Ex-Urban Development
- Town Centers
- Open and Agricultural Lands
- Aerodromes
- Indian Lands/Reservations

TOPOGRAPHY: SLOPE
- Slopes of 15% or less
- Slopes between 15% and 35%
- Slopes of 35% or more

RECREATION LANDS
- National Forests
- State Forests and State Parks
- Municipal Lands
- Scenic Wayside Areas
- Wild, Scenic and Designated Recreational Rivers
- National Scenic Trails
- Designated Scenic Roads

TRANSPORTATION
- Roads: Average Daily Traffic of 3000 and greater
- Roads: Average Daily Traffic less than 3000
- All Other Roads: no recorded Average Daily Traffic
- High Existing Access Density
- Medium Existing Access Density
- Low Existing Access Density

LAND OWNERSHIP
- Federally-Owned Lands
- State Owned Lands
- Semi-Public and Large-Institutional Lands
- High Parcel Density/Town
- Medium Parcel Density/Town
- Low Parcel Density/Town

ORIENTATION
- West - Northwest
- North- Northeast
- South- Southeast-Southwest

SURFACE HYDROLOGY
- Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
- Rivers and Streams
- Wetlands
- Sensitive Water Basins
- Navigable Waterways

ARCHAEOLOGY
- Existing Archaeological Sites
- Archaeological Sensitivity Zones

HISTORIC SITES
- National Register Historic Sites
- State Register Historic Sites
- Potential State and National Historic Sites

PHYSIOGRAPHY
- Elevations above 2500 feet
- Mountains, Hilltops, Military Ridges
- Mountain Sides, Hill Sides, Valley Walls
- Narrow Valley Floors

GROUND WATER
- Aquifers and Aquifer Recharge Areas

UNIQUE RESOURCES
- Identified Unique Resources
- Critical Areas: Maine
- National Natural Landmarks
- Natural Scientific Research/Wilderness Study Areas
- Wilderness/Primitive Areas

EXISTING UTILITIES & RIGHTS-OF-WAY
- Existing Electrical Transmission Lines, Substations, Generating Facilities
- Existing Oil Lines
- Railroad Corridors: Active and Abandoned

WILDLIFE
- Endangered and Threatened Species
- Species of Special Concern
- Restoration Areas (Some Endangered & Threatened)
- Deer Wintering Yards
- Waterfowl Areas
- Wildlife Refuges and Management Areas

FISH
- Warm Water Fish Habitats
- Cold Water Fish Habitats
- Anadromous Fish Habitats

VEGETATION
- Endangered and Threatened Species
- Alpine Tundra (Species of Special Concern)
- Spruce/Fir Associations
- Northern Hardwood Associations
- Lowlands Hardwoods Associations
- Transitional Hardwood Associations
- White or Red Pine/Eastern Hemlock Associations
- Pitch Pine

Available Resource - Data

figure 2-3

determinants to be considered in identifying alternative corridors. For the sake of thoroughness, because data were required to specify the nature of the environmental resources that might be affected by introduction of transmission facilities, collection of all data related to each of the location determinants under consideration was initially taken as an absolute necessity.

During data collection, however, the desire to assess all potentially relevant resource-data had to be reconciled both with limitations on the data actually available and with more practical considerations of the uses for which data were required in the Transmission Corridor Assessment. Availability of usable data was limited by a number of interrelated factors.

An immediate constraint was the Transmission Corridor Assessment's budget and scheduling, which limited the time for data collection and data analyses to an intensive six-month period. The combination of these factors prohibited generation of original data; all data used had to be either obtainable from sources within the study area or readily interpretable from existing information. 'Interpretable' data included, for example, the topographic information shown on Figure 2-3 by categories of of sloping terrain. The percentages required for use in the Transmission Corridor Assessment--to indicate, e.g., the amount of erosion that might result from installation of transmission lines and construction of access roads--were interpreted from the U.S. Geological Survey quadrangle maps. Where data were available, a related constraint in some cases was the incompatibility (e.g., in scale of presentation or detail of content) of available data with the needs of the Transmission Corridor Assessment.

Sources consulted during an intensive data search included: public agencies (both state and federal) and town records; private interest groups and individuals; and existing maps and photographs (both high-altitude and satellite) of the study area. Across the three states, more than 500 different agencies and individuals provided data-documents and/or information about environmental resources and resource management, existing and proposed land-use plans, and resource-management and land-use policies. (A list of individuals and agencies contacted, along with the source and scale of all data-documents provided, is contained in Volume II of this report.) Because the political units responsible for resource management and land-use planning vary in the three states, offices had to be contacted for information at various jurisdictional levels--regional, state, county, and town.* Recorded data (e.g., on locations of recreation areas, land ownership, archaeologically-significant areas, or historic sites) were often available in mapped form.

While the Figure 2-3 listing of available resource-data is thus, to some degree, a product of the reconciliation of data needs and data availability, available data proved more than sufficient for purposes of analysis. In fact, various analytical tools were required to reconcile the

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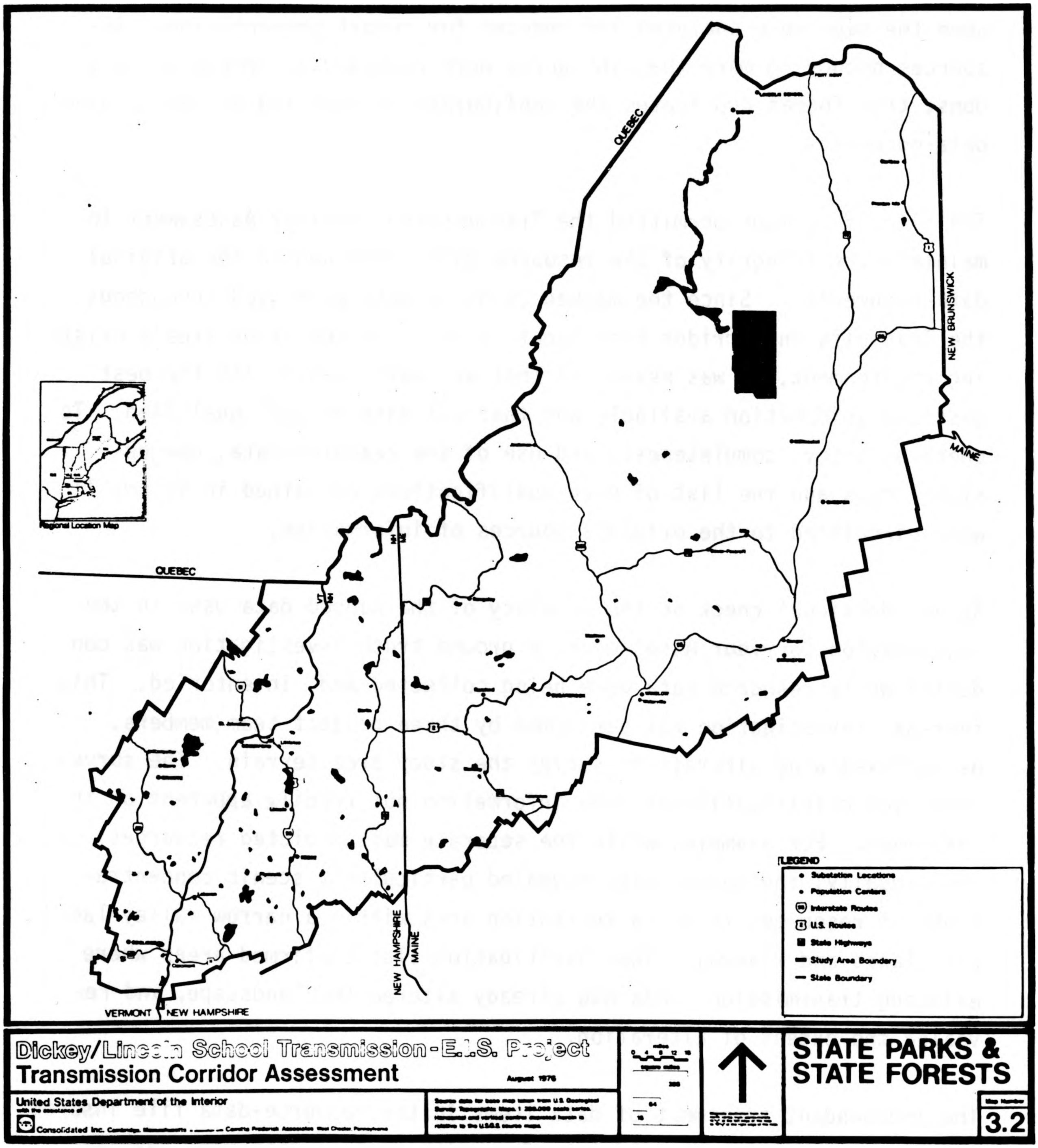
*For example, in Vermont the state plans and administers resource-management policies, while the counties maintain centralized records on existing environmental resources and general land uses (such as the 1972 Land Capability Plan). In New Hampshire, environmental information on the entire state is available through the state Office of Comprehensive Planning. In Maine, although regional planning commissions have been established over the entire state, most resource information is maintained at the town level. (For the unorganized townships in Maine, the Land Use Regulatory Commission, LURC, serves as a planning base.) Among the agencies with regional jurisdiction which were contacted was the New England River Basins Commission.

large number of resource-data items collected--and the desire to consider each resource individually--with the need for a manageable format that could be used in the Transmission Corridor Assessment. Part of the resolution of this methodological task was the mapping of resource-data items.

Conceptually, the listing of available resource-data can be thought of as a collective data file or inventory, which maintains separate records of all data items selected for study. While the resource-data are not expressed on Figure 2-3 in terms of geographic locations within the study area, each data item in the file--or, more precisely, the resource represented by each item--was, in fact, recorded on its own map. Thus, 73 separate maps were produced. Each map shows the location, distribution, and concentration of a resource (or of the various manifestations of a resource) within the study area. One such map is presented in Figure 2-4 for 'state parks and state forests' (listed under the 'Recreation Lands' topic in the data file). The largest polygon area on the map represents Baxter State Park in northern Maine; the river-like lines, the Allagash Wilderness Waterway. Smaller polygons and dots depict the distribution of the many state parks and forests throughout the study area. (A listing, by state, of names and/or kinds of resources depicted symbolically on each map is available in Volume II of this report.)

Each of the 73 resource-data items was recorded on a base map of the study area in either black-ink or other opaque symbols. The resources were graphed on mylar in different configurations (dots, lines, or polygons) that indicate size. All information on the original data-documents was condensed and delineated at a scale of either 1"=4 miles or 1"=8 miles, depending on the scale of the original data-documents. Because of this scale of presentation, certain extremely small resources (such as historic structures) were symbolocially recorded by dots. This degree of generalization was necessary when features occupied approximately 160 acres or less in order to insure the visual integrity of information



Resource - Data Item

figure 2·4

when the maps were analyzed and reduced for report presentation. Resources occupying more than 160 acres were recorded as irregular polygons; this format duplicates the configurations depicted on the original data-documents.

The file of 73 maps permitted the Transmission Corridor Assessment to maintain the integrity of the resource-data contained in the original data-documents. Since the mapped resource-data were used throughout the Transmission Corridor Assessment to describe the study area's existing environment, it was essential that all maps incorporate the best possible information available and that all data be well qualified. To check accuracy, completeness, and use of the resource-data, opaque-symbol maps and the list of data qualifications contained in Volume II were circulated to the original sources of information.

As an additional check on the accuracy of the mapped data used in the Transmission Corridor Assessment, a ground truth investigation was conducted while resource-data were being collected and inventoried. This four-day investigation was performed by three project team members, using fixed-wing aircraft to survey the study area terrain. The survey permitted clarification of some information not readily apparent on the data maps. For example, while the separate maps depicted resources individually, the aerial view revealed particularly scenic concentrations of resources (e.g., a recreation area within a narrow valley laced with lakes and rivers). The investigation also confirmed areas where existing transmission lines had already altered the landscape, and revealed the extent of alteration.

The independent treatment of data items in the resource-data file insured that each separate map could interface with various different corridor-location determinants. The analytical task remained to relate the resource-data to the location determinants whose nature they were intended to qualify.

Resources and resource-systems. Selection of a large number of determinants that should influence corridor locations would seem incompatible with the methodological need to objectively analyze a limited, more manageable number of factors. The content and form of the Transmission Corridor Assessment thus required reconciliation. Part of the resolution of this problem was conceptual. Each of the 28 location determinants identified in Figure 1-10 was considered a 'system' of resources, including 'components' from among the 73 resources represented in the resource-data file; each component of such a resource-system may individually be subject to impacts associated with the introduction of transmission facilities.

Methodologically, however, mentally correlating which resource-data items relate to which location determinants would have required a great deal of time and difficulty. For example, to identify factors contributing to the quality of the 'Deer Habitats' resource-system, the resource-data maps needed would include those related to deer habits: places where the animals are known to winter (filed, as shown in Figure 2-3, under the 'Wildlife' topic); and areas where an abundance of the vegetation types known to provide forage and protection against exposure should indicate deer habitats during other times of the year (filed under the 'Vegetation' topic). However, the items included in the resource-data file can be components of several different resource-systems. For example, the mapped data on 'Vegetation' could apply not only to 'Deer Habitats' but also to 'Forest Industry' and 'Vegetative Cover' location determinants. Or the 'slope' data filed under 'Topography' could be selected for study relative to either 'Soils: Erosion' or site-development 'Costs due to Steep Slopes'.

To simplify the correlation task, a matrix of resource-data and corridor-location determinants was prepared. Figure 2-5, the data/analysis matrix, depicts the file of resource-data items on the horizontal axis and a listing of the 28 location determinants analyzed on the vertical "C" axis. Note that the letters above the vertical axes indicate, proceeding from C to A,* levels of analysis performed on increasingly aggregated categories of location determinants; these analyses were conducted only after the resource-data maps on file had been translated into still more usable form--i.e., into the interim products of analysis presented at the end of this chapter. For convenience, the first level of analysis performed--using the data/analysis matrix and other analytical tools developed to relate the resource-data items to the location determinants--will hereafter be referred to as the "C-level" analysis of location determinants.

The black boxes presented horizontally in the body of the matrix indicate which component resources are included in a given environmental resource-system (in other words, which resource-data items have been analyzed relative to each location determinant). Blacking in of the boxes for this cross-tabulation was performed by members of the project team most knowledgeable about particular resources and resource-systems within the study area. Cross-tabulations were subsequently reviewed by the entire project team. On occasions when resources or resource-systems were considered of particular importance to special interest groups, assigned relationships were additionally reviewed by appropriate agencies having jurisdiction in the study area.

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*The 'A,B,C' titling was chosen for convenience, to reflect degrees of generality or specificity of the categories analyzed, and bears no relation to the 'A,B,C' designations of the USDI-recommended system plans.

Reading the black boxes vertically indicates only the 'variability' of resource-data items--i.e., the number of different location determinants to which a given resource-data item pertained or, in other words, the number of different contexts in which each resource-data map was analyzed. Some data items for which no black boxes are indicated--for example, all items filed under topic 13 ('Existing Utilities and Rights-of-Way') or the topic 4.2 item concerning roads with 'No Recorded A.D.T.' (i.e., average daily traffic)--were, in fact, used in a different way during the evaluation phase of the Transmission Corridor Assessment. While the corridor-identification phase sought to avoid 'least desirable' corridor locations, the evaluation process incorporated consideration of areas more compatible with transmission facilities (for example, areas where existing transmission facilities had already altered the landscape, or where lightly-traveled roads would entail least exposure of people to negative visual impacts associated with transmission facilities).

Analysis of resources was conducted using the horizontal axis of the data/analysis matrix, and the largest part of decisionmaking was required to relate each resource within the study area to different corridor-location determinants (considered as resource-systems). The relationships assigned--which can be read horizontally across the matrix--are for convenience also presented in tabulated format in Figure 2-6. On the figure, study area resources (indicated within the outlined arrows) are grouped under different resource-systems (C-level location determinants) and are also related to the different, numbered topics under which the appropriate resource-data maps were filed. Not included on the figure are the component resources analyzed relative to the 'Legal Regulations' location determinant; these resources are indicated on the data/analysis matrix but will be described in a later section of this chapter, since they were analyzed in a somewhat different manner.

Resources Within the Study Area

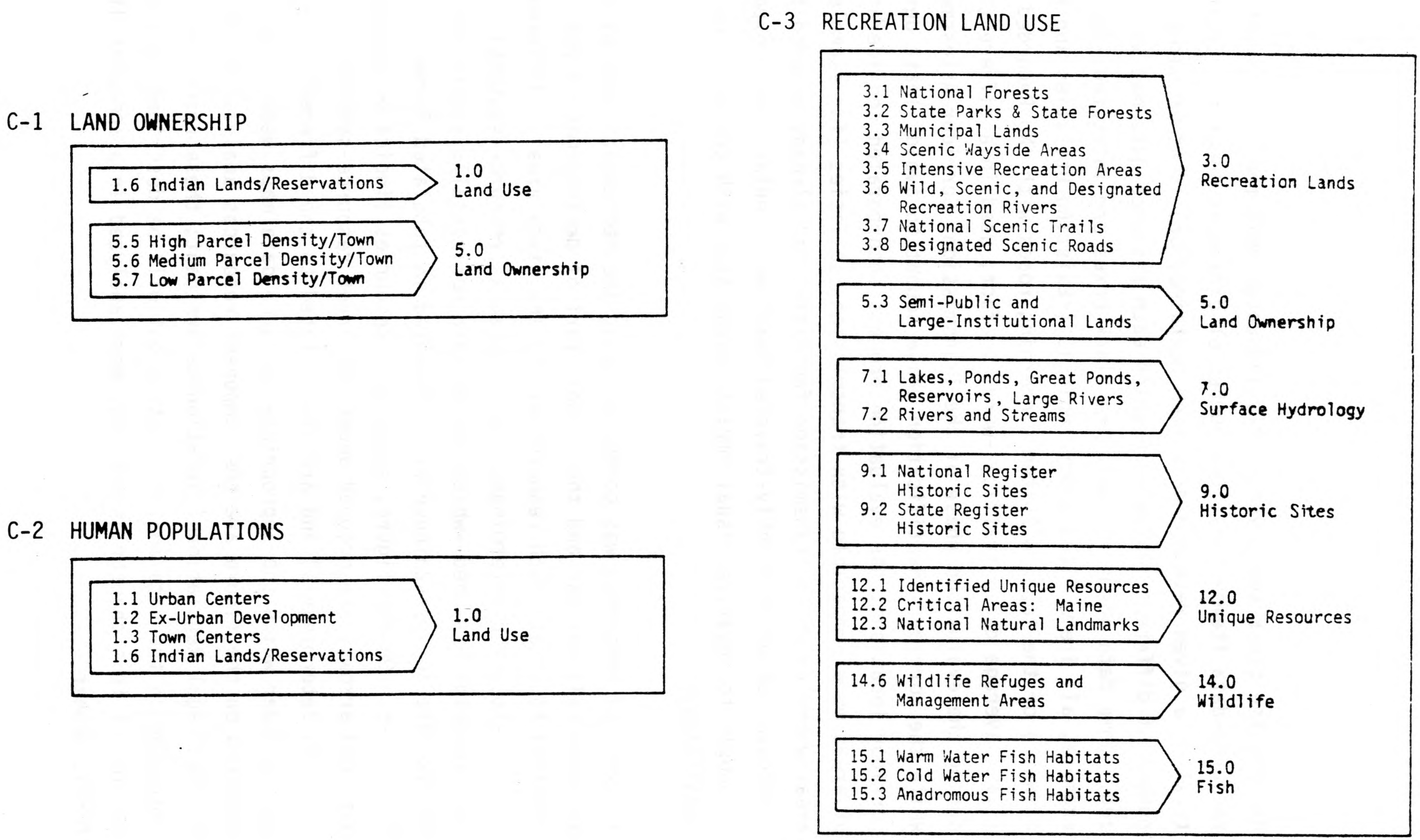

figure 2·6

C-4 RECREATION LAND VALUE

Components	Category
3.1 National Forests 3.2 State Parks & State Forests 3.3 Municipal Lands 3.5 Intensive Recreation Areas 3.6 Wild, Scenic, and Designated Recreation Rivers 3.7 National Scenic Trails 3.8 Designated Scenic Roads	3.0 Recreation Lands
5.3 Semi-Public and Large Institutional Lands	5.0 Land Ownership
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers 7.2 Rivers and Streams	7.0 Surface Hydrology
9.1 National Register Historic Sites 9.2 State Register Historic Sites	9.0 Historic Sites
12.1 Identified Unique Resources 12.2 Critical Areas: Maine 12.3 National Natural Landmarks	12.0 Unique Resources
14.6 Wildlife Refuges and Management Areas	14.0 Wildlife
15.1 Warm Water Fish Habitats 15.2 Cold Water Fish Habitats 15.3 Anadromous Fish Habitats	15.0 Fish

C-5 OPEN/AGRICULTURAL LAND

Components	Category
1.4 Open/Agricultural Land	1.0 Land Use

C-6 EXISTING FOREST INDUSTRY

Components	Category
3.1 National Forests 3.2 State Parks & State Forests	3.0 Recreation Lands
16.3 Spruce/Fir Associations 16.4 Northern Hardwoods Associations 16.5 Lowland Hardwoods Associations 16.6 Transitional Hardwoods Associations 16.7 White or Red Pine/Eastern Hemlock Associations 16.8 Pitch Pine	16.0 Vegetation

figure 2·6

C-7 VEGETATIVE COVER

Component	Category
7.3 Wetlands	7.0 Surface Hydrology
12.2 Critical Areas: Maine 12.4 Natural Scientific Research/ Wilderness Study Areas 12.5 Wilderness/Primitive Areas	12.0 Unique Resources
16.1 Endangered and Threatened Species 16.2 Alpine Tundra (Species of Special Concern) 16.3 Spruce/Fir Associations 16.4 Northern Hardwoods Associations 16.5 Lowland Hardwoods Associations 16.6 Transitional Hardwoods Associations 16.7 White or Red Pine/Eastern Hemlock Associations 16.8 Pitch Pine	16.0 Vegetation

C-8 SURFACE WATER SYSTEMS

Component	Category
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers 7.2 Rivers and Streams 7.3 Wetlands 7.4 Sensitive Water Basins	7.0 Surface Hydrology

C-9 GROUND WATER SYSTEMS

Component	Category
7.3 Wetlands	7.0 Surface Hydrology
11.1 Aquifers and Aquifer Recharge Areas	11.0 Ground Water

C-10 DEER HABITATS

Component	Category
14.4 Deer Wintering Yards	14.0 Wildlife
16.3 Spruce/Fir Associations 16.4 Northern Hardwoods Associations 16.5 Lowlands Hardwoods Associations 16.6 Transitional Hardwoods Associations 16.7 White or Red Pine/Eastern Hemlock Associations 16.8 Pitch Pine	16.0 Vegetation

C-11 WATERFOWL AREAS

Component	Category
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers 7.2 Rivers and Streams 7.3 Wetlands	7.0 Surface Hydrology
14.5 Waterfowl Areas	14.0 Wildlife

figure 2·6

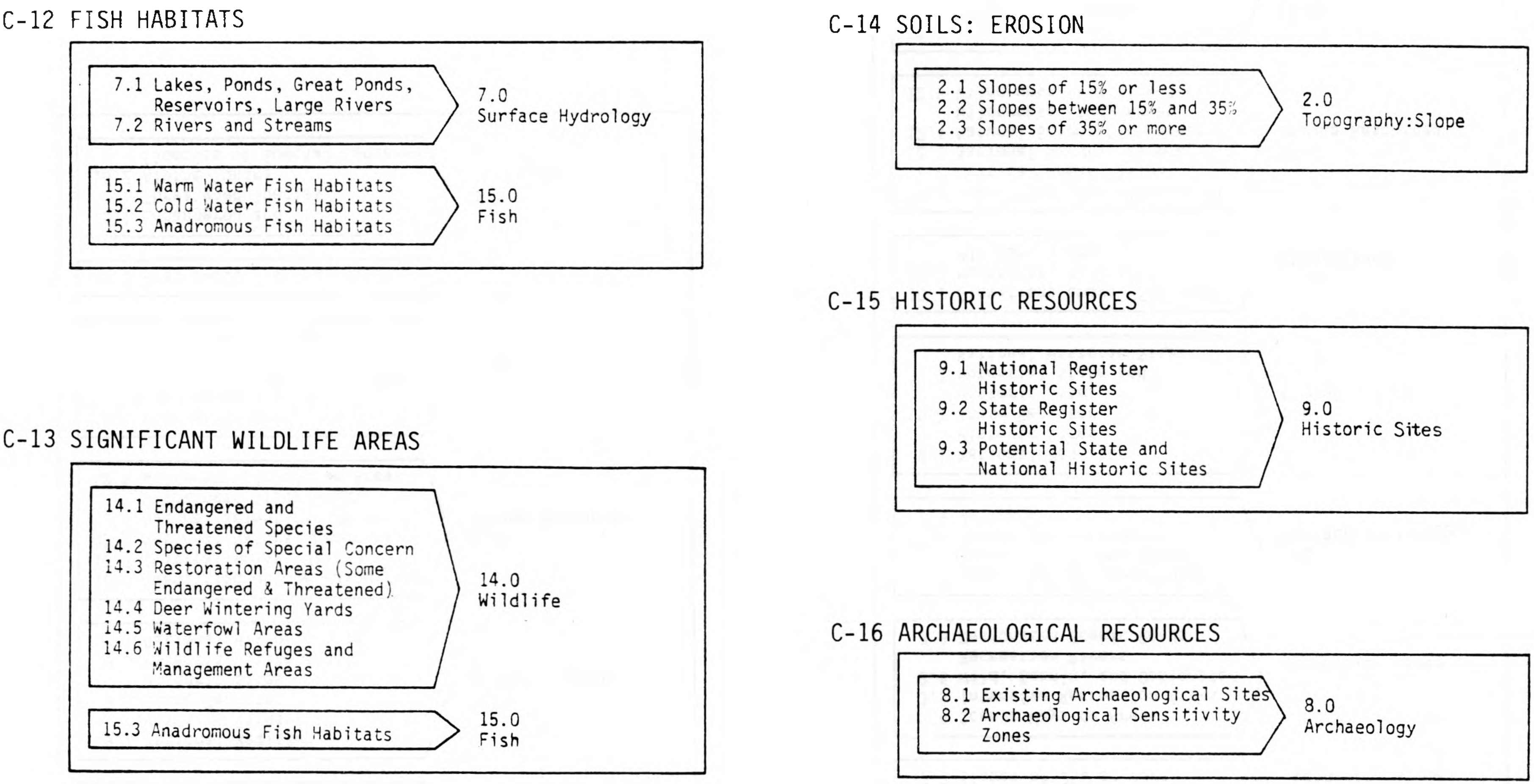
C-12 FISH HABITATS
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams
7.0 Surface Hydrology
15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats
15.3 Anadromous Fish Habitats
15.0 Fish
C-13 SIGNIFICANT WILDLIFE AREAS
14.1 Endangered and Threatened Species
14.2 Species of Special Concern
14.3 Restoration Areas (Some Endangered & Threatened)
14.4 Deer Wintering Yards
14.5 Waterfowl Areas
14.6 Wildlife Refuges and Management Areas
14.0 Wildlife
15.3 Anadromous Fish Habitats
15.0 Fish
C-14 SOILS: EROSION
2.1 Slopes of 15% or less
2.2 Slopes between 15% and 35%
2.3 Slopes of 35% or more
2.0 Topography:Slope
C-15 HISTORIC RESOURCES
9.1 National Register Historic Sites
9.2 State Register Historic Sites
9.3 Potential State and National Historic Sites
9.0 Historic Sites
C-16 ARCHAEOLOGICAL RESOURCES
8.1 Existing Archaeological Sites
8.2 Archaeological Sensitivity Zones
8.0 Archaeology

figure 2·6

C-17 UNIQUE RESOURCES

Components	Category
8.1 Existing Archaeological Sites	8.0 Archaeology
9.1 National Register Historic Sites 9.2 State Register Historic Sites 9.3 Potential State and National Historic Sites	9.0 Historic Sites
12.1 Identified Unique Resources 12.2 Critical Areas: Maine 12.3 National Natural Landmarks 12.4 Natural Scientific Research/ Wilderness Study Areas 12.5 Wilderness/Primitive Areas	12.0 Unique Resources
14.1 Endangered and Threatened Species 14.2 Species of Special Concern 14.3 Restoration Areas (Some Endangered & Threatened)	14.0 Wildlife
15.3 Anadromous Fish Habitats	15.0 Fish
16.1 Endangered and Threatened Species 16.2 Alpine Tundra (Species of Special Concern)	16.0 Vegetation

C-18 EXISTING VISUAL QUALITY

Components	Category
1.4 Open/Agricultural Land	1.0 Land Use
2.2 Slopes between 15% and 35% 2.3 Slopes of 35% or more	2.0 Topography:Slope
3.4 Scenic Wayside Areas 3.5 Intensive Recreation Areas 3.6 Wild, Scenic, and Designated Recreation Rivers 3.8 Designated Scenic Roads	3.0 Recreation Lands
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers 7.2 Rivers and Streams 7.3 Wetlands	7.0 Surface Hydrology
9.1 National Register Historic Sites 9.2 State Register Historic Sites 9.3 Potential State and National Historic Sites	9.0 Historic Sites
10.1 Elevations above 2500 feet 10.2 Mountains, Hilltops, Military Ridges	10.0 Physiography
12.1 Identified Unique Resources 12.2 Critical Areas: Maine 12.3 National Natural Landmarks 12.4 Natural Scientific Research/ Wilderness Study Areas 12.5 Wilderness/Primitive Areas	12.0 Unique Resources
16.1 Endangered and Threatened Species 16.2 Alpine Tundra (Species of Special Concern)	16.0 Vegetation

figure 2·6

C-19 DECREASED VISUAL QUALITY DUE TO VISIBILITY/ABSORPTION

1.4 Open/Agricultural Land	1.0 Land Use
2.2 Slopes between 15% and 35% 2.3 Slopes of 35% or more	2.0 Topography:Slope
6.3 S.-S.E.-S.W.	6.0 Orientation
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers	7.0 Surface Hydrology
10.1 Elevations above 2500 feet 10.2 Mountains, Hilltops, Military Ridges 10.3 Mountain Sides, Hill Sides, Valley Walls 10.4 Narrow Valley Floors	10.0 Physiography

C-20 DECREASED VISUAL QUALITY DUE TO VISIBILITY/EXPOSURE

1.1 Urban Centers 1.2 Ex-Urban Development 1.3 Town Centers 1.6 Indian Lands/Reservations	1.0 Land Use
3.1 National Forests 3.2 State Parks & State Forests 3.3 Municipal Lands 3.4 Scenic Wayside Areas 3.5 Intensive Recreation Areas 3.6 Wild, Scenic and Designated Recreation Rivers 3.7 National Scenic Trails 3.8 Designated Scenic Roads	3.0 Recreation Lands
4.1a Roads: A.D.T. 3000 and greater 4.1b Roads: A.D.T. less than 3000	4.0 Transportation
5.3 Semi-Public and Large-Institutional Lands	5.0 Land Ownership
9.1 National Register Historic Sites 9.2 State Register Historic Sites 9.3 Potential State and National Historic Sites	9.0 Historic Sites

figure 2·6

C-21 COST DUE TO VALUE OF DEVELOPED LANDS

- 1.1 Urban Centers
- 1.2 Ex-Urban Development
- 1.3 Town Centers
- 1.4 Open/Agricultural Land
- 1.6 Indian Lands/Reservations

→ 1.0 Land Use

C-22 COST DUE TO VALUE OF RECREATION LANDS

- 3.1 National Forests
- 3.2 State Parks & State Forests
- 3.3 Municipal Lands
- 3.4 Scenic Wayside Areas
- 3.5 Intensive Recreation Areas
- 3.6 Wild, Scenic, and Designated Recreation Rivers

→ 3.0 Recreation Lands

- 5.3 Semi-Public and Large-Institutional Lands

→ 5.0 Land Ownership

- 9.1 National Register Historic Sites
- 9.2 State Register Historic Sites

→ 9.0 Historic Sites

- 12.1 Identified Unique Resources
- 12.2 Critical Areas: Maine
- 12.3 National Natural Landmarks

→ 12.0 Unique Resources

C-23 COST DUE TO VALUE OF FOREST LANDS

- 3.1 National Forests
- 3.2 State Parks & State Forests

→ 3.0 Recreation Lands

- 16.3 Spruce/Fir Associations
- 16.4 Northern Hardwoods Associations
- 16.5 Lowland Hardwoods Associations
- 16.6 Transitional Hardwoods Associations
- 16.7 White or Red Pine/Eastern Hemlock Associations
- 16.8 Pitch Pine

→ 16.0 Vegetation

C-24 COST DUE TO DECREASED ACCESSIBILITY

- 4.3 High Existing Access Density
- 4.4 Medium Existing Access Density
- 4.5 Low Existing Access Density

→ 4.0 Transportation

C-25 COST DUE TO UNSTABLE SOILS

- 7.3 Wetlands

→ 7.0 Surface Hydrology

figure 2·6

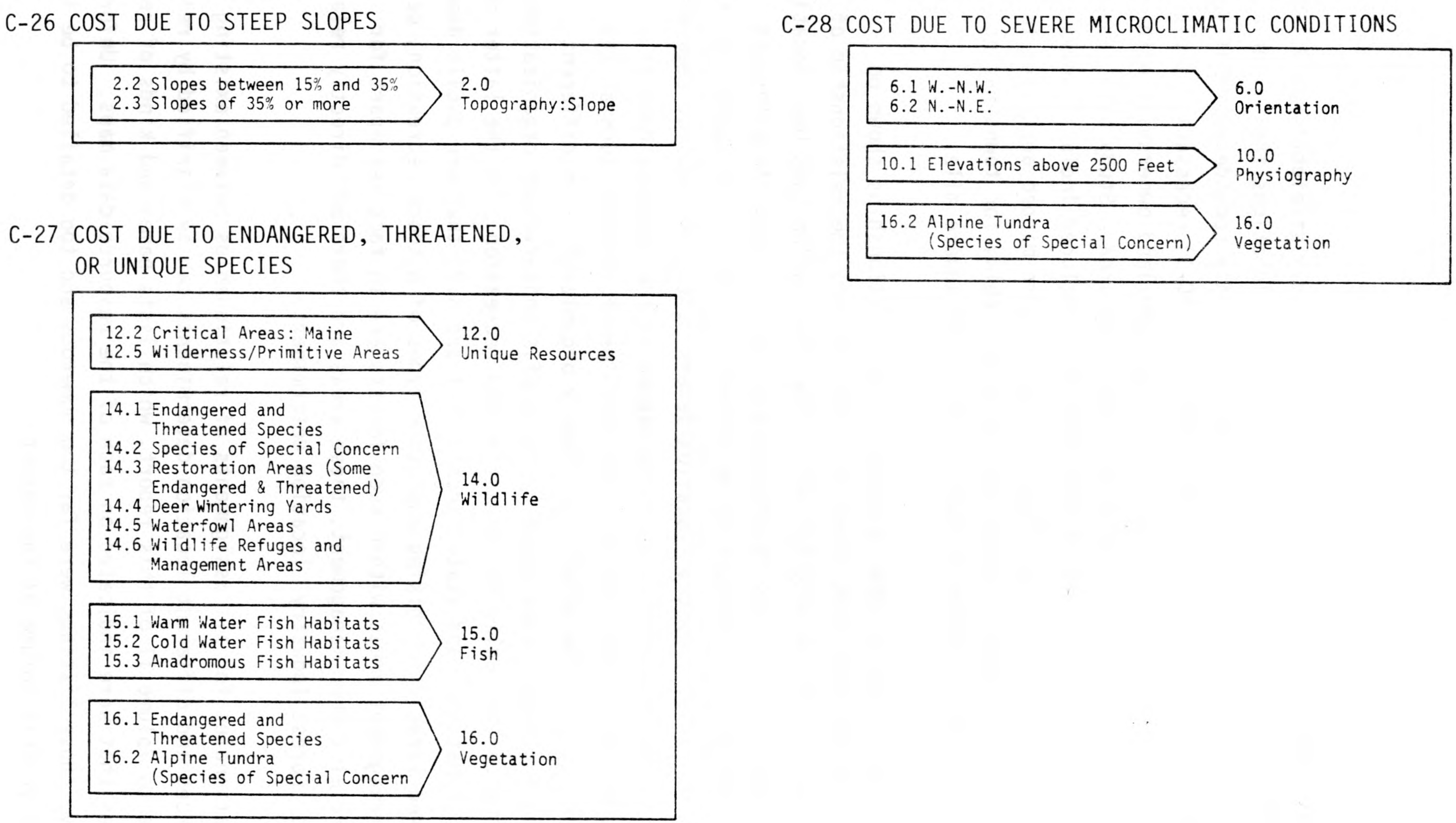
C-26 COST DUE TO STEEP SLOPES
2.2 Slopes between 15% and 35%
2.3 Slopes of 35% or more
2.0
Topography:Slope
C-27 COST DUE TO ENDANGERED, THREATENED, OR UNIQUE SPECIES
12.2 Critical Areas: Maine
12.5 Wilderness/Primitive Areas
12.0
Unique Resources
14.1 Endangered and Threatened Species
14.2 Species of Special Concern
14.3 Restoration Areas (Some Endangered & Threatened)
14.4 Deer Wintering Yards
14.5 Waterfowl Areas
14.6 Wildlife Refuges and Management Areas
14.0
Wildlife
15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats
15.3 Anadromous Fish Habitats
15.0
Fish
16.1 Endangered and Threatened Species
16.2 Alpine Tundra (Species of Special Concern
16.0
Vegetation
C-28 COST DUE TO SEVERE MICROCLIMATIC CONDITIONS
6.1 W.-N.W.
6.2 N.-N.E.
6.0
Orientation
10.1 Elevations above 2500 Feet
10.0
Physiography
16.2 Alpine Tundra (Species of Special Concern)
16.0
Vegetation

figure 2·6

Some assignments of relationships were relatively straightforward. For example, given an objective to avoid corridor locations that might displace land owners within the study area, the data considered relative to the 'Land Ownership' location determinant (C-1) necessarily included information on different types of land use and land ownership, both public and private, existing within the study area. Study area resources mapped according to forms of land ownership included Indian reservations and populated areas. Populated areas were mapped according to numbers of land owners; three maps were available, for towns having high, medium, or low densities of parcels owned per square mile.

The rationale behind other assignments of relationships shown on Figure 2-6 may seem less clearcut. For example, the relationship of lands owned by large institutions to the 'Recreation Land Use' location determinant (C-3) or the relationship of national and state forests (which are normally thought to be entirely in the public domain) to the 'Existing Forest Industry' location determinant (C-6) may not seem self-evident. In the former case, data mapped in the resource-data file (5.3) included both college campuses and land 'protectorates' such as the Audubon Society, the Nature Conservancy organizations in different states, and other lands owned by non-profit conservation organizations and open to the public for education and recreation. In the latter case, although national and state forests (3.1 and 3.2) that are public domain are used largely for hiking and other types of outdoor recreation, certain management areas within such forests are in fact set apart for commercial timber management; these areas are therefore directly related to the 'Forest Industry' location determinant.

The rationales for all assignments of relationships between existing resources and different location determinants can be clarified by reference to Volume II of this report, which lists names and kinds of resources that were indicated on each of the resource-data maps. Unfortunately, those listings were far too numerous and too detailed to be included in this volume of the report.

The assigned relationships between resource-data and corridor-location determinants (i.e., between study area resources and resource-systems analyzed) constituted one of the products of analysis at this stage of the Transmission Corridor Assessment. Like the available resource-data items, these analysis products were depicted on maps. By contrast to the opaque-symbol resource-data maps, however, the location determinant maps were portrayed in color and required a different format. Refinement of the mapping system was thus necessary. Because each C-level resource-system shown on Figure 2-6 may be defined as a composite of a number of different resources, the map for each location determinant was in fact created as a composite, by overlaying however many different resource-data maps were relevant to each location determinant. In this way, 28 color-composite maps were created.*

For example, the color-composite map for 'Deer Habitats' (C-10) overlayed seven different resource-data maps available in the resource-data file and depicted in the opaque-symbol format that was shown in Figure 2-4. In this case, one map depicted identified deer wintering yards; six maps depicted suspected deer habitats, identified according to locations of vegetation types known to provide forage and protection against exposure.

Assigning and mapping these relationships, however, was only a first, organizational step preceding analysis of potential impacts on study area resources (which will be discussed in Chapter III of this report). A second step in the interim analysis was needed to indicate which component resource or resources within a given resource-system should be considered 'most critical' for maintaining the existing quality of each resource-system.

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*The technical procedures for producing the composites will be described in the mapping section.

Transmission corridor siting sought to avoid location of transmission facilities in proximity to such resources, where any impacts could endanger the existing condition of the study area's environment. To reflect evaluations of relative importance, further refinements both in the data/analysis matrix and in the mapping system were required.

Note that while the interim analysis steps which determined the content of the C-level maps proceeded sequentially, the refinements in mapped form (i.e., the actual reproduction of color-composite maps, each incorporating relevant overlay maps selected from the resource-data file) were performed simultaneously. In fact, the 28 maps for the C-level location determinants were recorded not only in different colors but also in different intensities of color. The range of intensities was used on each map to indicate the relative importance of different components of each resource-system; the darkest colors depicted 'most critical' resources.

Critical resources within the study area. Ideally, the Transmission Corridor Assessment sought to avoid corridor locations where transmission facilities could entail deleterious impacts on any resource within the study area. In essence, every study area resource was considered important. More practically, however, interim analysis methods had to be developed to reconcile this idealistic assumption with the recognition that some impacts or degrees of impact may be unavoidable, that some resources are more vital than others in maintaining the existing quality of the study area's environment, and that mitigation measures would be needed to insure minimal impact on the 'most critical' resources. One such mitigation measure incorporated in the interim analysis stage of the Transmission Corridor Assessment was identification of resources, within different resource-systems, that can be considered most important to the quality--or in some cases, to the very survival--of existing resource-systems within the study area.

For example, within the study area, the number of areas usable as deer wintering yards is extremely limited while the availability of vegetation for forage and protection is much less constrained. Furthermore, the deer wintering yards mapped in the resource-data file are all identified deer habitats; the mapped vegetation types indicate locations that are only suspected of being habitats. Thus, in evaluating the most important components of the 'Deer Habitats' location determinant (C-10), potential impacts on known wintering yards were considered more critical to the survival of the animals, and the 'wintering yards' resource was assigned highest importance.

Note, however, that this judgment of the lesser importance of vegetation types is relative only to 'Deer Habitats'. Vegetation types (such as northern hardwoods forest-associations) considered less important to deer survival were also analyzed relative to other corridor-location determinants; in analyzing resources important to the 'Forest Industry' (C-6) or to the quality of 'Vegetative Cover' in the study area (C-7), northern hardwoods forest-associations were assigned higher importance.

The qualitative values assigned to each component of a location determinant were "high," "moderate," or "low," depending on the greater or lesser importance of the resource in maintaining the existing quality of the resource-system. On the different C-level maps, high values of importance were recorded in dark intensities of color; low values, in lighter intensities. These values were assigned to all component resources (indicated in the black boxes on Figure 2-5 and in tabulated format on Figure 2-6) considered relevant to each location determinant. On Figure 2-7, a revised version of the data/analysis matrix, value assignments for each resource in the resource-data file are indicated on the horizontal axis by the letters H, M, or L.

As the data/analysis matrix indicates, one location determinant ('Legal Regulations') was analyzed in a somewhat different manner. Because the relevant data in the resource-data file were more uniform, only the presence or absence of applicable resource-data items was recorded on the revised data/analysis matrix; the black boxes correspond directly to those presented in the first data/analysis matrix. Values of importance were, in fact, assigned to these resources and could easily have been marked in the matrix as uniformly "high." All available resource-data concerned legal restrictions to the introduction of transmission facilities in proximity to different resources--such as Maine's "great ponds"--within the study area. The location of any resource subject to legal regulations was considered a severe constraint to transmission corridor locations. The composite map for this location determinant was thus depicted in a uniformly dark color, without incorporating moderate or low intensities of color shading. This map was created at the same time as those for the 28 C-level location determinants but was not labeled as a "C-level" map, since the format was carried unchanged through subsequent stages of the Transmission Corridor Assessment while the C-level location determinants were subject to additional analyses and mapping.

Values of importance were assigned by the member or members of the multidisciplinary team who were most knowledgeable about each resource. All value judgments were then reviewed by the entire project team to insure the correctness of each value assignment relative to all others and thus to maintain objectivity. The 'critical' resources identified by these means are presented on Figure 2-8, which tabulates all high, moderate, and low values indicated on the matrix This figure duplicates Figure 2-6, except for the "H, M, or L" rankings. As in Figure 2-6, the grouping of resources (within the outlined arrows) under different C-level resource-systems indicates the relation of each set of resources to the different location determinants analyzed--as well as the relativity of the value assignment process to the particular C-level analysis being conducted.

Critical Resources Within the Study Area

C-1 LAND OWNERSHIP

- H — 1.6 Indian Lands/Reservations → 1.0 Land Use
- H — 5.5 High Parcel Density/Town
- M — 5.6 Medium Parcel Density/Town
- L — 5.7 Low Parcel Density/Town
  → 5.0 Land Ownership

C-2 HUMAN POPULATIONS

- H — 1.1 Urban Centers
- M — 1.2 Ex-Urban Development
- M — 1.3 Town Centers
- H — 1.6 Indian Lands/Reservations
  → 1.0 Land Use

C-3 RECREATION LAND USE

- H — 3.1 National Forests
- H — 3.2 State Parks & State Forests
- M — 3.3 Municipal Lands
- M — 3.4 Scenic Wayside Areas
- H — 3.5 Intensive Recreation Areas
- H — 3.6 Wild, Scenic, and Designated Recreation Rivers
- M — 3.7 National Scenic Trails
- M — 3.8 Designated Scenic Roads
  → 3.0 Recreation Lands
- L — 5.3 Semi-Public and Large-Institutional Lands → 5.0 Land Ownership
- L — 7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
- L — 7.2 Rivers and Streams
  → 7.0 Surface Hydrology
- H — 9.1 National Register Historic Sites
- H — 9.2 State Register Historic Sites
  → 9.0 Historic Sites
- M — 12.1 Identified Unique Resources
- M — 12.2 Critical Areas: Maine
- H — 12.3 National Natural Landmarks
  → 12.0 Unique Resources
- M — 14.6 Wildlife Refuges and Management Areas → 14.0 Wildlife
- M — 15.1 Warm Water Fish Habitats
- M — 15.2 Cold Water Fish Habitats
- H — 15.3 Anadromous Fish Habitats
  → 15.0 Fish

figure 2·8

C-4 RECREATION LAND VALUE

Rating	Element	Category
H	3.1 National Forests	3.0 Recreation Lands
H	3.2 State Parks & State Forests	
M	3.3 Municipal Lands	
H	3.5 Intensive Recreation Areas	
H	3.6 Wild, Scenic, and Designated Recreation Rivers	
M	3.7 National Scenic Trails	
M	3.8 Designated Scenic Roads	
M	5.3 Semi-Public and Large Institutional Lands	5.0 Land Ownership
L	7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers	7.0 Surface Hydrology
L	7.2 Rivers and Streams	
M	9.1 National Register Historic Sites	9.0 Historic Sites
M	9.2 State Register Historic Sites	
M	12.1 Identified Unique Resources	12.0 Unique Resources
M	12.2 Critical Areas: Maine	
H	12.3 National Natural Landmarks	
M	14.6 Wildlife Refuges and Management Areas	14.0 Wildlife
M	15.1 Warm Water Fish Habitats	15.0 Fish
M	15.2 Cold Water Fish Habitats	
H	15.3 Anadromous Fish Habitats	

C-5 OPEN/AGRICULTURAL LAND

Rating	Element	Category
M	1.4 Open/Agricultural Land	1.0 Land Use

C-6 EXISTING FOREST INDUSTRY

Rating	Element	Category
M	3.1 National Forests	3.0 Recreation Lands
L	3.2 State Parks & State Forests	
M	16.3 Spruce/Fir Associations	16.0 Vegetation
M	16.4 Northern Hardwoods Associations	
M	16.5 Lowland Hardwoods Associations	
L	16.6 Transitional Hardwoods Associations	
M	16.7 White or Red Pine/Eastern Hemlock Associations	
L	16.8 Pitch Pine	

figure 2·8

C-7 VEGETATIVE COVER

Rating	Item	Category
H	7.3 Wetlands	7.0 Surface Hydrology
H	12.2 Critical Areas: Maine	12.0 Unique Resources
H	12.4 Natural Scientific Research/ Wilderness Study Areas	12.0 Unique Resources
H	12.5 Wilderness/Primitive Areas	12.0 Unique Resources
H	16.1 Endangered and Threatened Species	16.0 Vegetation
H	16.2 Alpine Tundra (Species of Special Concern)	16.0 Vegetation
M	16.3 Spruce/Fir Associations	16.0 Vegetation
M	16.4 Northern Hardwoods Associations	16.0 Vegetation
M	16.5 Lowland Hardwoods Associations	16.0 Vegetation
L	16.6 Transitional Hardwoods Associations	16.0 Vegetation
M	16.7 White or Red Pine/Eastern Hemlock Associations	16.0 Vegetation
L	16.8 Pitch Pine	16.0 Vegetation

C-8 SURFACE WATER SYSTEMS

Rating	Item	Category
M	7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers	7.0 Surface Hydrology
M	7.2 Rivers and Streams	7.0 Surface Hydrology
M	7.3 Wetlands	7.0 Surface Hydrology
M	7.4 Sensitive Water Basins	7.0 Surface Hydrology

C-9 GROUND WATER SYSTEMS

Rating	Item	Category
H	7.3 Wetlands	7.0 Surface Hydrology
M	11.1 Aquifers and Aquifer Recharge Areas	11.0 Ground Water

C-10 DEER HABITATS

Rating	Item	Category
H	14.4 Deer Wintering Yards	14.0 Wildlife
M	16.3 Spruce/Fir Associations	16.0 Vegetation
L	16.4 Northern Hardwoods Associations	16.0 Vegetation
L	16.5 Lowlands Hardwoods Associations	16.0 Vegetation
L	16.6 Transitional Hardwoods Associations	16.0 Vegetation
M	16.7 White or Red Pine/Eastern Hemlock Associations	16.0 Vegetation
M	16.8 Pitch Pine	16.0 Vegetation

C-11 WATERFOWL AREAS

Rating	Item	Category
M	7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers	7.0 Surface Hydrology
M	7.2 Rivers and Streams	7.0 Surface Hydrology
H	7.3 Wetlands	7.0 Surface Hydrology
H	14.5 Waterfowl Areas	14.0 Wildlife

figure 2·8

C-12 FISH HABITATS

- L — 7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
- L — 7.2 Rivers and Streams

→ 7.0 Surface Hydrology

- M — 15.1 Warm Water Fish Habitats
- M — 15.2 Cold Water Fish Habitats
- H — 15.3 Anadromous Fish Habitats

→ 15.0 Fish

C-13 SIGNIFICANT WILDLIFE AREAS

- H — 14.1 Endangered and Threatened Species
- H — 14.2 Species of Special Concern
- H — 14.3 Restoration Areas (Some Endangered & Threatened)
- H — 14.4 Deer Wintering Yards
- H — 14.5 Waterfowl Areas
- H — 14.6 Wildlife Refuges and Management Areas

→ 14.0 Wildlife

- H — 15.3 Anadromous Fish Habitats

→ 15.0 Fish

C-14 SOILS: EROSION

- L — 2.1 Slopes of 15% or less
- M — 2.2 Slopes between 15% and 35%
- H — 2.3 Slopes of 35% or more

→ 2.0 Topography:Slope

C-15 HISTORIC RESOURCES

- H — 9.1 National Register Historic Sites
- H — 9.2 State Register Historic Sites
- H — 9.3 Potential State and National Historic Sites

→ 9.0 Historic Sites

C-16 ARCHAEOLOGICAL RESOURCES

- H — 8.1 Existing Archaeological Sites
- M — 8.2 Archaeological Sensitivity Zones

→ 8.0 Archaeology

figure 2·8

C-17 UNIQUE RESOURCES

Rating	Item	Category
H	8.1 Existing Archaeological Sites	8.0 Archaeology
H	9.1 National Register Historic Sites	9.0 Historic Sites
H	9.2 State Register Historic Sites	
H	9.3 Potential State and National Historic Sites	
H	12.1 Identified Unique Resources	12.0 Unique Resources
H	12.2 Critical Areas: Maine	
H	12.3 National Natural Landmarks	
H	12.4 Natural Scientific Research/ Wilderness Study Areas	
H	12.5 Wilderness/Primitive Areas	
H	14.1 Endangered and Threatened Species	14.0 Wildlife
H	14.2 Species of Special Concern	
H	14.3 Restoration Areas (Some Endangered & Threatened)	
H	15.3 Anadromous Fish Habitats	15.0 Fish
H	16.1 Endangered and Threatened Species	16.0 Vegetation
H	16.2 Alpine Tundra (Species of Special Concern)	

C-18 EXISTING VISUAL QUALITY

Rating	Item	Category
M	1.4 Open/Agricultural Land	1.0 Land Use
L	2.2 Slopes between 15% and 35%	2.0 Topography:Slope
M	2.3 Slopes of 35% or more	
H	3.4 Scenic Wayside Areas	3.0 Recreation Lands
M	3.5 Intensive Recreation Areas	
H	3.6 Wild, Scenic, and Designated Recreation Rivers	
H	3.8 Designated Scenic Roads	
H	7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers	7.0 Surface Hydrology
H	7.2 Rivers and Streams	
M	7.3 Wetlands	
H	9.1 National Register Historic Sites	9.0 Historic Sites
H	9.2 State Register Historic Sites	
M	9.3 Potential State and National Historic Sites	
H	10.1 Elevations above 2500 feet	10.0 Physiography
H	10.2 Mountains, Hilltops, Military Ridges	
H	12.1 Identified Unique Resources	12.0 Unique Resources
H	12.2 Critical Areas: Maine	
H	12.3 National Natural Landmarks	
H	12.4 Natural Scientific Research/ Wilderness Study Areas	
H	12.5 Wilderness/Primitive Areas	
H	16.1 Endangered and Threatened Species	16.0 Vegetation
H	16.2 Alpine Tundra (Species of Special Concern)	

figure 2·8

C-19 DECREASED VISUAL QUALITY DUE TO VISIBILITY/ABSORPTION

M	1.4 Open/Agricultural Land	1.0 Land Use
L	2.2 Slopes between 15% and 35%	2.0 Topography:Slope
M	2.3 Slopes of 35% or more	
L	6.3 S.-S.E.-S.W.	6.0 Orientation
M	7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers	7.0 Surface Hydrology
H	10.1 Elevations above 2500 feet	10.0 Physiography
H	10.2 Mountains, Hilltops, Military Ridges	
M	10.3 Mountain Sides, Hill Sides, Valley Walls	
L	10.4 Narrow Valley Floors	

C-20 DECREASED VISUAL QUALITY DUE TO VISIBILITY/EXPOSURE

H	1.1 Urban Centers	1.0 Land Use
L	1.2 Ex-Urban Development	
M	1.3 Town Centers	
M	1.6 Indian Lands/Reservations	
M	3.1 National Forests	3.0 Recreation Lands
M	3.2 State Parks & State Forests	
M	3.3 Municipal Lands	
H	3.4 Scenic Wayside Areas	
H	3.5 Intensive Recreation Areas	
H	3.6 Wild, Scenic and Designated Recreation Rivers	
H	3.7 National Scenic Trails	
M	3.8 Designated Scenic Roads	
M	4.1a Roads: A.D.T. 3000 and greater	4.0 Transportation
L	4.1b Roads: A.D.T. less than 3000	
M	5.3 Semi-Public and Large-Institutional Lands	5.0 Land Ownership
M	9.1 National Register Historic Sites	9.0 Historic Sites
M	9.2 State Register Historic Sites	
L	9.3 Potential State and National Historic Sites	

figure 2·8

C-21 COST DUE TO VALUE OF DEVELOPED LANDS

- H — 1.1 Urban Centers
- M — 1.2 Ex-Urban Development
- H — 1.3 Town Centers
- L — 1.4 Open/Agricultural Land
- H — 1.6 Indian Lands/Reservations

→ 1.0 Land Use

C-22 COST DUE TO VALUE OF RECREATION LANDS

- M — 3.1 National Forests
- H — 3.2 State Parks & State Forests
- M — 3.3 Municipal Lands
- L — 3.4 Scenic Wayside Areas
- H — 3.5 Intensive Recreation Areas
- H — 3.6 Wild, Scenic, and Designated Recreation Rivers

→ 3.0 Recreation Lands

- M — 5.3 Semi-Public and Large-Institutional Lands

→ 5.0 Land Ownership

- H — 9.1 National Register Historic Sites
- H — 9.2 State Register Historic Sites

→ 9.0 Historic Sites

- H — 12.1 Identified Unique Resources
- H — 12.2 Critical Areas: Maine
- H — 12.3 National Natural Landmarks

→ 12.0 Unique Resources

C-23 COST DUE TO VALUE OF FOREST LANDS

- M — 3.1 National Forests
- L — 3.2 State Parks & State Forests

→ 3.0 Recreation Lands

- M — 16.3 Spruce/Fir Associations
- M — 16.4 Northern Hardwoods Associations
- M — 16.5 Lowland Hardwoods Associations
- L — 16.6 Transitional Hardwoods Associations
- M — 16.7 White or Red Pine/Eastern Hemlock Associations
- L — 16.8 Pitch Pine

→ 16.0 Vegetation

C-24 COST DUE TO DECREASED ACCESSIBILITY

- L — 4.3 High Existing Access Density
- M — 4.4 Medium Existing Access Density
- H — 4.5 Low Existing Access Density

→ 4.0 Transportation

C-25 COST DUE TO UNSTABLE SOILS

- H — 7.3 Wetlands

→ 7.0 Surface Hydrology

figure 2·8

C-26 COST DUE TO STEEP SLOPES

Rating	Factor	Category
M	2.2 Slopes between 15% and 35%	2.0 Topography:Slope
H	2.3 Slopes of 35% or more	

C-27 COST DUE TO ENDANGERED, THREATENED, OR UNIQUE SPECIES

Rating	Factor	Category
H	12.2 Critical Areas: Maine	12.0 Unique Resources
H	12.5 Wilderness/Primitive Areas	
H	14.1 Endangered and Threatened Species	14.0 Wildlife
H	14.2 Species of Special Concern	
H	14.3 Restoration Areas (Some Endangered & Threatened)	
H	14.4 Deer Wintering Yards	
H	14.5 Waterfowl Areas	
H	14.6 Wildlife Refuges and Management Areas	
M	15.1 Warm Water Fish Habitats	15.0 Fish
M	15.2 Cold Water Fish Habitats	
H	15.3 Anadromous Fish Habitats	
H	16.1 Endangered and Threatened Species	16.0 Vegetation
H	16.2 Alpine Tundra (Species of Special Concern	

C-28 COST DUE TO SEVERE MICROCLIMATIC CONDITIONS

Rating	Factor	Category
H	6.1 W.-N.W.	6.0 Orientation
M	6.2 N.-N.E.	
L	10.1 Elevations above 2500 Feet	10.0 Physiography
H	16.2 Alpine Tundra (Species of Special Concern)	16.0 Vegetation

figure 2·8

LEGAL REGULATIONS

Regulation	Category
H__ 1.5 Aerodromes H__ 1.6 Indian Lands/Reservations	1.0 Land Use
H__ 3.7 National Scenic Trails	3.0 Recreation Lands
H__ 7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers H__ 7.3 Wetlands H__ 7.5 Navigable Waterways	7.0 Surface Hydrology
H__ 8.1 Existing Archaeological Sites	8.0 Archaeology
H__ 9.1 National Register Historic Sites H__ 9.2 State Register Historic Sites H__ 9.3 Potential State and National Historic Sites	9.0 Historic Sites
H__10.1 Elevations above 2500 feet	10.0 Physiography
H__14.1 Endangered and Threatened Species H__14.2 Species of Special Concern H__14.3 Restoration Areas (Some Endangered & Threatened) H__14.5 Waterfowl Areas H__14.6 Wildlife Refuges & Management Areas	14.0 Wildlife
H__16.1 Endangered and Threatened Species	16.0 Vegetation

figure 2·8

The 'variability' of resources relative to different C-level location determinants accounts for many of the "moderate" and "low" values assigned to resources which might, in and of themselves, seem to warrant higher values. Again, the names and kinds of resources mapped in the data file (and documented in Volume II of this report) also clarify the rationale for value assignments. Several extended examples may illustrate what the moderate and low values assigned to different resources do and do not mean.

Example 1. The 'critical areas: Maine' resource (classified in the data file under the 'Unique Resources' topic 12.2) would seem a logical "high" value to be assigned, and in fact was assigned high importance relative to the 'Vegetative Cover' location determinant (C-7) though only moderate importance relative to the 'Recreation Land Use' analysis (C-3). The nature of Maine's "Critical Areas Program," which officially recognizes areas containing natural features of significance to the state, accounts for the distinction. Three natural features, all vegetation types, are so recognized--the largest white pine in Maine, located in the town of Blanchard, as well as two unique kinds of vegetation (rhododendrun and mountain-laurel stands) located near Safford Pond and in the town of Albany, respectively.

Because these three vegetation features (depicted on the 'critical areas' resource-data map as three black dots) are a significant part of the state's natural heritage, they were considered of high importance relative to the 'Vegetative Cover' location determinant, which considered different species of vegetation across the study area. Because they serve as outdoor museums or natural classrooms for state residents, they were also necessarily included for consideration relative to the 'Recreation Land Use' location determinant, even though the Critical Areas Program functions mainly as a nature protectorate; hence, the lower value relative to more intensively used recreation areas.

Example 2. Among the recreation areas examined in the context of the 'Recreation Land Use' location determinant (C-3), the resources mapped in the data file as 'lakes, ponds, great ponds, reservoirs, and large rivers' (topic 7.1) would seem to indicate logical sites for outdoor sports. However, developed resorts beside surface water bodies were in fact mapped (along with other areas such as ski slopes) as the 'intensive recreation areas' resource data item (filed under topic 3.5). Thus, the catch-all resource-data map of water bodies was assigned less importance relative to 'Recreation Land Use' (C-3), though more importance relative to 'Surface Water Bodies' (C-8), possible 'Waterfowl Areas (C-11), and 'Existing Visual Quality' of the study area (C-18).

Note that the water bodies mapped as topic 7.1 were also, perhaps surprisingly, assigned "low" importance relative to the 'Fish Habitats' location determinant (C-12). The distinction underlying the low value in this case is between positively identified vs. suspected fish habitats. Since the map of lakes, ponds, great ponds, reservoirs, and large rivers included all surface water bodies in the study area, each body of water could not be verified as a fish habitat. Relative to the 'Fish Habitats' location determinant, water bodies known to be fish habitats were thus assigned higher importance. Resource-data maps for such verified habitats (particularly those of anadromous fish) were included under the entire 'Fish' topic (15.0) in the data file.

Example 3. A similar distinction between verified vs. possible locations of resources explains why 'existing archaeological sites' (topic 8.1) were assigned higher importance than 'archaeological sensitivity zones' (topic 8.2) relative to the 'Archaeological Resources' location determinant (C-16). On the former resource-data map, resources included known sites of archaeological significance or of archaeological digs; on the latter, areas as yet unexplored by archaeologists. Such unexplored areas were identified by a professional archaeologist, drawing on experience working with archaeological resources in the study area and on knowledge concerning customs of ancient peoples who inhabited the study area (such as the tendency to camp where streams flow into lakes).

Although the 'sensitive' zones were identified on the basis of educated guesses, inclusion of these areas in the analysis was considered important since the Transmission Corridor Assessment sought to avoid corridor locations that might endanger either archaeological artifacts known to exist or those likely to be found during future archaeological research. Thus, while not assigned as high a value as 'existing archaeological sites', the 'sensitivity zones' were assigned "moderate" rather than "low" value.

The process of assigning "high" values was somewhat more straightforward. Among the 'critical' resources assigned high values relative to different resource-systems were (to name a few): resources such as deer wintering yards, anadromous fish habitats, and locations of all species (both wildlife and vegetation) officially designated as "Species of Special Concern" or "Endangered or Threatened Species"; other officially recognized unique or important resources such as national and state forests, intensive recreation areas, and known archaeological and historic sites; and various other features of the study area considered important in maintaining the existing visual quality.

Note that, in the value assignment analysis step, all qualitative values assigned to resources considered only the importance of different resources within various resource-systems. Potential impacts of transmission facilities on the various resources and resource-systems were considered during later analyses of the location determinants, subsequent to the analyses used to create the C-level maps. Furthermore, the value assignment process--using the data/analysis matrices--was not specifically concerned with the geographic locations of the various resources within the study area. The mapping system was provided to directly translate both the resource-data overlay maps (which do indicate geographic locations) and the high, medium, or low resource values that are products of analysis into a format indicating, by intensities of color, the locations of 'critical' resources within the study area.

However, before mapping could be implemented, an additional level of distinction relative to the resource-data was needed. After the decisions relating resource-data to resource-systems and assigning relative values to the resources selected for each resource-system, additional interaction between the analysts and the resource-data was required to identify concentrations of resources existing within the study area. Such geographic locations of resources were not indicated on either of the data/analysis matrices but ascertained by overlaying various opaque-symbol maps from the resource-data file.

Some of the different resources in the data file, each depicted on a base map of the study area, were found to share the same space within the study area. In other words, where data on the resources "coincided," multiple resources existed within the study area. These resources--or, more precisely, unique combinations of resources--were called "spatially coincident." Special analytical procedures were developed to analyze such combinations of resources, redefine in more geographic terms the nature of 'critical' resources within the study area, and translate the products of analysis directly into the C-level maps of location determinants that are discussed in the Interim Findings section of this chapter.

Unique combinations of resources within the study area. The interim analysis procedures that identified both 'critical' resources and combinations of resources were intended to insure that unique resources and site conditions within the study area would be considered individually. As a result, transmission corridors could be more precisely allocated to avoid location of transmission facilities either near such 'critical' resources or within 'sensitive' geographic areas containing many resources.

Any combination of two or more resources that occupy the same space within the study area was considered a unique site condition. Spatial coincidence of resources was studied to determine whether the unique site should be assigned a value of high importance relative to a given location determinant. For this determination, the combined resources were conceived of as a new resource-data item in the data file, and the "new" resource had to be revalued according to the high, moderate, or low designations discussed in the previous section. If the reassigned value was "high" (as most frequently was the case), the geographic location of the combined resources was considered an environmentally 'sensitive' area and recorded on the appropriate C-level composite map as a dark intensity of color--i.e., an area to be avoided during the corridor allocation process.

The identification and analysis of coincident resources entailed three basic steps. First, manually overlaying the transparent resource-data maps on a light-table revealed geographic coincidence of different resources. This procedure was performed because, given the presence of a large number of resources within the same study area boundaries, a certain amount of coincidence was anticipated in advance.

Some of the coincident resources revealed by these means included: designated scenic roads located on municipal lands or in proximity to scenic wayside areas, identified unique resources, and/or surface water bodies such as lakes, ponds, great ponds, reservoirs, and large rivers; wetlands located within open or agricultural lands; and town centers located within national and state forests and/or state parks. In some cases, the resource-data maps for coincident resources had been filed under the same topic (e.g., 'Recreation Lands') in the resource-data file; in others, the maps were dispersed and filed under various different topics.

Second, quantitative values of 4, 2, or 1--corresponding directly to the high, moderate, or low qualitative values assigned to resources on the second data/analysis matrix--were assigned to all resources selected for study relative to the different location determinants.* In themselves, these quantitative values, like the qualitative values to which they correspond, were only descriptors, designating the importance of different resources relative to different resource-systems without consideration of geographic locations of the resources.

As used in the analysis, the numeric analogs were preliminary tools for reassigning values when locations of resources coincided. Quantitative values could be more directly "scored" than qualitative values. Numeric analogs were used, for example, when two resources that had individually been assigned "moderate" value were reexamined to determine whether, in combination, the resources warranted a "high" value. In numeric terms, two "moderates"(2) could be considered the equivalent of one "high"(4) or, if the resources had individually been assigned "low" value, two "lows"(1) could equal one "moderate"(2).

However, such scoring was provided only for convenient reference, to simplify the analyst's complex task. Direct summation of numeric values could easily produce less clearcut results--for example, when the combination of resources included resources individually assigned "low"(1) and "moderate"(2) value. And even when numeric values summed to 4, the analyst was not automatically required to assign the higher value to the combined resource and designate the area of coincidence as more environmentally 'sensitive'. The quantitative values, thus, served only as an aid to analytical decisionmaking.

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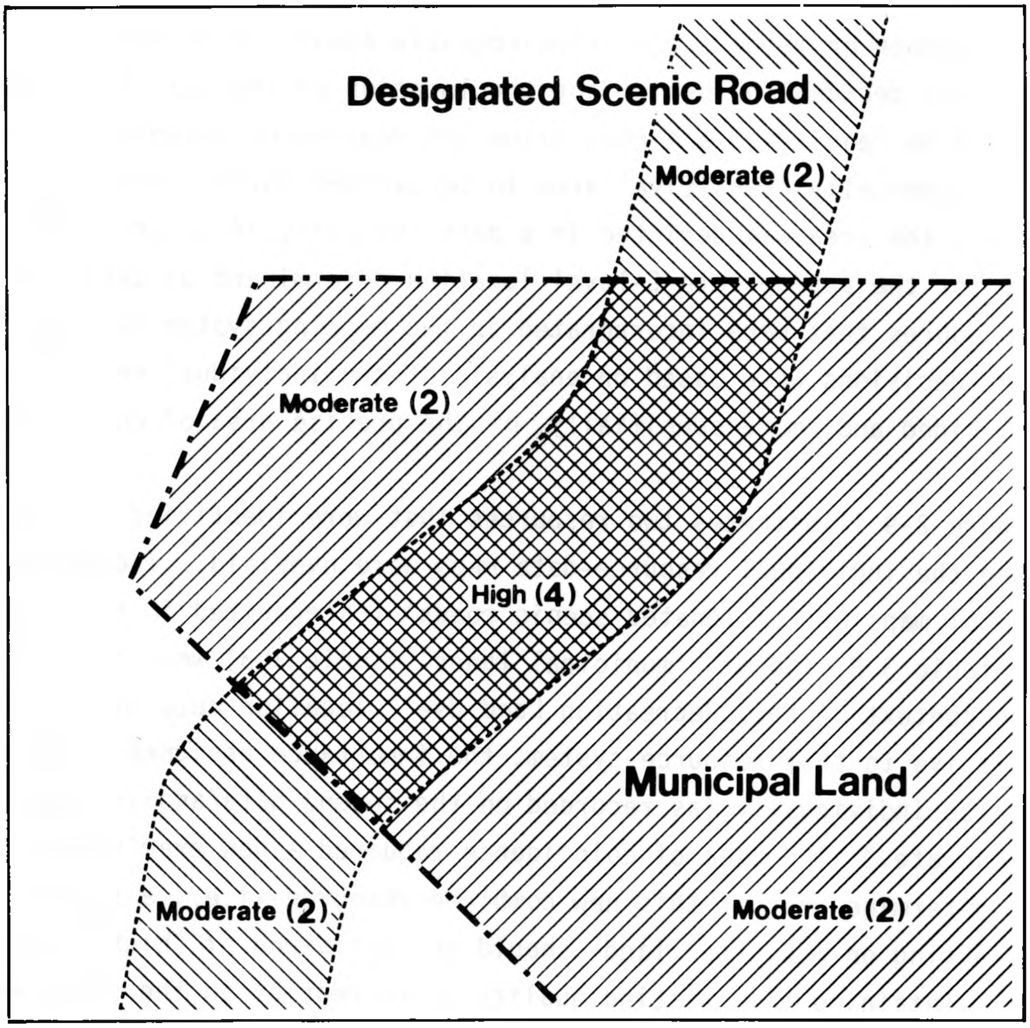
*As previously noted, some data items on file were not related--during the analyses performed using the blacked-in data/analysis matrix--to any of the C-level location determinants. In such cases, where the resource was not analyzed during the interim stage, "0" was assigned to the resource-data item as the quantitative value.

The third procedural step related to coincident resources was analysis itself. Judgment of the analyst was required whenever unique combinations of resources were identified. In all such cases, the project team member or members most knowledgeable about the resources or area in question decided whether or not the location of the coincident resources should be reassigned a higher value and reproduced graphically as an environmentally 'sensitive' area to be avoided during corridor allocation. If so, the area was depicted in a dark intensity of color on the composite map for the appropriate C-level location determinant by using special procedures that were incorporated in the mapping system for that purpose. Such decisions were based on analysis of the individual resources that coincided and, more specifially, of the precise area of coincidence.

Figure 2-9 illustrates two resources that were identified as coincident when the individual resource-data maps were overlaid. The opaque-symbol maps of 'designated scenic roads' (categorized in the data file as topic 3.8) and of 'municipal lands' (topic 3.3) were both analyzed in the context of the 'Recreation Land Use ' location determinant (C-3). Relative to that resource-system, the importance assigned to each resource individually (as recorded on the second data/analysis matrix) was "moderate." The area of coincidence required a new examination, however, to determine whether this new combined resource--i.e., a scenic road occurring on municipal land--should be considered of "high" importance in maintaining the existing quality of recreation in the study area.

The diagram shown in Figure 2-9 is presented only as an illustration, to suggest the different intensities of color that appeared on the C-level composite maps when higher values were reassigned to the unique combinations of resources that were identified. When actual opaque-symbol maps (such as the 'state parks and state forests' map shown in Figure 2-4) were overlaid to identify areas of coincidence, the various point, line, or polygon configurations did not appear in so enlarged a format, and all areas of coincidence appeared relative to a base map of the study



Coincident Resources: Designated Scenic Road Located On Municipal Land

figure 2·9

area that depicted precise geographic locations of the coincident resources. Furthermore, following the analyst's decision to assign higher value to an area of coincidence, reproduction of a correspondingly darker intensity of color on the appropriate C-level composite map was automatic; the new value was not recorded on the data/analysis matrix, and no interim diagram resembling Figure 2-9 was required.*

Given these distinctions, the diagram can be used to clarify the nature of the value assignment process used for coincident resources. As indicated on the figure, a higher value is assigned at, and only at, the point or area of coincidence (in this case, where the scenic road crosses the municipal land). Non-coincident portions of the two resources retain the originally assigned values that were indicated on the data/analysis matrix. For purposes of the Transmission Corridor Assessment, because the value assigned to the area of coincidence (or, more conceptually, to the "new" resource) is higher than the values assigned to either of the individual resources, the area can be depicted in a darker color and the site avoided during allocation of alternative corridors. On a less analytical level, the high value represents the higher quality of a unique geographic site within the study area that has been enhanced by the combined presence of two resources (and thereby also rendered more 'sensitive' to potential environmental impacts).

Note that, although the road depicted on Figure 2-9 would seem disproportionately wide, the diagram is in one sense more realistic than it would appear. The resource-data map on file for 'scenic roads' depicted each such road within a corridor four miles wide. Because of the

*Notations of the coincident resources identified were, of course, maintained. However, the actual number of areas reassigned values because of such coincidence was nowhere near as large as the number of resources for which values were recorded on the second data/analysis matrix. Therefore, the format of notation was not as detailed, and does not warrant presentation in this report.

two-mile margin on either side, an existing road located in close proximity to another resource (for example, a mile away from a lake) could be considered spatially coincident with the second resource, even though the coincidence was not as direct as that shown on Figure 2-9. (In the example suggested, a full mile of the road's corridor would coincide when the two resource-data maps were overlaid, even though the existing road clearly could not coincide with or be located on the lake.) The provision of a buffer zone on either side of any scenic road was intended to insure that the negative appearance of transmission facilities would not be visible from any scenic road, and that the existing quality of areas where several scenic resources coincided could be preserved.

When resources were found to coincide, the decision whether to assign a new value depended on the nature of the resources and on the degree to which, in the analyst's judgment, the importance of the resources relative to a given C-level location determinant was enhanced by the coincidence. As previously noted, higher values were not automatically assigned to coincident resources, even when direct summation of numeric values might have suggested such action.

For example, relative to the 'Recreation Land Value' location determinant (C-4), one identified combination of resources that was not assigned higher value was the location of warm and/or cold water fish habitats on lands owned by large institutions (e.g., land protectorates open to the public for education and recreation). Both resources generate a certain amount of revenue as visitor attractions, and were therefore analyzed relative to the 'Recreation Land Value' location determinant. However, even in combination, the resources could not be considered--as potential revenue producers--on a par with the more intensively used recreation areas (such as ski slopes, resorts, etc.) that were assigned highest importance relative to this location determinant. In this case, therefore, the coincidence was examined but the originally assigned values were left the same and carried through in matrix format to the mapping stage of the Transmission Corridor Assessment.

More often (for perhaps 70 percent of the occurrences of spatial coincidence), the importance of an area was judged to be enhanced by the unique combination of resources, and higher value was assigned. Coincident resources were assigned higher value relative to a total of seven different C-level location determinants. The rationales for value reassignments relative to the different location determinants are best illustrated on the summary maps of C-level location determinants that appear in the Interim Findings section of this chapter. All unique combinations of resources that were reassigned high values are listed for convenience here, according to the resource-data maps that were overlaid in order to identify areas of coincidence relative to a given location determinant.

RECREATION LAND USE (C-3)

3.8 + 3.3: Designated Scenic Roads located on Municipal Lands

3.8 + 3.4: Designated Scenic Roads in proximity to Scenic Wayside Areas

3.8 + 7.1: Designated Scenic Roads in proximity to Lakes, Ponds, Great Ponds, Reservoirs, or Large Rivers

3.8 + 12.1: Designated Scenic Roads in proximity to Unique Resources

RECREATION LAND VALUE (C-4)

3.8 + 3.3: Designated Scenic Roads located on Muncipal Lands

3.8 + 12.1: Designated Scenic Roads in proximity to Unique Resources

EXISTING FOREST INDUSTRY (C-6)

3.1 + 16.3: National Forests containing Spruce/Fir Associations

3.1 + 16.4: National Forests containing Northern Hardwood Associations

3.1 + 16.5: National Forests containing Lowland Hardwood Associations

3.1 + 16.7: National Forests containing White or Red Pine/Eastern Hemlock Associations

EXISTING VISUAL QUALITY (C-18)

7.3 + 1.4: Wetlands occurring on Open and/or Agricultural Lands

DECREASED VISUAL QUALITY DUE TO VISIBILITY/EXPOSURE (C-20)

1.3 + 3.1: Town Centers located within National Forests

1.3 + 3.2: Town Centers located within State Parks and State Forests

COST DUE TO VALUE OF FOREST LANDS (C-23)

3.1 + 16.3: National Forests containing Spruce/Fir Associations

3.1 + 16.4: National Forests containing Northern Hardwood Associations

3.1 + 16.5: National Forests containing Lowland Hardwood Associations

3.1 + 16.7: National Forests containing White or Red Pine/Eastern Hemlock Associations

COST DUE TO SEVERE MICROCLIMATIC CONDITIONS (C-28)

10.1 + 6.2: Elevations Above 2500 Feet having North-Northwest Exposure

The procedures for identifying and analyzing these coincident resources constituted the final step in the interim analysis procedures that generated the content of the C-level analysis maps. The identified areas where unique combinations of resources were reassigned high values were carried forward to the mapping stage of the Transmission Corridor Assessment--to be depicted in dark intensities of color, i.e., as areas to be avoided during siting of alternative transmission corridors.

Mapping Resources and Products of Analysis

The mapping system used in the Transmission Corridor Assessment was designed to respond to a wide variety of needs. Within the Transmission Corridor Assessment, various kinds of maps served as important aids in decisionmaking during both the corridor-identification and the corridor-evaluation phases. All maps created depended on the file of resource-data items--i.e., the hand-drawn display of information on selected resources within the study area, which served throughout the Transmission Corridor Assessment to describe the study area's existing environment. The uniform format in which the 73 resource-data items were depicted also insured that the resource-data used in identifying alternative transmission corridors would be available for uses other than this project (e.g., for studies involving land-use planning in various towns within the study area).

During the interim analysis stage of the Transmission Corridor Assessment, two kinds of maps were developed:

- The 73 individual maps of resource-data items (such as the 'state parks and state forests' map shown in Figure 2-4) constituted the resource-data file, upon which numerous analyses were performed and from which numerous composite maps were produced. Each of the 73 maps was depicted on transparent mylar in the black or opaque symbols noted (points, lines, or polygons) and indicated the location, distribution, and concentration of one type of resource existing within the study area.

- The 28 C-level maps of location determinants were color "composites" (incorporating both the relevant maps of existing resources and the results of analyzing those resources) that translated both kinds of data into a format indicating geographic locations to be avoided during corridor allocation (i.e., the sites of 'critical' resources and of unique combinations of resources). Each map incorporated three different intensities (dark, medium, or light) of color; darkest shadings indicated areas least desirable for corridor locations.

Some of the advantages of maintaining individual graphic records of the 73 resource-data items have already been noted. The independent treatment of data items both maintained the integrity of each resource-data item on file and permitted maximum flexibility in the use of resource-data during analysis. One one hand, individual resource-data maps could interface with different corridor-location determinants (i.e., resources such as vegetation types could be considered as components of different C-level resource-systems, such as 'Deer Habitats' or 'Vegetative Cover'). On the other hand, resource-data items filed under different topics could interface with each other (i.e., the resource-data maps could be overlaid to identify coincident resources within the study area). Furthermore, because the individual resource-data maps did not require redrawing during analysis, both the economy and the accuracy of the Transmission Corridor Assessment were improved; unnecessary manual labor was avoided, as well as the possibility of compound cartographic error that is inherent in any manual duplication process.

In using the resource-data maps to create the C-level composites, the key requirement was interaction between analyst and data; actual reproduction of the composites was performed automatically only after various decisions had determined the content of the C-level maps. These decision-making processes and their products were described in the preceding section of this chapter in the form of three interim analysis steps: 1) selection of relevant resource-data maps to be analyzed for each location determinant--i.e., designation of component resources within the different C-level resource-systems (as indicated on the blacked-in data/analysis matrix, Figure 2-5); 2) assignment of relative values--high, moderate, or low--indicating the importance of each component resource in maintaining the existing quality of a given resource-system (as recorded on the second data/analysis matrix, Figure 2-7); and 3) re-examination of coincident resources and assignment of higher values to environmentally 'sensitive' areas important in maintaining the existing quality of a given C-level resource-system (as illustrated schematically on Figure 2-9).

These decisions, completed prior to the actual reproduction process, determined certain variations in the mapping procedures used to depict the C-level analysis results. The C-level maps were produced via a photographic overlay process that used light-sensitive "contact imaging" material to translate the black-and-white imagery of the resource-data maps into the various intensity-of-color images of the C-level composites.* The entire process entailed four basic steps. (In the interest of clarity, these technical procedures are presented here in somewhat simplified form.)

Step 1 (Production of Film Negatives). Positive imagery such as that shown on the 'state parks and state forests' map (Figure 2-4) was converted to a negative form that could be used directly in the photographic overlay process. A common scale of presentation (1 inch = 8 miles) was used rather than the variant scale of information (either 1 inch = 8 miles or 1 inch = 4 miles) that was employed in condensing the resource-data maps from the original data-documents.

Step 2 ("The Sandwich"). Film negatives of different resource-data maps were overlaid on a vacuum-frame press and "sandwiched" between a light-sensitive contact material on one end and ultraviolet light (in this case, from a carbon-arc lamp) on the other end. The number of overlays sandwiched depended on the number of component resources selected for analysis relative to each C-level resource-system.

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*The use of light-sensitive materials and the overlaying of individual maps to form color composites was based upon a unique mapping and land analysis concept investigated by Carl Steinitz. (See: Steinitz, Carl. On Hand-Drawn Map Overlays: An Alternative Approach. Harvard University Graduate School of Design, Department of Landscape Architecture. Cambridge Mass. March, 1976.) In adapting these mapping concepts for use in the Transmission Corridor Assessment, the procedures for mapping the various products of analysis were developed by the Consultant.

The contact material was the medium for generating color. The material used is called "negative-acting transparent proofing material" and consists of a clear polyester film which is fused with an ink-pigmented coating that is sensitive to ultraviolet light. This material is available in four process colors (magenta, yellow, cyan, and black). A single sheet of the material was placed on the vacuum-frame press as the first layer of each sandwich. Selected areas of this proofing material, underneath the different configurations of resource data to be depicted, were either masked from or exposed to direct light in order to produce the desired graphic depiction of analysis results

To reproduce different intensities of color, an additional layer of the sandwich (placed between the sheet of contact material and the package of film negatives) was required. The select areas masked for each resource-data map were also exposed through different intensities of screens (60% or 30%). The percentage of screen inserted in the sandwich depended on the high, moderate, or low value assigned to the resource being considered. High values were "exposed" directly as dark intensities of color without requiring screening (in the next mapping step). Moderate and low values were reproduced in corresponding intensities of color by utilizing 60% and 30% screening respectively. This screening process was required for all location determinants except 'Legal Regulations', for which no range of values was assigned; because of the uniform importance of the data analyzed, the 'Legal Regulations' map was depicted entirely in a dark intensity.

Step 3 (Exposure). The sandwich constructed by the analyst for each C-level location determinant and placed in the vacuum-frame press was then exposed for several minutes to the ultraviolet light source (the carbon-arc lamp). This process (which is also called "burning") was performed in order to allow the masked areas behind resource configurations to appear in the appropriate intensities of color (indicating values assigned to 'critical' resources and unique combinations of resources). Note that where two or more resource-data maps indicated coincident resources, the decision to depict the area of coincidence in a darker color was essentially made by incorporating the film negatives of all such maps in the sandwich. Because the same masked area of coincidence was exposed two or more times to the light source, the environmentally 'sensitive' area of coincidence was automatically recorded.

Step 4 (Developing). The exposed proofing material was covered with a developer fluid to remove the ink-pigmented coating and thus allow color images to appear in their final form. Finally, the proofing material was rinsed with water to remove extra color pigment and dried with absorbent paper.

For the entire process, the tools required (in addition to the proofing material and developer fluid) included: 1) an ultraviolet light source; 2) a vacuum-frame printing press; 3) an exposure guide to insure transmission of the proper amount of ultraviolet light; 4) a timer to insure the proper exposure time; and 5) a developing area in which to rinse the color proofs. The tools were thus relatively simple. The most complex element incorporated in the mapping system was the role of the analyst, who had to decide what to include in each sandwich; when to incorporate in the sandwich those maps showing coincident resources; and the kinds of screens to include along with each sandwich in order to reproduce the appropriate color intensities.

The mapping system can be used to effectively allocate transmission corridors because areas to be avoided--including locations of 'critical' resources and of environmentally 'sensitive' areas having coincident resources--stand out readily as dark colors on the C-level analysis maps. Each dark-shaded depiction of such a resource or area (judged vital to maintaining the existing environment of the study area) aided in the decision to redirect a transmission corridor instead toward areas shown in light and moderate intensities of color, which also stand out readily on the maps. The iterative use of color in the mapping system, thus, was a valuable graphic tool for decisionmaking.

Note that alternative corridors were not actually allocated until a third, related kind of map had been developed. The maps used directly to identify alternative corridors were called "Corridor Allocation Maps," or "CAMs." The relation of these CAMS to the C-level analysis maps will be described generally in the next section of this chapter. Because the CAMs were produced by further analyzing the 28 location determinants in increasingly aggregated categories, they will be described in greatest detail together with those analysis procedures, in Chapter III of this report.

INTERIM FINDINGS

The 28 C-level composite maps generated by using the interim analysis procedures and the mapping methods described in this chapter constitute the interim findings of the Transmission Corridor Assessment. These procedures identified within the study area the geographic occurrence of critical resources and of environmentally sensitive areas having coincident resources. The dark colors in which such resources and areas were reproduced on the C-level maps represented locations inappropriate for transmission facilities. The Transmission Corridor Assessment assumed that, within such vital geographic areas, any impacts associated with transmission facilities might endanger the existing condition of the study area's environment and all such impacts should be avoided.

The "interim" step was designed, thus, to insure that 'least desirable' corridor locations--in areas most susceptible to potential impacts--could be eliminated from consideration before delineating alternative transmission corridors. Had these procedures not been incorporated, the number of delineated corridors would have included all corridors capable of connecting the various substations in the USDI system plans; the number of such 'potential' corridors would have been myriad and the corridors themselves could easily have been sited in proximity to vital resources and unique sites within the study area.

Theoretically, the intensity-of-color maps at the C level could have been used directly to delineate alternative transmission corridors. Technically, however, overlaying 28 separate maps* of location determinants

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*Like the resource-data maps, the C-level composites were reproduced on transparent material that could be overlaid. Corridors were actually delineated on top of overlay maps of location determinants.

would have increased not only the difficulty of delineating alternative corridors but also the possibilities of error. The interim findings for C-level location determinants were therefore subjected to additional analyses at different levels of aggregation. The products of these later analyses, as already noted, were the Corridor Allocation Maps (CAMs).

CAMs were created and used directly to allocate and delineate alternative corridors. Where the C-level color composites indicated three intensities of color on each map, the CAMs (also color composites) incorporated medium and light intensities of color on one map, dark intensities on another. In general, the C-level maps were used to identify constraints to the introduction of transmission facilities; the CAMs, to identify more opportune locations. 'Best' locations for transmission corridors were determined--according to the 'least impact' criterion--by observing gradations of color on the different maps, then avoiding darker areas and seeking out lighter areas.

Before examining the corridor identification procedures that employed the CAMs, the interim findings themselves require further description. The gradations of color required for use in corridor identification can be observed on eight C-level maps presented as samples in Appendix A. Unfortunately, these fold-out maps were much too cumbersome either to be inserted in the report itself or to be provided for all 28 location determinants. This section will therefore describe only those samples shown in the Appendix and will summarize the color intensities on the other 20 C-level maps.

Sample C-Level Analysis Maps: Natural Resources

Sample maps are provided for the location determinants from C-7 through C-14: Vegetative Cover; Surface Water Systems; Ground Water Systems; Deer Habitats; Waterfowl Areas; Fish Habitats; Significant Wildlife Areas; and Soils: Erosion. The data available in the resource-data file for these location determinants were particularly detailed or well-documented and protection of all such natural resources was of particular concern to study area residents and project team members alike.

The gradations of color that are observable on these maps are the spatial manifestations of the high, moderate, and low importance assigned during the interim analysis procedures to the different resources within each C-level resource-system. Observation of these maps also indicates that the various opaque-symbol configurations of resources shown on the individual resource-data maps are no longer recognizable.* Only the more prominent natural features (such as large lakes or mountainous terrain) and the political boundaries between the three study-area states are still distinguishable.

The darkest colors on the maps can be taken to represent areas that would be highly susceptible to impacts if transmission facilities were introduced; the lightest colors, areas that would be less threatened by the introduction of transmission facilities. Given the assumption that any impacts on critical resources or on unique combinations of resources will be considered severe and should be avoided, the terminology used to designate the locations of such resources--either "dark intensities of color" or "high-impact areas"--is not as important as the locations themselves (i.e., the geographic indications which signaled the need to redirect transmission corridors elsewhere). The distribution and concentration of color on the different C-level analysis maps can best be described relative to the sample maps; for each sample map described, a summary map of relevant resource-data items and their high, moderate, or low rankings is also incorporated in the text.

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*In this sense, the 'integrity' of the individual resource-data items has not been maintained on the C-level maps; precise geographic locations of individual resources can only be verified by reference to the resource-data maps on file and to the data qualification in Volume II of this report. In another sense, however, translation of these resource-data maps into intensities of color insured that introduction of transmission facilities would not damage the existing environment of the study area--and thus served to protect the study area's existing resources.

'VEGETATIVE COVER' ANALYSIS MAP (C-7). The darkest areas on this map are dispersed and cover only a small percentage of the total study area. Most of these areas are either wetlands (which are particularly productive sites for vegetation and also particularly sensitive environments) or concentrations of rare or unique types of vegetation (especially those officially designated as "Endangered or Threatened Species" or "Species of Special Concern" and therefore afforded federal protection). Among the other potentially high-impact areas mapped are designated areas of concern such as Maine's "Critical Areas" and locations of vegetation that support wildlife.

In the largest percentage of the study area, the susceptibility of vegetative cover to potential impacts is displayed as moderate. The vegetative cover shown in moderate shading is particularly extensive, mainly because the 'Vegetation' resource-data items (topic 16.0) that were mapped for this location determinant included most of the forest 'associations' (or types of trees) that exist in the study area.* (The large percentages of forest lands in all three study-area states have already been noted.) This moderate shading appears uniformly in western Maine and in northern New Hampshire and Vermont; these areas have minimal urbanization or other development.

The lightest colors on the map are dispersed throughout the study area (though sparsest concentrations are seen in Vermont) and indicate locations of pitch pine and transitional hardwood associations; these vegetation types were assigned low value because of their stability as vegetative communities whose ecological balance was not likely to be disturbed by impacts associated with transmission facilities. Areas showing no color at all indicate locations--such as urban areas or bodies of water--that have little or no vegetative cover.

*Of the various forest associations that occur within the study area, northern hardwoods (maple, beech, birch) are most prevalent in Vermont; white or red pine and eastern hemlock associations, in New Hampshire; and spruce/fir associations, in Maine.

The gradations of color on this map correspond directly to the high, moderate, and low values assigned on the second data/analysis matrix to the various resources.

<u>Environmental Resources (by resource-data topic)</u>

7.3 Wetlands
12.2 Critical Areas: Maine
12.4 National Scientific Research/Wilderness Study Areas
12.5 Wilderness/Primitive Areas
16.1 Endangered and Threatened Species
16.2 Alpine Tundra (Species of Special Concern)

16.3 Spruce/Fir Associations
16.4 Northern Hardwood Associations
16.5 Lowlands Hardwood Associations
16.7 White or Red Pine/Eastern Hemlock Associations

16.6 Transitional Hardwood Associations
16.8 Pitch Pine

'SURFACE WATER SYSTEMS' ANALYSIS MAP (C-8). No surface water feature on this map was depicted in a light color. All surface water across the study area was considered important--for consumption by people and by wildlife as well as for recreational uses. The map illustrates an abundance of surface water features within the study area. Lakes, ponds, streams, wetlands, and rivers were formed largely through glacial activity and large amounts of precipitation in the study area (on the average, more than 40 inches a year). The quality of these features is maintained largely because of the extensive forest cover in the study area, which reduces the impacts (such as excessive run-off and sedimentation) that result from flooding following the spring thaw.

With the exception of wetlands, all of the surface water features depicted on the map are utilized to supply water for human consumption. Many of these water bodies are located within designated 'sensitive water basins', concentrations of which are shown on the map in northern and central Maine.

Because these resources 'coincided', and because the highest quality waters (class "A") available for human consumption are supplied from the various bodies of surface water (lakes, ponds, reservoirs, streams, rivers, wetlands) that occur within the basins, thehighest values relative to this location determinant were assigned to the areas where resources coincided. The darkest colors on the map, thus, depict surface water features located within 'sensitive water basins'.

In most of the study area, where Class "B" waters predominate, moderate shading is shown on the map to correspond to the moderate value assigned to such waters, whose quality is still relatively high. As defined by the New Hampshire Water Supply and Pollution Control Commission, such waters are "acceptable for bathing and other recreational purposes and, after adequate treatment, for use as water supplies."

Mapping of gradations of color for this location determinant incorporated the provisions for coincident resources previously mentioned.

Environmental Resources (by resource-data topic)

7.4 + 7.1 Sensitive Water Basins containing Lakes, Ponds, Great Ponds, Reservoirs, and/or Large Rivers
7.4 + 7.2 Sensitive Water Basins containing Rivers and/or Streams
7.4 + 7.3 Sensitive Water Basins containing Wetlands

7.1 Lakes, Ponds, Great Ponds, Reservoirs, and Large Rivers
7.2 Rivers and Streams
7.3 Wetlands
7.4 Sensitive Water Basins

'GROUND WATER SYSTEMS' ANALYSIS MAP (C-9). Only two resource-data items were used to create this analysis map--'wetlands', and 'aquifers and aquifer recharge areas'. Both resources were considered important in maintaining existing ground water systems--which are often the source of municipal and/or domestic drinking supplies--free from pollution that could result from introduction of transmission facilities. No light colors are shown on the map.

Because wetlands provide storage for ground water reserves and prevent contamination of ground water during periods of flooding and high rainfall, the water quality of the wetlands was considered essential to maintaining the water quality of ground water systems, and locations of wetlands are shown in the darkest intensity of color. Moderate shading on the analysis map indicates locations identified as aquifers and aquifer recharge areas, in which permeable soil conditions allow ready infiltration of surface water and precipitation into the ground water.

Environmental Resources (by resource-data topic)

7.3 Wetlands

11.1 Aquifers and Aquifer Recharge Areas

'DEER HABITATS' ANALYSIS MAP (C-10). The darkest areas on this map are locations of known deer wintering yards, which were considered critical to insuring the survival of the animals during the harsh New England winters.*

*The precise impacts of transmission facilities on deer wintering yards can only be assessed after detailed right-of-way studies delineate right-of-way locations relative to the known deer habitats. The Transmission Corridor Assessment assumed that, because wintering yards are critical to the survival of deer, any impacts should be avoided. However, depending on the exact location of right-of-way clearings, some impacts of transmission facilities could actually be beneficial--for example, increased browse and food both within the rights-of-way and at forest edges, or availability of new trails and movement routes.

The large number of such dark areas gives an indication of the size of deer populations throughout the study area. (Note that the analysis map does not depict deer wintering yards in southern Maine, but only because updated information was not available.) The distribution of dark colors indicates that most deer wintering yards are located away from urbanized areas.

Moderate shadings on the map are locations of the forest types that provide forage and protection against exposure for deer. The thick, coniferous growth of these trees is a particularly good buffer against winds, and also tends to reduce snow cover. Most of the moderate-shading areas are in the northern, undeveloped portions of the study area; the concentraion of such areas is highest in Maine and lowest in Vermont.

Areas depicted in light colors include locations of forest types (particularly hardwoods) that offer least protection or food for deer. These areas are far more abundant in Vermont and New Hampshire than in Maine, which, though it has approximately the same acreage of this kind of forest cover, has far less acreage per square mile than either of the other states. Areas containing no color--large lakes and rivers, urbanized and developed lands, and open agricultural lands--do not support a significant number of deer and were thus not considered relevant to this location determinant. For the resources relevant to this C-level map, the gradations of color correspond directly to the values assigned on the data/analysis matrix.

Environmental Resources (by resource-data topic)

14.4 Deer Wintering Yards

16.3 Spruce/Fir Associations
16.7 White or Red Pine/Eastern Hemlock Associations
16.8 Pitch Pine

16.4 Northern Hardwood Associations
16.5 Lowlands Hardwood Associations
16.6 Transitional Hardwood Associations

'WATERFOWL AREAS' ANALYSIS MAP (C-11). This map depicts both primary habitats used by waterfowl for nesting, feeding, and resting and suspected waterfowl areas that are located along migratory routes or secondary flyways. The darkest colors indicate sites specifically identified by Fish and Game Departments across the study area as waterfowl areas and locations of wetlands known to be waterfowl habitats. Most of these primary habitats are located in Maine, near the eastern seaboard. Moderate shading indicates potential habitats, including the many surface water bodies--lakes, ponds, great ponds, reservoirs, rivers, streams--located within the study area. All such areas were considered important in maintaining the existing quality of temporary and permanent waterfowl habitats; therefore, no light colors are indicated on this map.

<u>Environmental Resources (by resource-data topic)</u>

7.3 Wetlands
14.5 Waterfowl Areas

7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams

'FISH HABITATS' ANALYSIS MAP (C-12). In addressing the 'Fish Habitats' location determinant, all surface water bodies in the study area were considered. The single most important fish habitats were judged to be the water bodies identified as habitats of "anadromous" fish--species (like the Atlantic salmon) that spend portions of their lives in fresh water and portions in salt water. Because some anadromous fish species within the study area are becoming extinct such species are now receiving special attention across New England; where anadromous fish have already become extinct, programs to reestablish the species are underway. Given such concerns, all identified anadromous fish habitats are depicted on the map in dark colors, to be avoided during allocation of transmission corridors. The majority of these dark areas are streams and rivers, most of them in eastern and central Maine, some in Vermont and New Hampshire.

Moderate shading indicates surface water bodies that may be habitats for fish species that live either in warm or in cold water. Unfortunately, the relative importance of warm- versus cold-water fish habitats could not be assessed because uniform data on the various fish species were not available throughout the study area. The two resources were therefore treated identically in the C-level analysis. Because such habitats are more widespread within the study area than the identified anadromous fish habitats, both warm- and cold-water habitats were assigned moderate importance. Areas depicted in light colors on the map included all other surface water bodies within the study area that could potentially be fish habitats.

Environmental Resources (by resource-data topic)

15.3 Anadromous Fish Habitats

15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats

7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams

'SIGNIFICANT WILDLIFE AREAS' ANALYSIS MAP (C-13). To insure that all significant forms of study-area wildlife, both terrestrial and aquatic, would be protected from potential impacts associated with the introduction of transmission facilities, a special location determinant was included in the analysis. The analysis map for 'Significant Wildlife Areas' is somewhat different from the others, as it can be considered a summary sheet of the highest values shown on many of the other C-level maps. Because all wildlife in this category are, by definition, "significant," all locations are graphically depicted in dark colors.

Resources included on this composite map are: habitats of rare or unique species (especially, those designated as "Endangered or Threatened" and "Species of Special Concern," i.e., recognized by the federal government for preferential treatment and/or protection); critical or life-sustaining habitats of other wildlife like deer, waterfowl, and anadromous fish;

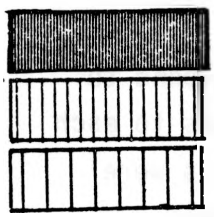
lands owned and operated by the state or the federal government for the express purpose of providing wildlife refuges or reintroducing fish or wildlife species that are on the verge of extinction.

Most of the waterfowl areas and anadromous fish habitats shown on the map are located in Maine, near the eastern seaboard. Most of the wildlife programs that deal with protection or reintroduction of species are concentrated in New Hampshire and Vermont. Concentrations of dark color are strikingly absent in northwestern Maine's unorganized townships; while abundant wildlife certainly exist in these 'wildernesses', the human encroachment that presents a threat to wildlife habitats in other parts of the study area is less prevalent. Note that, because of the variability of resource-data items relative to many different location determinants, the same geographic location (e.g., of wilderness areas in northwestern Maine) that is not shown here in dark color will appear on other C-level composite maps (e.g., of 'Vegetative Cover' or 'Unique Resources') in dark colors, to be avoided during transmission corridor allocation.

Environmental Resources (by resource-data topic)

14.1 Endangered and Threatened Species
14.2 Species of Special Concern
14.3 Restoration Areas
14.4 Deer Wintering Yards
14.5 Waterfowl Areas
14.6 Wildlife Refuges and Management Areas
15.3 Anadromous Fish Habitats

'SOILS: EROSION' ANALYSIS MAP (C-14). The only data used to create this analysis map pertained to topographic slope--the single most important factor that determines the amount of soil erosion that could result from introduction of transmission facilities. Intensities of color on the map correspond directly to the three different grades of slope that are categorized in the resource-data file. Darkest colors indicate steepest slopes, with grades of 35 percent or more, that would be most susceptible to erosion. The steepest slopes in the study area are concentrated around the White Mountain region of New Hampshire and Maine. Progressively lighter colors indicate slopes between 15 and 35 percent and those of 15 percent or less. The moderate shading tends to appear in Vermont and New Hampshire; the lightest colors, indicating relatively flat topography, in much of Maine (with the exception of the area around Mt. Katahdin in Baxter State Park, where steep slopes are depicted in dark colors).



Environmental Resources (by resource-data topic)

2.3 Slopes of 35% or more

2.2 Slopes between 15% and 35%

2.1 Slopes of 15% or less

Summary C-Level Analysis Maps

Like the C-level natural-resources maps described, the 20 color-composite maps of location determinants not included in the Appendix A sample package depict in different intensities of color the resources critical to maintaining the quality of each C-level resource-system. Again, darker colors indicate areas to be avoided first during corridor allocation because of their susceptibility to potential impacts. The interim analysis and mapping procedures employed to produce these composites have already been examined at length. In the follwoing pages, a summary--in the form of a color legend--is presented for each C-level analysis map created.

In most cases, gradations of color were mapped directly to correspond to the high, moderate, or low values assigned by project team members to each resource on the second data/analysis matrix.* Where higher values were reassigned to environmentally sensitive areas containing coincident resources, coincident data are indicated by conjunction of the resource-data topic numbers for the resources that coincided--for example, 3.8 + 3.3: 'designated scenic roads' located on 'municipal lands'.

In general, the actual appearance of each of the 28 maps is strikingly different. While certain features within the study area--e.g., the White Mountain National Forest, anadromous fish habitats, or certain large lakes--tend to appear on a number of different maps (usually in dark colors indicating critical importance relative to different location determinants), the maps as a whole do not show any consistent patterns of color, and no two maps are identical.

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*Note that for the C-21 through C-28 location determinants, which are generally concerned with acquisition, construction, and maintenance costs relative to transmission facilities, the values assigned on the matrix and carried through on the maps were also checked by USDI representatives with expertise in these aspects of transmission planning.

C-1 'LAND OWNERSHIP' ANALYSIS MAP

Environmental Resources (by resource-data topic)

1.6 Indian Lands/Reservations
5.5 High Parcel Density/Town

5.6 Moderate Parcel Density/Town

5.7 Low Parcel Density/ Town

Because the Transmission Corridor Assessment sought to avoid locations of transmission facilities that would displace large numbers of land owners (either private or public), the darkest colors on this map represent the highest concentrations of land owners within the study area. Apart from the high ranking of communally-owned Indian reservations, the range of color intensities corresponds directly to the numbers of privately-owned land parcels per square mile in each town mapped. The highest concentration of parcels belonging to different owners within a single town was 28 or more parcels per square mile.

C-2 'HUMAN POPULATIONS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

1.1 Urban Centers

1.6 Indian Lands/Reservations

1.2 Ex-Urban Development

1.3 Town Centers

In order to avoid impacts on large numbers of people within the study area, the Transmission Corridor Assessment sought to avoid corridor locations in settled areas and areas having high population densities. Darkest colors therefore correspond to more populated areas; lighter colors, to less populated areas.

C-3 'RECREATION LAND USE' ANALYSIS MAP

Environmental Resources (by resource-data topic)

3.1 National Forests
3.2 State Parks and State Forests
3.5 Intensive Recreation Areas
3.6 Wild, Scenic, and Designated Recreation Rivers
9.1 National Register Historic Sites
9.2 State Register Historic Sites
12.3 National Natural Landmarks
15.3 Anadromous Fish Habitats
3.8 + 3.3 Designated Scenic Roads located on Municipal Lands
3.8 + 3.4 Designated Scenic Roads in proximity to Scenic Wayside Areas
3.8 + 7.1 Designated Scenic Roads in proximity to Lakes, Ponds, Great Ponds, Reservoirs, and Large Rivers
3.8 + 12.1 Designated Scenic Roads in proximity to Identified Unique Resources

3.3 Municipal Lands
3.4 Scenic Wayside Areas
3.7 National Scenic Trails
3.8 Designated Scenic Roads
12.1 Identified Unique Resources
12.2 Critical Areas: Maine
14.6 Wildlife Refuges and Management Areas
15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats

7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams
5.3 Semi-Public/Large-Institution Lands

Impacts of transmission facilities located within recreation areas could vary depending on the type and/or quality of recreation experience sought by visitors to different areas. Gradations of color on this map correspond to degrees of incompatibility of the existing recreation land use with introduction of transmission facilities.

Darkest colors represent: areas where preservation of the 'wilderness' environment is essential to the quality of the recreation experience; intensively used recreation areas and/or those most frequently visited by the public; various unique natural landmarks recognized by the National Park Service; and areas reassigned high values because of spatial coincidence of resources. Transmission corridors were considered incompatible with all such recreation land uses. Moderate shadings indicate areas possessing such recreation qualities to a lesser degree. Note that relative to fishing activities in the study area, habitats of certain game fish which are more in demand by fishermen are distinguished by darker colors than habitats of other kinds of fish. Light shadings indicate general areas where potential recreation land uses exist but are usually secondary to other uses.

C-4 'RECREATION LAND VALUE' ANALYSIS MAP

Environmental Resources (by resource-data topic)

3.1 National Forests
3.2 State Parks and State Forests
3.5 Intensive Recreation Areas
3.6 Wild, Scenic, and Designated Recreation Rivers
12.3 National Natural Landmarks
19.3 Anadromous Fish Habitats
3.8 + 3.3 Designated Scenic Roads located on Municipal Lands
3.8 + 12.1 Designated Scenic Roads in proximity to Identified Unique Resources

3.3 Municipal Lands
3.7 National Scenic Trails
3.8 Designated Scenic Roads
5.3 Semi-Public/Large-Institution Lands
9.1 National Register Historic Sites
9.2 State Register Historic Sites
12.1 Identified Unique Resources
12.2 Critical Areas: Maine
14.6 Wildlife Refuges and Management Areas
15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats

7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams

One aim of the Transmission Corridor Assessment was to allocate corridors that would entail least impact upon revenues generated by recreation activities and tourism in the study area. Such impacts could range from reduction of the aesthetic appeal of a particularly scenic area to diminution of wildlife or fish in a prime hunting or fishing area. The 'Recreation Land Value' location determinant judged the economic value of recreation lands specifically as revenue producers (i.e., areas where money could be expended for tourism, entrance fees, equipment and licenses, etc.).

The darkest colors on this map represent locations of recreation lands and sites for recreation activities that produce the highest revenues. Moderate and light shadings accordingly indicate areas that generate less revenue (for example, wildlife refuges that attract many paying visitors but are also designed to accommodate nonpaying birdwatchers). Note that while hunting and fishing were considered relative to this location determinant, all revenues generated from such activities were difficult to portray on maps. For example, a single hunting license allows a hunter access to numerous wildlife species; all locations of game species could not be mapped.

C-5 "OPEN/AGRICULTURAL LANDS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

1.4 Open/Agricultural Lands

Depending on the type of agriculture practiced or the management of open lands, introduction of transmission facilities could reduce the productive capacity or economic value of such lands. While avoiding impacts on agricultural lands was important in this respect, the presence of transmission facilities was not considered disruptive to all types of agricultural land uses. Open and agricultural lands were therefore depicted in moderate shading on the map.

C-6 'EXISTING FOREST INDUSTRY' ANALYSIS MAP

Environmental Resources (by resource-data topic)

16.3 + 3.1 Spruce/Fir Associations within National Forests
16.4 + 3.1 Northern Hardwood Associations within National Forests
16.5 + 3.1 Lowlands Hardwood Associations within National Forests
16.7 + 3.1 White or Red Pine/Eastern Hemlock Associations within National Forests

3.1 National Forests
16.3 Spruce/Fir Associations
16.4 Northern Hardwood Associations
16.5 Lowlands Hardwood Associations
16.7 White or Red Pine/Eastern Hemlock Associations

3.2 State Parks and State Forests
16.6 Transitional Hardwood Associations
16.8 Pitch Pine

The Transmission Corridor Assessment sought to avoid corridor locations near the most commercially valuable timber resources (especially, those managed by the forest industry), since right-of-way clearing could remove substantial amounts of land from forest production. Vegetation species on this analysis map are ranked according to their economic value for timber production.

Darkest shadings show locations of coincident resources, in this case, forest types occurring on lands managed by the forest industry. Moderate shadings indicate locations of timber species that are both plentiful and commercially valuable; light shadings represent species that are neither as extensive nor as valuable.

C-7 'VEGETATIVE COVER' ANALYSIS MAP*

Environmental Resources (by resource data topic)

7.3 Wetlands
12.2 Critical Areas: Maine
12.4 National Scientific Research/Wilderness Study Areas
12.5 Wilderness/Primitive Areas
16.1 Endangered and Threatened Species
16.2 Alpine Tundra (Species of Special Concern)

16.3 Spruce/Fir Associations
16.4 Northern Hardwood Associations
16.5 Lowlands Hardwood Associations
16.7 White or Red Pine/Eastern Hemlock Associations

16.6 Transitional Hardwood Associations
16.8 Pitch Pine

C-8 'SURFACE WATER SYSTEMS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

7.4 = 7.1 Sensitive Water Basins containing Lakes, Ponds, Great Ponds, Reservoirs, and/or Large Rivers
7.4 + 7.2 Sensitive Water Basins containing Rivers and/or Streams
7.4 + 7.3 Sensitive Water Basins containing Wetlands

7.1 Lakes, Ponds, Great Ponds, Reservoirs, and Large Rivers
7.2 Rivers and Streams
7.3 Wetlands
7.4 Sensitive Water Basins

C-9 'GROUND WATER SYSTEMS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

7.3 Wetlands

11.1 Aquifers and Aquifer Recharge Areas

*Analysis maps from C-7 through C-14 have already been discussed in detail, in the preceding section. As noted, the actual maps are included in Appendix A.

C-10 'DEER HABITATS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

14.4 Deer Wintering Yards

16.3 Spruce/Fir Associations
16.7 White or Red Pine/Eastern Hemlock Associations
16.8 Pitch Pine

16.4 Northern Hardwood Associations
16.5 Lowlands Hardwood Associations
16.6 Transitional Hardwood Associations

C-11 'WATERFOWL AREAS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

7.3 Wetlands
14.5 Waterfowl Areas

7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams

C-12 'FISH HABITATS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

15.3 Anadromous Fish Habitats

15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats

7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams

C-13 'SIGNIFICANT WILDLIFE AREAS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

14.1 Endangered and Threatened Species
14.2 Species of Special Concern
14.3 Restoration Areas
14.4 Deer Wintering Yards
14.5 Waterfowl Areas
14.6 Wildlife Refuges and Management Areas
15.3 Anadromous Fish Habitats

C-14 'SOILS EROSION' ANALYSIS MAP

Environmental Resources (by resource-data topic)

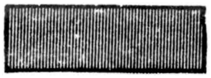
2.3 Slopes of 35% or more

2.2 Slopes between 15% and 35%

2.1 Slopes of 15% or Less

C-15 'HISTORIC RESOURCES' ANALYSIS MAP

Environmental Resources (by resource-data topic)

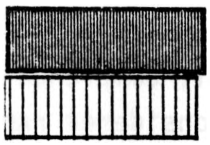


9.1 National Register Historic Sites
9.2 State Register Historic Sites
9.3 Potential State and National Historic Sites

The historic sites included on this map have been recognized by various state and federal agencies and are protected by legal regulations. All such sites were judged to be unique cultural resources that are highly susceptible to impacts associated with introduction of transmission facilities (either destruction of historic structures or aesthetic intrusion on the quality of historic sites). The resources on this analysis map are therefore depicted in uniformly dark colors, to be avoided during corridor allocation.

C-16 'ARCHAEOLOGICAL RESOURCES' ANALYSIS MAP

Environmental Resources (by resource-data topic)



8.1 Existing Archaeological Sites

8.2 Archaeological sensitivity zones

This map indicates two mutually exclusive resources: known locations of archaeological sites or artifacts (identified by state or regional agencies), and potential archaeological sites, i.e., areas that may be expected to yield artifacts given further investigation (identified by agencies and experts in the area). Because the existing sites were considered rare and unique and were also subject to legal regulations, they were assigned higher value than the suspected sites and are shown in dark colors, to be avoided during corridor allocation.

C-17 'UNIQUE RESOURCES' ANALYSIS MAP

Environmental Resources (by resource-data topic)

8.1 Existing Archaeological Sites
9.1 National Register Historic Sites
9.2 State Register Historic Sites
9.3 Potential State and National Historic Sites
12.1 Identified Unique Resources
12.2 Critical Areas: Maine
12.3 National Natural Landmarks
12.4 National Scientific Research/Wilderness Study Areas
12.5 Wilderness/Primitive Areas
14.1 Endangered and Threatened Species (Wildlife)
14.2 Species of Special Concern
14.3 Restoration Areas
15.3 Anadromous Fish Habitat
16.1 Endangered and Threatened Species (Vegetation)
16.2 Alpine Tundra (Species of Special Concern)

In an attempt to avoid location of transmission corridors in areas containing resources important to study area residents, a special, comprehensive location determinant was included for all resources considered rare or irreplaceable. Such 'unique resources' are uniformly depicted in dark colors on this analysis map. Most of the resources have been formally recognized by state and federal governments or by the New England Regional Commission as resources of concern, and many of them are legally protected by state, federal, or local laws. The New England Natural Areas Program (NENAP), sponsored by the New England Regional Commission in order to identify unique natural resources and areas in New England, has catalogued 4059 such areas.

C-18 'EXISTING VISUAL QUALITY' ANALYSIS MAP

Environmental Resources (by resource-data topic)

3.4 Scenic Wayside Areas
3.6 Wild, Scenic, and Designated Recreational Rivers
3.8 Designated Scenic Roads
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams
9.1 National Register Historic Sites
9.2 State Register Historic Sites
10.1 Elevations above 2500 feet
10.2 Mountains, Hilltops, Military Ridges
12.1 Identified Unique Resources
12.2 Critical Areas: Maine
12.5 Wilderness/Primitive Areas
16.1 Endangered and Threatened Vegetation Species
16.2 Alpine Tundra
7.3 + 1.4 Wetlands occurring on Open/Agricultural Lands

1.4 Open/Agricultural Lands
2.3 Slopes of 35% or more
3.5 Intensive Recreation Areas
7.3 Wetlands
9.3 Potential State and National Historic Sites
12.4 National Scientific Research/Wilderness Study Areas

2.2 Slopes between 15% and 35%

Visual and aesthetic impacts are usually associated with transmission facilities. The 'Existing Visual Quality' location determinant was intended to identify and protect areas of high visual quality or scenic beauty. The darkest colors on this map represent primitive wilderness areas and other highly scenic landscape within the study area, as well as areas where landscape alteration as a result of introduction of transmission facilities would be readily apparent. Moderate intensities of color indicate areas that, while possessing relatively high visual quality, are somewhat less scenic than areas depicted in the darkest colors.

C-19 'DECREASED VISUAL QUALITY DUE TO VISIBILITY/ABSORPTION' ANALYSIS MAP

Environmental Resources (by resource-data topic)

10.1 Elevations above 2500 feet
10.2 Mountains, Hilltops, Military Ridges
16.2 Alpine Tundra (Species of Special Concern)

1.4 Open/Agricultural Land
2.3 Slopes of 35% or more
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
10.3 Mountain Sides, Hill Sides, and Valley Walls

2.2 Slopes between 15% and 35%
6.3 S - SE - SW
10.4 Narrow Valley Floors

Because the appearance of transmission lines was considered a negative quality, the Transmission Corridor Assessment sought to avoid corridor locations where the visibility of transmission facilities would alter the existing landscape. On this analysis map, therefore, areas that do not contain various land forms and other physiographic features that can conceal transmission lines were depicted in darker colors, to be avoided during corridor allocation. Areas where conditions such as exposure or elevation were suitable for concealing transmission lines were depicted in lighter colors.

C-20 'DECREASED VISUAL QUALITY DUE TO VISIBILITY/EXPOSURE' ANALYSIS MAP

Environmental Resources (by resource-data topic)

1.4 Urban Centers
3.4 Scenic Wayside Areas
3.5 Intensive Recreation Areas
3.6 Wild, Scenic, and Designated Recreation Rivers
3.7 National Scenic Trails

1.3 + 3.1 Town Centers located within National Forests
1.3 + 3.2 Town Centers located within State Parks and State Forests

1.3 Town Centers
1.6 Indian Lands/Reservations
3.1 National Forests
3.2 State Parks and State Forests
3.3 Municipal Lands
3.8 Designated Scenic Roads
4.1 Roads: ADT 3000 and greater
5.3 Semi-Public/Large-Institution Lands
9.1 National Register Historic Sites
9.2 State Register Historic Sites

1.2 Ex-Urban Development
9.3 Potential State and National Historic Sites

On the assumption that transmission corridors should minimize the exposure of people to the negative visual aspects of transmission facilities, transmission corridor siting sought to avoid areas where large numbers of people might be exposed to transmission lines; these areas were identified according to different kinds of activities or land-uses which could be expected to attract many people. The darkest shadings on this analysis map represent intensively used areas and those where highly scenic quality attracts people to various activities. Areas depicted in lighter shading represent those less intensively used or those where decreased visual quality would less strongly affect the types of activities conducted.

C-21 'COST DUE TO VALUE OF DEVELOPED LANDS' ANALYSIS MAP

Environmental Resource (by resource-data topic)

1.1 Urban Centers
1.3 Town Centers
1.6 Indian Lands/Reservations

1.2 Ex-Urban Development

1.4 Open/Agricultural Land

Relative to this analysis map, areas where costs of acquiring land for the installation of transmission facilities would be highest were depicted in darkest color, as severe constraints to the location of transmission facilities. These dark shaded areas included both areas having large concentrations of developed land and those having high population densities. As previously noted, values identified relative to this location determinant and to those from C-22 through C-28, were reviewed by USDI representatives with experience in such aspects of transmission planning.

C-22 'COST DUE TO VALUE OF RECREATION LANDS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

3.2 State Parks and State Forests
3.5 Intensive Recreation Areas
3.6 Wild, Scenic, and Designated Recreation Rivers
9.1 National Register Historic Sites
9.2 State Register Historic Sites
12.1 Identified Unique Resources
12.2 Critical Areas: Maine
12.3 National Natural Landmarks

3.1 National Forests
3.3 Municipal Lands
5.3 Semi-Public/Large-Institution Lands

3.4 Scenic Wayside Areas

Given an aim to keep costs of acquiring land for transmission facilities within reasonable bounds, the Transmission Corridor Assessment sought to avoid location of transmission corridors in areas where recreation is the primary designated land use and the revenues generated from recreation are therefore highest. As a rough rule of thumb, the higher the value of a recreation area specifically as a revenue producer, the higher the land value and the cost of acquiring land. The darkest shading on this analysis map therefore indicates locations of the most intensively used recreation areas; lighter shading, the least intensively used areas.

C-23 'COST DUE TO VALUE OF FOREST LANDS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

16.3 + 3.1 Spruce/Fir Associations within National Forests
16.4 + 3.1 Northern Hardwood Associations within National Forests
16.5 + 3.1 Lowlands Hardwood Associations within National Forests
16.7 + 3.1 White or Red Pine/Eastern Hemlock Associations within National Forests

3.1 National Forests
16.3 Spruce/Fir Associations
16.4 Northern Hardwood Associations
16.5 Lowlands Hardwood Associations
16.7 White or Red Pine/Eastern Hemlock Associations

3.2 State Parks and State Forests
16.6 Transitional Hardwood Associations
16.8 Pitch Pine

This location determinant identified, in general, forest lands of potential commercial value and, more specifically, those commercially valuable forest lands that are managed for timber harvest by the forest industry. Lightest shadings on this analysis map indicate the former kind of forest land; darker shading, the latter. Since costs of acquiring land for transmission facilities will be higher where lands are utilized by the forest industry, transmission corridor siting sought to avoid such areas.

C-24 ' COST DUE TO DECREASED ACCESSIBILITY' ANALYSIS MAP

Environmental Resources (by resource-data topic)

4.3 High Existing Access Density

4.4 Medium Existing Access Density

4.5 Low Existing Access Density

Location determinants C-24 through C-28 in general seek to identify and avoid areas where transmission planning is likely to encounter construction and maintenance difficulties. In such areas, potential engineering difficulties (for example, requirements for specialized construction equipment and techniques) could be overcome but would entail significantly increased costs. One such cost--as depicted by the dark shading on the C-24 analysis map--is entailed by the need to construct new access roads where the density of existing access roads is low. Transmission corridor siting therefore sought out areas where many existing access roads could be used, as indicated by the lighter shadings.

C-25 'COST DUE TO UNSTABLE SOILS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

7.3 Wetlands

Among the data inventoried for the Transmission Corridor Assessment, only one resource-data item was considered relative to this location determinant: wetlands across the study area are the primary locations of unstable soils. Since construction and maintenance costs are significantly increased in areas of unstable soils, the locations of wetlands were depicted on this analysis map in dark shading, to be avoided during transmission corridor siting.

C-26 'COST DUE TO STEEP SLOPES' ANALYSIS MAP

Environmental Resources (by resource-data topic)

2.2 Slopes between 15% and 35%

2.3 Slopes of 35% or more

Steep slope conditions increase the cost of constructing and maintaining transmission facilities in general and access roads in particular. As indicated by the gradations of shading on this analysis map, increased costs are commensurate with the severity of the slope. Since locating transmission facilities in areas without steep slopes would entail no constraints, the resource-date item on 'slopes of 15% or less' did not require consideration relative to this analysis map.

C-27 'COST DUE TO ENDANGERED, THREATENED OR UNIQUE SPECIES' ANALYSIS MAP

Environmental Resources (by resource-data topic)

12.1 Critical Areas: Maine
12.5 Wilderness/Primitive Areas
14.1 Endangered and Threatened Species (Wildlife)
14.2 Species of Special Concern
14.3 Restoration Areas
14 4 Deer Wintering Yards
14.5 Waterfowl Areas
14.6 Wildlife Refuges and Management Areas
15.3 Anadromous Fish Habitats
16.1 Endangered and Threatened Species (Vegetation)
16.2 Alpine Tundra (Species of Special Concern)

15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats

In areas where endangered and threatened or unique species of animals and plants are officially recognized and subject to protective legislation, specialized construction and maintenance techniques could be required, and costs of transmission facilities would increase accordingly. For example, transmission lines and supporting structures might require installation by helicopter rather than by conventional vehicles, or herbicide application in rights-of-way and removal of vegetation from the rights-of-way might have to be performed manually. Locations of most such species of plants and animals were therefore depicted in dark shading on this analysis map-- to be avoided during transmission corridor siting. Moderate shading indicates warm and cold water fish habitats, which were considered less susceptible to potential impacts and accordingly a somewhat less severe constraint to introduction of transmission facilities.

C-28 'COST DUE TO SEVERE MICROCLIMATIC CONDITIONS' ANALYSIS MAP

Environmental Resources (by resource-data topic)

6.1 W - NW
6.2 + 10.1 N - NE and
Elevations above 2500 feet
16.2 Alpine Tundra (Species of Special Concern)

6.2 N - NE
10.1 Elevations above 2500 feet

The severity of microclimatic conditions such as high winds or ice loading in some locations within the study area could greatly increase the need for maintenance of transmission facilities while reducing the accessibility of facilities to maintenance crews. Such interruptions in service could greatly increase costs. Locations where most severe microclimatic conditions exist were therefore depicted in darkest shading on this analysis map, to be avoided during transmission corridor siting.

CHAPTER 3

CHAPTER III

ALTERNATIVE TRANSMISSION CORRIDORS

The interim analysis procedures and findings described in Chapter II constituted a preliminary assessment of the study area's sensitivity to potential environmental impacts associated with introduction of transmission facilities. Potential impacts on study area resources could not be evaluated until interim analysis had established where to look -- i.e., the mapped locations of critical resources and environmentally sensitive areas -- and which resources would be analyzed relative to the different resource-systems that constituted corridor-location determinants.

In determining locations of alternative transmission corridors, the primary need was a geographic indication of areas to be avoided during the corridor allocation and corridor delineation processes. Both the interim C-level analysis maps and the individual resource-data maps were reviewed. Because the products of analysis that provided input to corridor selection had to be expressed in a manageable and compatible format, an additional tool was developed prior to corridor selection -- the Corridor Allocation Maps.

This chapter discusses the two major phases of the Transmission Corridor Assessment: identification of alternative transmission corridors; and evaluation of the identified corridors in order to rank 'best' corridors relative to the electrical-system plans provided by the USDI. Before detailing the procedures and findings during each phase, the Corridor Allocation Maps that were used directly to identify alternative corridors warrant further explanation. The analyses required to arrive at these maps can be seen as a final stage of the interim analysis process.

Corridor Allocation Maps

The basic tools required for identification of alternative transmission corridors were the Corridor Allocation Maps, or CAMs. Theoretically, corridor delineation could have been performed directly from the C-level analysis maps. Technically, the procedures required would have entailed an unreasonable amount of time and difficuly. Corridors capable of connecting the various system plans would have been identified relative to each of the 28 location determinants, and 28 separate sets of corridors would have required correlating to produce a single set of corridors that could be used during evaluation and recommendation processes.

To provide better tools for corridor allocation and delineation, the detailed C-level location determinants were combined and analyzed at different levels of aggregation. The classification system developed to produce B-level and A-level location determinants (which were shown on the data/analysis matrices in Chapter II) was designed to resolve the methodological problem of considering a large number of location determinants in manageable form. Products of analysis were mapped at each level of aggregation. The A-level analysis results are the CAMs, which were used directly to identify alternative transmission corridors.

Graphically, the CAMs are very similar in appearance to the other mapped products of analysis. All products of analysis were available in three intensities of color, indicating occurrences of resources considered susceptible in varying degrees to potential impacts associated with transmission facilities. Dark shadings indicated locations inappropriate for introduction of transmission facilities; light shadings, locations more appropriate.

However, where the C-level and B-level color-composite maps indicated three intensities of color on each map, the CAMs incorporated moderate and light intensities of color on one map, dark intensities on another. This separation of color intensities allowed for flexibility in identifying alternative corridor locations, as various combinations of CAMs could be used in identifying and subsequently checking the alternative corridors. The specific 'sandwiches' of CAMs used in different corridor allocation and delineation procedures will be discussed in the next section of this chapter. Note that in some instances (particularly for checking alternative transmission corridors), the CAMs were not used in separate form but each CAM incorporated all three intensities of color; displays of these composite CAMs are included in Appendix A of this report.

Apart from the CAMs incorporating all three intensities of color, eleven CAMs were produced in separable form, to correspond to six location determinants analyzed at the A level. Six CAMs were depicted in entirely dark shading (using a 20 percent screened value of black). One such CAM -- for Legal Regulations -- did not require a separate map for moderate and light shadings, since all resources subject to legal regulations were uniformly considered constraints to transmission corridor locations and all were thus assigned high values and depicted in dark color. Only five CAMs were therefore depicted in the combined moderate and light shadings.

Before examining the procedures for using the CAMs to allocate and delineate alternative transmission corridors, the methods for arriving at the A-level products of analysis require clarification. The next subsection generally describes the classification system used in analyzing increasingly aggregated categories of location determinants. Because the aggregation process required detailed assessment of possible impacts on the resources analyzed relative to the different location determinants, the methods for analyzing impacts (and using that analysis to weigh the relative importance of location determinants) will be examined in a separate subsection.

Classification of location determinants. While the identification of location determinants described in Chapter I proceeded from general categories of resource-systems to specific location determinants for which data were available, analysis of impacts on location determinants proceeded from the 28 most detailed C-level location determinants to increasingly more generalized classes of resource-systems. Six general classes of location determinants were analyzed at the A level. Five of these classes -- for Social, Economic, Natural, Aesthetic/Cultural, and Legal systems of resources -- examined constraints to transmission corridor locations that were due to possible impacts of transmission facilities on various resources. One class -- Site Development Costs -- examined locations where resources might entail impacts on acquisition costs and construction and maintenance practices associated with transmission facilities.

The six A-level classes of location determinants represent the most concise means of expressing all location determinants that influenced the siting of alternative transmission corridors. Reducing the number of location determinants treated and graphically depicting these summary categories of location determinants in compatible format (i.e., the CAMs) allowed for manageable and objective consideration of the resources represented by the various location determinants.

Each of the 28 C-level location determinants was not necessarily analyzed at three different levels. Prior to the A-level analysis, resources were grouped and mapped at the B-level only when available resource-data were particularly detailed and/or complex and where the resources analyzed relative to different C-level location determinants were relatively uniform -- for example, where the resources analyzed relative to location determinants C-10 through C-13 (Deer Habitats, Waterfowl Areas, Fish Habitats, and Significant Wildlife Areas) were all forms of wildlife.

In addition to these resources, classified as the 'Wildlife' location determinant at the B level, other resources that required additional analysis and mapping included: 1) location determinants C-18 through C-20 (Existing Visual Quality, Decreased Visual Quality due to Visibility/Absorption and Decreased Visual Quality due to Visibility/Exposure), which were mapped at the B level as the 'Visual Quality' location determinant; 2) location determinants C-21 through C-23 (Costs due to varying values of Developed Lands, Recreation Lands, and Forest Lands), mapped as B-level 'Acquisition' costs; and 3) location determinants C-24 through C-28 (various costs due to Decreased Accessibility, Unstable Soils, Steep Slopes, Endangered, Threatened or Unique Species, and Severe Microclimatic Conditions), mapped as B-level 'Construction and Maintenance' costs. In all, the analyses conducted and location determinant maps produced included: 28 at the C level, 4 at the B level, and 6 at the A level.

In aggregating the location determinants, thus, the classification system took into account an entire hierarchy of location determinants. That 'hierarchy' was determined by procedures that assigned relative importance to the different location determinants or, in other words, weighted the influence that each location determinant should exert in determining alternative corridor locations. In short, where procedures for arriving at the C-level analysis results (i.e., the interim analysis maps) assessed the relative importance of resources within different resource-systems, the procedures for arriving at the A-level analysis results (i.e., the CAMs) assessed the relative importance of the resource-systems or the C-level location determinants themselves.

Such weighting procedures were required, in part, to manageably treat a large number of location determinants in more limited form while giving each location determinant due importance in its own right. However, the aggregation process also assumed that alternative corridor locations would entail some trade-offs between location determinants; 'best' corridors identified according to 'least impact' necessarily entailed a compromise between location determinants, all of which could not exert equal influence. This compromise recognized that, while ideally corridors should avoid impacts on all study area resources, more realistically, some resources would necessarily fall within the path of transmission corridors and therefore might be subject to environmental impacts. The impact factors described in the next subsection, which constituted the analysis method employed to effectuate compromises between location determinants, were therefore designed to insure that resources most susceptible to severe impacts would be considered more important than other resources and avoided during identification of corridor locations.

Relative importance of location determinants. Impact factors were required to decide which location determinants should be considered most important and graphically depicted on the CAMs in dark intensities of color that could be avoided during corridor allocation. Use of impact factors permitted individual location determinants to exert an influence on corridor location proportional to the degree to which the resources included in each location determinant might be threatened by the introduction of transmission facilities. In other words, while all location determinants were considered during corridor allocation, a hierarchy of location determinants was necessary. To determine this hierarchy, impact factors assigned highest importance to the location determinants containing resources expected to be most threatened by the introduction of transmission facilities.

Impact factors were first assigned to the C-level location determinants; these factors were then used as a basis for assigning impact factors to the B-level and A-level location determinants. The C-level impact factors assigned are shown on Figure 3-1. Varying degrees of possible impact on a given resource-system were described both qualitatively and quantitatively: by the designation "severe, moderate, slight" impact and by corresponding numeric values 3, 2, or 1. Note that these qualitative and quantitative values directly consider potential impacts on resources, and therefore differ from the "high, moderate, low" values (and corresponding numeric analogs of 4, 2, or 1) that were assigned during the interim analysis to weight the relative importance of different components of resource-systems (i.e., to decide which resources should be considered most critical to maintaining the quality of each resource-system).

Impact factors were assigned by members of the multidisciplinary team who had most expertise and experience in dealing with the resources analyzed relative to each of the 28 C-level location determinants. For location determinants C-21 through C-28, impact factors were assigned by USDI representatives experienced in land acquisition and construction and maintenance aspects of transmission planning. All impact factor assignments were reviewed by the entire project team to insure the equitability of assignments and also checked against the 'Ratings of Concern' forms distributed to study area residents at an earlier stage of the Transmission Corridor Assessment (shown in Figure 1-11 of this report). As previously discussed, those forms provided an index of resources and resource-systems which study area residences felt should be avoided during transmission corridor allocation. The impact factors actually assigned correspond closely to the public concerns indicated on the response sheets.

'C' LEVEL

CORRIDOR-LOCATION DETERMINANTS		IMPACT FACTOR	
C-1	Land Ownership...................................	Moderate	(2)
C-2	Human Populations................................	Severe	(3)
C-3	Recreation Land Use..............................	Moderate	(2)
C-4	Recreation Land Value............................	Slight	(1)
C-5	Open/Agricultural Land...........................	Slight	(1)
C-6	Existing Forest Industry.........................	Severe	(3)
C-7	Vegetative Cover.................................	Severe	(3)
C-8	Surface Water Systems............................	Moderate	(2)
C-9	Ground Water Systems.............................	Slight	(1)
C-10	Deer Habitats....................................	Severe	(3)
C-11	Waterfowl Areas..................................	Moderate	(2)
C-12	Fish Habitats....................................	Severe	(3)
C-13	Significant Wildlife Areas.......................	Severe	(3)
C-14	Soils: Erosion...................................	Moderate	(2)
C-15	Historic Resources...............................	Severe	(3)
C-16	Archaeological Resources.........................	Moderate	(2)
C-17	Unique Resources.................................	Severe	(3)
C-18	Existing Visual Quality..........................	Severe	(3)
C-19	Decreased Visual Quality Due to Visibility/ Absorption.......................................	Severe	(3)
C-20	Decreased Visual Quality Due to Visibility/ Exposure...	Severe	(3)
C-21	Cost Due to Value of Developed Lands............	Severe	(3)
C-22	Cost Due to Value of Recreation Lands...........	Moderate	(2)
C-23	Cost Due to Value of Forest Lands...............	Slight	(1)
C-24	Cost Due to Decreased Accessibility.............	Moderate	(2)
C-25	Cost Due to Unstable Soils......................	Severe	(3)
C-26	Cost Due to Steep Slopes........................	Slight	(1)
C-27	Cost Due to Endangered, Threatened, or Unique Species.................................	Moderate	(2)
C-28	Cost Due to Severe Microclimatic Conditions.....	Slight	(1)

DEGREES OF IMPACT POSSIBLE

1 = slight
2 = moderate
3 = severe

Impact Factors: C·Level Analysis

figure 3·1

The impacts factors shown were determined by considering, for each location determinant, the different kinds of impacts that might be associated with the three different components of transmission facilities: 1) supporting structures for transmission lines; 2) right-of-way clearing; and 3) access road construction. Assignment of impact factors was a relatively straightforward process. Each location determinant was considered a single unit of combined resources. If even one of the three components of transmission facilities was judged to entail potentially severe impacts on these resources, the impact factor assigned was 3. In other words, impact factor assignment followed the 'worst case' instance of potential impacts by different components of transmission facilities.

For example, in assigning an impact factor to location determinant C-16 (Archaeological Resources), right-of-way clearing was judged to entail no impacts on archaeological artifacts (which are generally located well below the ground), and access road construction was similarly considered to entail only slight impact. However because construction of foundations for supporting structures could entail potential impacts on artifacts, the impact factor assignment for this location determinant followed this 'worst case' instance of possible impact. Because supporting structure foundations would be confined to a limited area within a transmission corridor, the degree of potential threat to archaeological resources was considered "moderate" and an impact factor of 2 was recorded. Note that all such impact factors were assigned without consideration of possible mitigation measures that would be incorporated during later stages of the Dickey/Lincoln School project. Proper mitigation measures at the time of construction could, of course, eliminate many of the potential impacts.

The range of impact factors at the C level was a preliminary tool for deciding which location determinants containing 'most threatened' resources would be depicted in darker color intensities on the B- and A-level analysis maps. Impacts were analyzed at all three levels of aggregation of location determinants. In each case, the impact factors assigned were based upon the factors assigned at the preceding level of analysis; in other words, the impact factors at each level of analysis were used to produce the impact factors at the ensuing level of analysis.

The impact factors for the B- and A-level location determinants (aggregated as described in the preceding subsection) are shown in Figure 3-2. These scores were derived mathematically. For each B-level location determinant, the impact factor was produced by averaging the impact factors assigned to the C-level location determinants that were aggregated relative to that category. For example, the impact score of 2.8 indicated for the 'Wildlife' location determinant (B-1) was derived by adding the impact factors assigned to the relevant C-level location determinants from C-10 through C-13 and then dividing by 4.

The A-level impact factors were produced in precisely the same manner, by averaging the scores produced at the B-level as well as other impact factors assigned at the C-level. For example, the impact factor assigned for the A-level 'Natural' resource-system averaged both the B-level impact factor for the B-1 'Wildlife' location determinant and the C-level impact factors for other kinds of natural systems (Vegetative Cover, Surface Water Systems, Ground Water Systems, and Soils: Erosion). Where no B-level analysis was performed (the only cases being the A-1 and A-2 'Social' and 'Economic' resource-system categories encompassing the C-level location determinants from C-1 through C-3 and C-4 through C-6 respectively), the A-level impact factor was derived by averaging only the C-level impact factors.

'B' LEVEL CORRIDOR-LOCATION DETERMINANTS		IMPACT FACTOR
B-1	Wildlife	2.8
B-2	Visual Quality	3.0
B-3	Acquisition	2.0
B-4	Construction and Maintenance	1.8

'A' LEVEL CORRIDOR LOCATION DETERMINANTS		IMPACT FACTOR
A-1	Social	2.3
A-2	Economic	1.7
A-3	Natural	2.2
A-4	Aesthetic/Cultural	2.8
A-5	Legal	3.0
A-6	Site Development Costs	1.9

DEGREES OF IMPACT POSSIBLE

1 = slight
2 = moderate
3 = severe

Impact Factors: B·Level Analysis
A·Level Analysis

figure 3·2

To produce different color intensities on the CAMs, tools in addition to the impact factors were needed. High, moderate, or low values (similar to those assigned during the interim analysis procedures that produced the C-level maps) also had to be assigned at the B and A levels of analysis. The values assigned at this point in the analysis (and again, corresponding numeric analogs of 4, 2, and 1 for dark, moderate, or light shading on the maps) now represented not the most important component resources within a resource-system but the location determinants that should exert most influence on corridor allocation because they contained 'most threatened' resources.

For example, to produce the A-level CAM for 'Social' systems, the maps for the three C-level location determinants that made up the A-1 location determinant category were analyzed. This analysis was required to identify, in effect, 'coincident location determinants' -- i.e., areas on the different C-level maps where 'most threatened' resources coincided. As in the procedures for reassigning values to coincident resources during the interim analysis, interaction between the analyst and the maps was required. To produce a range of numbers that could be used as a tool in deciding which location determinants should be depicted in darkest colors on the CAMs, the numeric analogs (4, 2, or 1) for color intensities appearing on the C-level maps were multiplied by the impact factors assigned to each C-level location determinant. For this A-1 location determinant, the results of the multiplication process and the numeric range produced are shown below:

Location Determinants	Color Intensities		Impact Factor	Numeric Range	Ordered Numeric Range
C-1 Land Ownership	H (4)	X	2	8	12
	M (2)	X	2	4	↓
	L (1)	X	2	2	
C-2 Human Populations	H (4)	X	3	12	
	M (2)	X	3	6	
C-3 Recreation Land Use	H (4)	X	2	8	
	M (2)	X	2	4	
	L (1)	X	2	2	2

Decisions were required when the C-level maps were overlaid (on a light table) to produce the A-level CAMs and various color intensities on the maps were found to coincide. The numeric range available for each C-level map aided in deciding when areas showing coincident color intensities should be assigned highest importance -- as areas containing resources most threatened by potential environmental impacts -- and depicted in darkest colors on the CAMs. As in the interim analyses that reassigned values when data coincided, assignment of higher values to areas where color shadings coincided was not automatic but required constant interaction between the analysts, the maps, and the range of numeric values available. The only rule applied in deciding when to assign values of high importance on the CAMs was: any time a C-level location determinant was assigned the highest possible impact factor (3), the dark shading on the C-level map (with the numeric analog of 4) was always assigned a high value, i.e., depicted in a dark color intensity on the appropriate CAM.

The numeric range available for each C-level location determinant, while not an automatic criterion for assigning high values on the CAMs, was an invaluable aid in decisionmaking. For example, if dark shading on the C-level 'Land Ownership' map (for which the "numeric range" number produced by multiplication of the C-1 impact factor was 8) coincided with the dark shading on the C-3 map of 'Recreation Land Use' (for which the number produced was also 8), a numeric "score" could be derived by adding the two numbers; in this case, the score assigned to the area of coincident dark shading would be 16.

Overlaying the three C-level maps that comprised the A-1 'Social' location determinant actually indicated five areas where colors on the individual maps coincided. These areas of coincident shadings, the numeric scores produced as described, and the values of relative importance therefore assigned on the CAMs were:

Location Determinants	Numeric Score	Value Assigned
C-1 Land Ownership/Dark C-3 Recreation Land Use/Dark	(16)	High
C-1 Land Ownership/Dark C-2 Human Populations/Moderate	(14)	High
C-2 Human Populations/Moderate C-3 Recreation Land Use/Dark	(14)	High
C-1 Land Ownership/Moderate C-2 Human Populations/Moderate C-3 Recreation Land Use/Moderate	(14)	High
C-1 Land Ownership/Moderate C-3 Recreation Land Use/Moderate	(8)	Moderate

Such areas of coincidence, identified by overlaying all B- and C-level location determinant maps relevant to each of the A-level categories, were analyzed for all CAMs produced. Appendix C of this report presents a listing of all identified areas of coincidence and the values assigned on the CAMs.

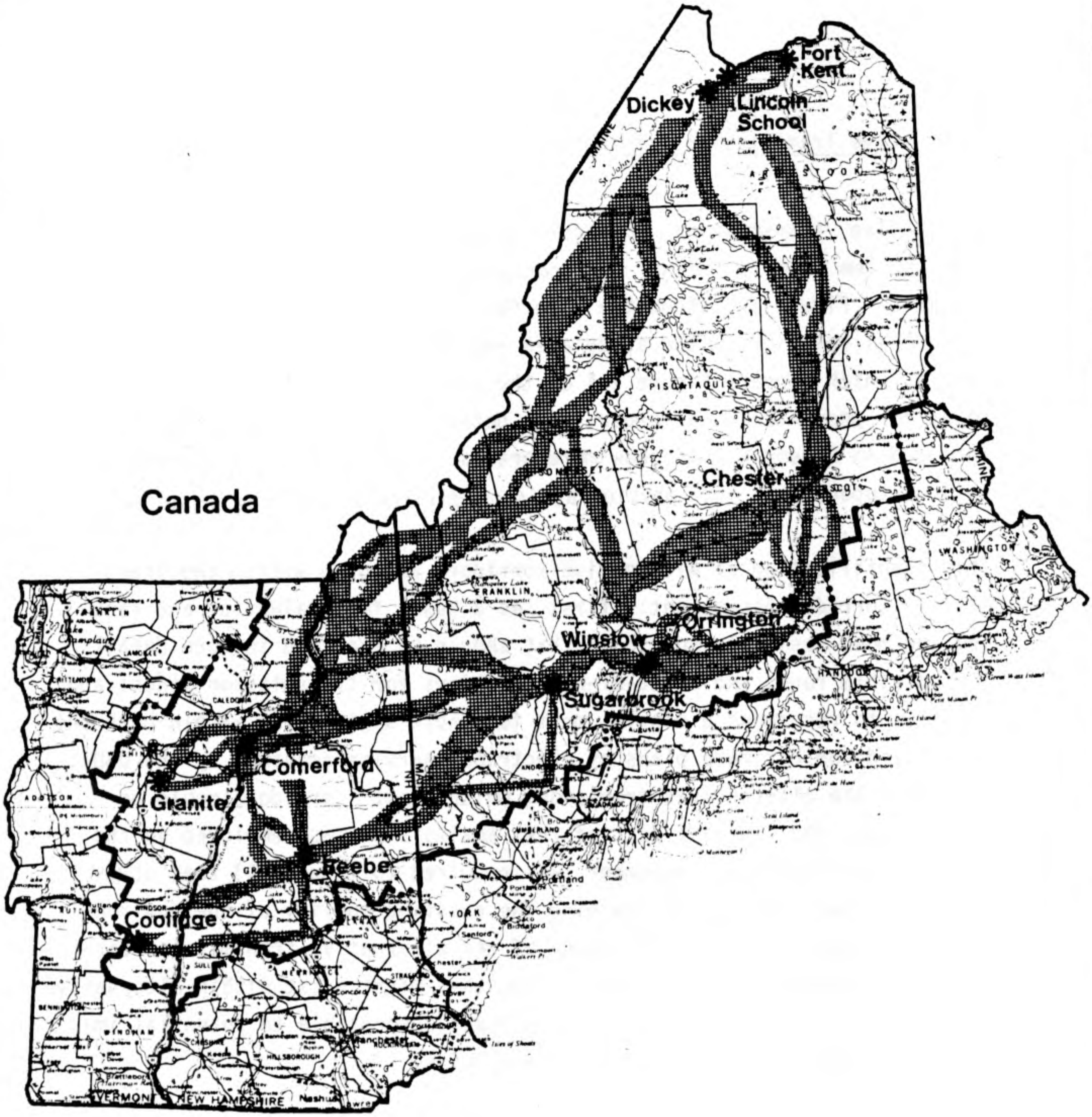
The CAMs produced by these means were carried forward directly for use as the primary tool in corridor allocation and delineation.

Alternative Transmission Corridors

Alternative transmission corridors were identified relative to the USDI system plans as means of connecting the various substations. Figure 3-3 shows the alternative corridors actually identified in general relation to the study area and the substations; while this figure, which repeats Figure 1-1 of the report, is re-presented at this point for convenience, a larger, more detailed version of the map is included in Appendix A to show more precise relationships of corridors to various topographic and physiographic conditions within the study area

This identification of alternative corridors was used within the Transmission Corridor Assessment: first, as a basis for evaluating and ranking the most desirable corridors that should be examined in more detail for possible route and right-of-way locations for transmission lines; and finally, to recommend a single, most favorable system plan within both the Authorized and Ultimate plans of electrical service provided by the USDI. To select the alternatives from among which 'best' corridors could be recommended, the largest part of the analysis process employed in the Transmission Corridor Assessment was required to insure: 1) that study area resources vital to maintaining the existing quality of the environment would not fall within the path of the alternative transmission corridors; and therefore 2) that resources that might exist within alternative transmission corridors would be those least susceptible to potential impacts associated with transmission facilities.

To achieve these ends, identification of alternative corridors was conducted in two stages. During corridor "allocation," corridor locations were selected by eliminating from consideration areas in which resources most susceptible to environmental impacts existed, and broad corridors



Alternative Corridor Locations

figure 3·3

were drawn on a study area map. This stage was required to avoid 'least desirable' corridor locations and potentially severe impacts from the outset, and thus constituted a significant mitigation measure incorporated within the Transmission Corridor Assessment. Since allocation of these uniformly broad corridors--many of them more than 15 miles wide--was only an interim stage, the format for the corridors drawn is not included in this report.

During corridor "delineation," which identified the final set of corridors (each 1-10 miles wide) shown in Figure 3-3 and in the Appendix, the broad corridors produced during the allocation stage were further refined in order to select 'more desirable' locations. Again, corridor locations were delineated relative to study area resources--i.e., the resources remaining after the allocated corridors had avoided paths where resources might suffer the most detrimental impacts. Essentially, this stage was required to identify the 'second most environmentally sensitive' resources and avoid corridor locations where such resources existed. In avoiding such areas, corridor borders were adjusted and islands were drawn within the broad corridors (as may be seen on the figure).

In both the allocation and the delineation stages, the primary tools that aided in decisionmaking were the Corridor Allocation Maps. Different CAMs were used in each stage. Parallel procedures were followed in using the CAMs to draw alternative corridor lines.

Allocation procedures. Apart from the CAMs, the tools required for the entire corridor allocation process were quite simple: a light-table, and a base map of the study area showing all substations designated as terminal points for the electrical power generated at the proposed hydroelectric dam. Three basic steps were required in order to eliminate from further consideration possible corridors that could have connected the various substations according to the designated system plans but might have entailed detrimental impacts on study area resources.

Step 1. The base map of the study area and substations--depicted on a sheet of 42" x 42" transparent mylar--was laid on a light-table, and a "sandwich" of CAMs was placed on top. Of the eleven Corridor Allocation Maps available (i.e., the six entirely dark CAMs and the five CAMs, excluding 'Legal Regulations', each of which incorporated a combination of moderate and light shading), only the dark-shaded CAMs were included in this package. As previously discussed, these dark colors indicated the potentially 'highest-impact' areas relative to each of the six most comprehensive, A-level location determinants, i.e., the locations of resources and/or groups of resources considered most susceptible to potential impacts associated with the introduction of transmission lines. The dark shading depicted on each high-impact CAM was a "screened" value, produced in translucent rather than opaque color.

This combining of six CAMs can be thought of as a final level of aggregation performed on the corridor-location determinants. At this level of aggregation, the integrity of environmental resource-data depicted on each A-level map was not maintained (just as, in producing the C-level maps, the details on each individual resource-data map became indistinguishable). The combination of the CAMs produced, instead, a "regional" picture of all of the most critical resource concentrations existing within the study area. This combination was therefore the most appropriate tool for identifying corridor locations relative to the overall study area.

Step 2. On a transparent sheet laid on top of the sandwich of CAMs, straight lines were drawn to directly connect those substations which required connecting within each system plan.. These lines, drawn regardless of the dark areas shown on the CAMs, were intended only as guidelines--to indicate the general direction of electrical transmission between any two substations--and bore no resemblance to the corridors actually allocated, which were drawn to avoid dark areas shown on the maps.

Each straight-line connection between two substations was called a "segment" of a system plan; relative to the six USDI-recommended system plans, twelve such segments were recorded. Within each of the system plan segments, many alternative corridors were allocated.

Step 3. Corridor allocation was performed directly on the overlay sheet indicating system plan segments. The rules for the allocation process were conceptually simple: for each segment, allocate corridors in areas where introduction of transmission facilities would entail 'least impact' on the existing environment, using the presence or absence of color on the CAMs to define areas of impact and to guide allocation decisions. A related objective, beyond avoiding severe impacts, was to minimize the number of impacts by keeping transmission corridors as short as possible.

The darkest (or 'highest impact') areas to be avoided during corridor allocation were readily visible because of the "sandwiching" of the CAMs. When any two individual CAMs entailed an area of color in the same location within the study area, the spatial coincidence was automatically revealed--by overlaying the CAMs on the light-table--as an increased intensity of color; the more coincidence of resources revealed by consecutively overlaying each of the six CAMs, the darker the coloration in the area of spatial coincidence. In other words, certain areas depicted in translucent black on each individual CAM became progressively more opaque as the six CAMs were combined. The most opaque colors, i.e., the blackest blacks, indicated the areas to be avoided first during corridor allocation.

Corridors were drawn to avoid all of the most opaque areas. While ideally the broad corridors aimed to exclude all other dark areas, in practice this goal was difficult to achieve. For example, some dark-shaded areas--especially linear features that run northwest-southeast across the entire study area (such as roads, rivers, or scenic trails like the Benedict Arnold Historic Trail)--were impossible to avoid entirely; since all system plans run basically northeast-southwest, each such linear feature necessarily crosses each system plan at least once. Allocation of alternative corridors was constrained to eliminate as many dark-shaded areas as possible without eliminating the possibility of connecting the various substations.

The corridor allocation process necessarily entailed constant interaction between the analysts and the Corridor Allocation Maps, and decisionmaking relative to each direction in which each corridor was drawn. When decisions could not be reached easily, each of the CAMs was surveyed individually. In these cases, the order in which the CAMs were examined corresponded to the importance assigned, by using impact factors, to the A-level location determinants (as discussed in the previous section of this chapter). The CAM for the 'Legal Regulations' location determinant was surveyed first, because of its unique nature and the uniformly high value assigned to all resources which are legally protected. Then, according to the A-level impact factors that indicated the relative importance of the other five CAMs, the order of examination proceeded: Aesthetic/Cultural Systems; Social Systems; Natural Systems; Site Development Costs; and Economic Systems. Note that this ordering of relative importance required consideration only when the corridor allocation process had to choose between equally dark areas in order to decide the direction in which to draw a corridor at any given moment.

The combination of these three basic steps produced the broad alternative corridors that constituted the end product of the corridor allocation stage. The results were then carried forward for further refinement into the corridor delineation stage.

Delineation procedures. The delineation process for alternative transmission corridors was designed to refine--using parallel procedures--the broad corridors drawn during the corridor allocation stage. Where most of the corridors allocated represented swaths of land about 15 miles wide, the width of the corridors identified during the delineation stage ranged from 1 to 10 miles.* This width was required in order to leave many options open for identification of alternative transmission routes within each delineated corridor (during the next phase of the Dickey/Lincoln School project), while still allowing areas of potential impact to be avoided within the corridors.

The basic procedure for delineating the final alternative corridors was parallel to the allocation process. A combination of CAMs was sandwiched between the base map of the study area placed on the light-table and an overlay sheet of mylar upon which the corridors could be drawn. At this point, the guideline sheet showing straight-line segments between substations was no longer required; instead, the end product of the allocation process--i.e., the map of broad alternative corridors within each segment--was placed on top of the CAMs. More importantly, the CAMs included in the sandwich were now the five moderate/light-shaded maps instead of the six dark-shaded, highest-impact CAMs. Thus, the delineation process aimed--beyond avoiding the potentially highest-impact areas within the study area-- to encompass within the final alternative corridors the lightest-shaded or least impact areas on the CAMs, and therefore to insure that the resources that might fall within the path of alternative corridors would be those least susceptible to environmental impacts.

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*In some areas, corridors were delineated as narrow as ½ mile wide, but only when absolutely necessary--for example, when confronted with the choice of delineating a wide corridor over a mountain top (which would have constituted an almost impossible constraint to construction of transmission facilities) or of delineating the narrower corridor through a lower-impact area. Such cases, however, were the exception rather than the rule.

Again, the sandwiching of CAMs entailed, essentially, a final level of aggregation of the location determinants. This sandwich of CAMs depicted for the entire study area those resources that, while judged less critical than the darkest-colored resources mapped on the first sandwich of CAMs, were still considered very important in maintaining the existing environmental condition of the study area. And again, coincident resources appeared in increasingly darker coloration as each of the five CAMs was overlaid. Visually, any combination of two or more moderate-shaded resources that shared the same space within the study area became the equivalent of a dark-shaded or high-impact area.

Throughout the delineation process, the boundaries of the allocated corridors were refined and areas within each broad corridor were analyzed in more detail as observation of the presence or absence of intense coloration on the CAMs indicated where corridor-delineation decisions were required. For example, when dark coloration appeared within one of the broad allocated corridors, an island was delineated within the corridor to isolate the environmentally sensitive area of coincident resources and thus protect the resources from potential impacts associated with introduction of transmission lines within the corridor.

In addition to avoiding areas where resources coincided entirely, the delineation process also avoided corridor locations where resources were located in close proximity to each other. For example, corridor delineation sought to avoid corridor locations within intensive recreation areas, each of which could be comprised of a number of different (and individually scenic) features; one such location existing within the study area included a large lake, bordered by numerous vacation homes and recreation areas, and surrounded by a mountain chain having numerous valleys--i.e., an area of high visual quality that is intensively used. On an A-level map, while the individual features of such an area would be indistinguishable, the general outline of the mountain chain would appear in dark coloration, within which a number of lighter colors would be visible (corresponding to the various valleys). While such lighter areas would technically represent opportunities for corridor locations, the delineation process preferred to encircle the entire area as an island within a broad corridor rather than locate a transmission corridor in proximity to so many resources.

Corridors were drawn to avoid the darkest areas shown on the sandwich of moderate/light-value CAMs (i.e., those areas where sandwiching had intensified the coloration of resources originally valued as moderate) and to seek out areas on the CAMs shown in the lightest shading. Note that, while a path along areas showing no color at all would seem even more logical, few such areas were shown on the sandwich of CAMs. In a combination of six maps, even one entirely colored CAM (such as the 'Natural Systems' A-level category, encompassing numerous natural resources within a study area perhaps 90% of which is forest land alone) was sufficient to account for this lack of areas without color. While the corridors delineated could not, thus, guarantee a total lack of impacts associated with transmission facilities they do represent the corridors containing the fewest and least severe potential impact areas, and therefore the least constraint to location of transmission facilities.

To insure that the final corridors delineated did, in fact, represent the 'least impact' corridors, a variety of verification procedures were employed. The alternative corridors were checked against the four B-level analysis maps and the 28 C-level interim-analysis products in order to prevent oversights. As an additional, even more extensive check on the final corridors--and on the allocation and delineation procedures by which they were produced--a different procedure was used to identify alternative transmission corridors. While this alternative procedure was parallel in the methods of overlaying CAMs and transparent mylar on a light-table, the CAMs were initially examined individually rather than in combination in order to 'maximize' the A-level location determinants. Furthermore, the individual CAMs were used not in their separate form--i.e., as one high-value and one moderate/low-value map for each general location determinant category (except, again, 'Legal Regulations')--but in a combined form such as that shown in Appendix A. Thus, six CAMs in all were examined, five of them shaded in three intensities (light, moderate, and dark) and one, for 'Legal Regulations', shaded entirely in translucent black.

In this alternative corridor identification process, corridors were drawn on mylar placed over each individual CAM and delineated to avoid the darkest of the different color intensities on each CAM. Because these corridors were drawn on individual CAMs, the corridors that avoided highest-impact areas on any one CAM necessarily included some highest-impact areas that appeared on the other five CAMs. To correlate the results, the alternative corridors drawn on each CAM were sandwiched on the light-table. All six sets of corridors were combined into a single composite set of corridors by eliminating any corridor that did not coincide with at least one other corridor and, where corridors did coincide spatially, redefining the borders to eliminate any areas that did not coincide entirely.

The results of this corridor identification process were compared with the final corridors produced by the combined allocation and delineation process. The alternative transmission corridors identified in each process coincided almost entirely.

As a final check on the alternative transmission corridors, a "ground truth" survey verified corridors with respect to existing environmental conditions within the study area. This field investigation was conducted by helicopter rather than by fixed-wing aircraft to allow for close investigation of specific points within the identified corridors, especially in those areas where corridors were less than one mile wide. Areas within or in close proximity to alternative corridors were assessed to identify potential "problem" spots; such areas included, for example, the linear resources such as trails or roads that run across the study area and were represented by dark colors on the CAMs examined during corridor allocation. As previously noted, in several cases transmission corridor locations close to such resources proved unavoidable. The ground truth survey was therefore intended to insure that, where such 'high-impact' areas might be located within a given corridor, the corridor was sufficiently wide to allow for a number of alternative transmission routes, and thus to insure the possibility of avoiding such sensitive areas during the next stage of the Dickey/Lincoln School project.

Transmission Corridor Evaluation and Ranking

Ranking of 'most desirable' transmission corridors, which was based on evaluation of the alternative corridors identified in Figure 3-3, was required for two purposes. Within the Transmission Corridor Assessment, the top-ranked corridors identified during the evaluation process were used to recommend most favorable system plans from among the alternatives provided by the USDI (i.e., those system plans, either Authorized or Ultimate, that should be further investigated). In subsequent stages of the Dickey/Lincoln School project, the top-ranked corridors will be used to identify alternative transmission routes and rights-of-way within each corridor and evaluate potential environmental impacts at a more detailed scale.

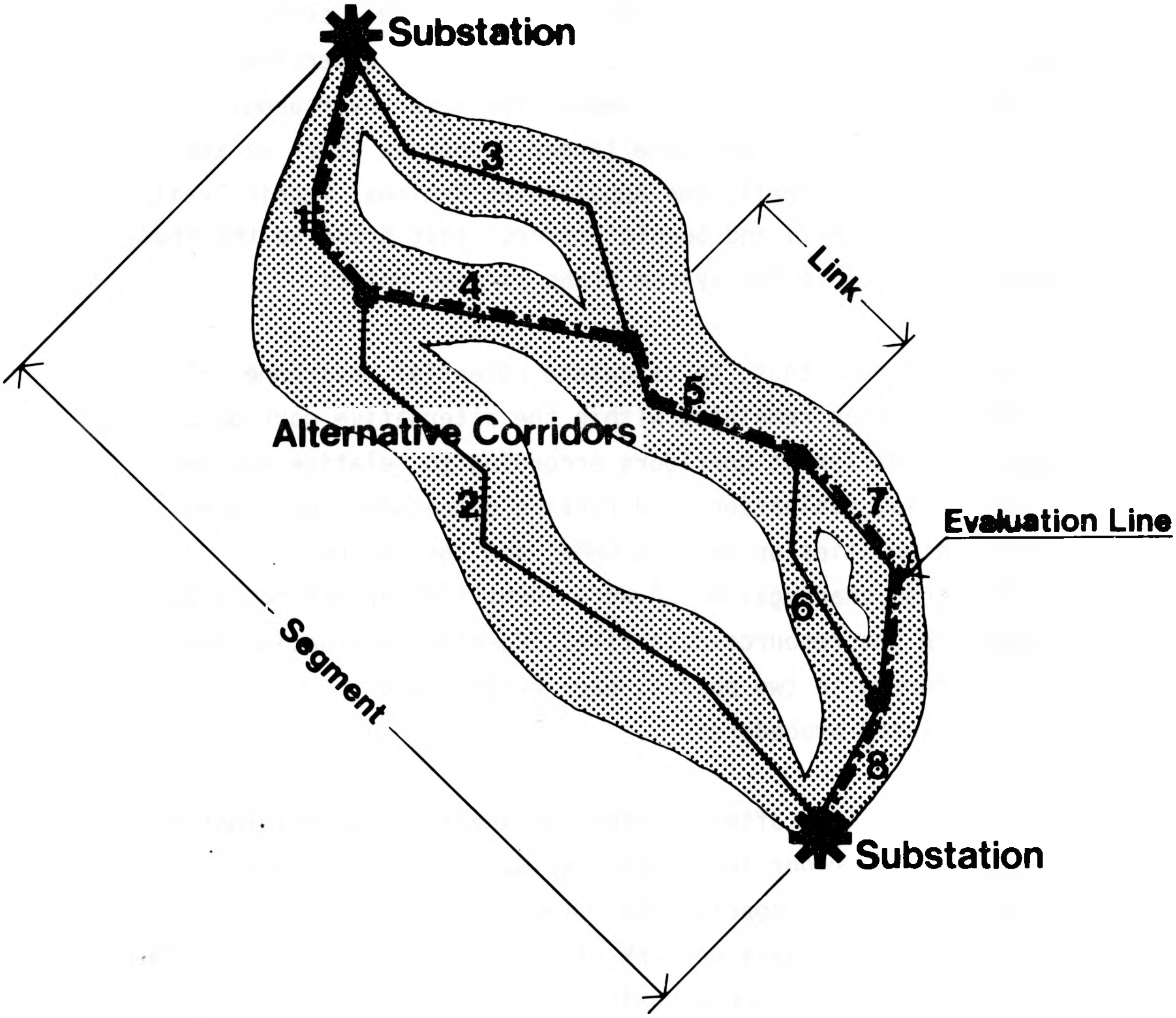
Evaluation of alternative corridors within each system plan identified the most desirable corridors (i.e., those most compatible with the existing environment), again, according to the 'least impact' criterion. This evaluation was performed after the corridor allocation process had eliminated the least desirable locations from further consideration (those shown in darkest colors on the CAMs) and the corridor delineation process had refined the allocated corridors (by eliminating locations in areas shown in moderate intensities of color) and thus selected more desirable corridors (in areas show in lighter shading on the CAMs).

Ideally, of all the corridors delineated using the sandwich of five moderate/light-shaded CAMs, one corridor for each system plan segment should stand out visually, in lightest shading, as the obviously 'best' corridor to connect any two substations. However, while the alternative corridors identified encompass proportionately few areas of high impact (relative to areas of impact that might have been included had interim analyses not been performed to insure least impact on critical resources or within environmentally sensitive areas), some of the areas shown in more intense colors on the CAMs could not be avoided during corridor delineation. As previously noted, these areas include: certain environmentally sensitive resources that are areally extensive throughout the study area (e.g., the vegetative cover over about 90 percent of the study area); and some linear resources (such as the Benedict Arnold Historic Trail, the Appalachian National Scenic Trail, or certain designated 'Wild and Scenic' rivers) that traverse the study area and necessarily cross the system plans at some points.

Evaluation was required, thus, to calculate potential environmental impacts on the resources remaining within the alternative corridors and to compare the different corridors according to relative degrees of impact. To do so, evaluation and ranking procedures considered both the color intensities on various CAMs and the resources represented by those shadings, which were identified by reference to the data mapped in the resource-data file. Corridor evaluation and ranking were performed in two phases, each entailing a logically interrelated procedures.

Corridor evaluation. Even after corridor delineation had eliminated the myriad possible corridor locations that would have entailed undesirable environmental impacts, the number of alternative corridors that remained comprised a vast network of possible connections between the various substations. To more easily and objectively examine these corridors during the evaluation process, a classification system was developed that disaggregated the alternative corridors into component parts.

Figure 3-4 indicates schematically the corridor components that were evaluated. Within each alternative corridor, an evaluation line was



Evaluation Lines & Links Within Alternative Corridors

figure 3·4

drawn, then subdivided into various numbered links.* The series of connecting links (i.e., the alternative corridors) were evaluated relative to system plan 'segments' (the areas between substations).

This disaggregation allowed a large number of corridor links to be examined individually (and thus retained the integrity of data on resources occurring within the links) and provided flexibility in evaluating different alternative corridors or corridor 'variations', which could be defined in terms of different combinations of numbered links. (For example, one corridor for the segment depicted in Figure 3-4 might have consisted of the coterminal links 3, 5, 7, and 8; another, of links 1, 4, 5, 7, and 8.) Evaluation of links and corridors relative to system plan segments insured that the rankings assigned to corridors would automatically indicate logical rankings to be assigned to the different system plans (which will be explained in detail in the final, system plan recommendation chapter of this report).

The basic tool used thoughout the corridor evaluation process was the evaluation line, which represents an area of 'least potential impact' within a given corridor. In that sense, the evaluation lines could also be taken as theoretical rights-of-way within alternative corridors. Since only one right-of-way for transmission lines would ultimately be cleared within a transmission corridor, and on the assumption that each alternative corridor identified would contain a single 'best' right-of-way location for transmission lines, the evaluation process 'identified' a single, theoretical right-of-way (or evaluation line) within each alternative corridor.

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*Note that the figure is presented only to clarify the relationship between components. Delineation of evaluation lines and numbering of links were actually performed on a larger map of the study area that indicated all identified locations of alternative corridors (see Appendix A). Futhermore, the corridor components were identified only for purposes of analysis and do not represent components of transmission facilities that would be incorporated in an actual system plan.

Note, however, that these evaluation lines were identified only for purposes of analysis, to facilitate comparison of potential impacts on environmental resources occurring along the evaluation lines. By using these lines, potential impacts could be calculated within a limited area rather than across the 1-10 mile width of an entire corridor. The evaluation lines do not represent actual locations for transmission routes or rights-of-way. Such locations will be identified and precise impacts assessed only during subsequent stages of the Dickey/Lincoln School project.

To measure impacts along an evaluation line, numeric scoring methods were used for each corridor link. This quantitative evaluation entailed a series of logically interrelated steps: 1) delineation of evaluation lines; 2) identification of opportunities for right-of-way sharing; 3) identification and numbering of corridor links along evaluation lines; 4) numeric scoring of links; and 5) numeric scoring of potential opportunities for right-of-way sharing. These preliminary procedures for arriving at impact scores for the various links are described below. Actual ranking of alternative corridors, described in the next subsection, employed both quantitative calculation of corridor impact scores(based on the link impact scores) and a variety of qualitative considerations.

Step 1 (Delineation of Evaluation Lines). A transparent sheet of mylar indicating the alternative corridor locations was overlaid on a sandwich of the five moderate/light-shaded CAMs. On the mylar, evaluation lines were delineated to avoid the intensities of color remaining within the alternative corridors (and thus, as previously noted, represent lines of 'least potential impact'). These lines were drawn by project team members and subsequently checked against a sandwich of the six dark-shaded CAMs to insure that evaluation line crossings of any high-impact areas would be minimal. The lines were also reviewed, and in some instances adjusted, by USDI representatives.

Step 2 (Identification of Opportunities for Right-of-Way Sharing). Opportunities for sharing the rights-of-way of existing utilities were explored, on the assumption that given equivalent distance between substations, sharing an existing right-of-way would entail less impact than constructing a new one. (For example, land acquisition and costs for construction of new access roads would be minimized, and since alteration of the environment would already exist, visual impacts from new transmission lines might also be minimized).*

Opportunities for right-of-way sharing were identified by reference to the resource-data file (topic 13.0), which provided maps of all existing rights-of-way within the study area. Locations of rights-of-way either within or in close proximity to alternative corridors were examined and recorded on the mylar similarly to the evaluation lines.

Step 3 (Identification and Numbering of Links). Discrete links were identified relative both to the evaluation lines and to the right-of-way sharings delineated. These links were illustrated schematically in Figure 3-4; the actual map of numbered links used during corridor evaluation is presented in Appendix A (see Map 2"Corridor Evaluation Lines"). In all, 117 such links were identified relative to the evaluation lines and right-of-way sharing opportunities. Individual links along evaluation lines were numbered consecutively from 1 through 88; those identified relative to existing rights-of-way were distinguished by the prefix P and by triple-digit numbers, assigned consecutively from P-100 through P-129.

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*Note that no attempt was made to gauge the precise difference in visual impacts associated with clearing of new rights-of-way as opposed to sharing of existing ones. Also not explored was the possibility of increased public acceptance for right-of-way sharings rather than clearing of new rights-of-way.

Step 4 (Numeric Scoring of Links). To measure potential impacts associated with introduction of transmission facilities, numeric scores were calculated for each of the 117 links. Initially, thus, the right-of-way sharing links were not distinguished from the regular links; special provisions for calculating impact scores for links P-100 through P-129 were implemented subsequently (as described in Step 5).

To arrive at these scores, the transparent mylar showing numbered links (Appendix A, Map 2) was placed on a light-table over different CAMs taken individually. Six CAMs were used for the scoring, as well as the numeric analogs available for different intensities of color shown on the CAMs (4=dark shading, 2=moderate shading, 1=light shading). Instead of separating the five moderate/light-shaded CAMs from their respective dark-shaded CAMs, each of the five CAMs incorporated all three intensities of color; the sixth, Legal CAM, as already explained, was available throughout the analysis in only one, dark intensity of color. The impact factors previously assigned to the six A-level location determinants (see Figure 3-2) could thus be used in scoring links relative to the six CAMs (each of which corresponds to a location determinant).

In addition, for each link, the portions of the link that traversed dark, moderate, or light color shadings on a given CAM were assessed spearately, and the length in miles of each such portion was calculated (relative to the mapped scale of 1"=8 miles) and recorded. (For example, one link overlaid on one CAM might entail a total length of six miles: three miles traversing light-shaded areas; two miles, moderate-shaded areas; one mile, dark-shaded areas.) Where a link traversed only one intensity of color on a CAM (for example, a link shown entirely in light shading), this additional disaggregation was clearly not required, and only one mileage length was recorded.

The formula for calculating impact scores for each of the 117 links, applied separately for each of the six CAMs, was:

A-Level Impact Factor (by CAM)	X	Miles of Impacted Area Traversed (by color intensity)	X	Appropriate Numeric Analog (H=4,M=2,L=1)	=	Link Impact Score

In the simplest application of this formula -- for example, if a six-mile link traversed uniformly light shading (L=1) on, say, the 'Social' CAM (impact factor 2.3) -- the impact score would be 2.3 X 6 X 1 = 13.8. Six different scores would be provided for the same link, relative to each of the CAMs. In the most complex application -- if a link on a given CAM was disaggregated according to three different color intensities traversed -- the formula would be applied three times for that CAM, using the same A-level impact factor for the CAM but substituting the three different mileages and the corresponding numeric analogs; the three disaggregated impact scores would then be summed to produce the link impact score relative to the CAM, and the procedure repeated for that link relative to the other CAMs.

Clearly, the link impact scores derived by these means are far too numerous to be listed in this report. Not counting the disaggregate scores produced for some links, 117 different impact scores were calculated for each CAM (or in other words, six impact scores for each of the 117 links relative to the different CAMs), totaling well over 600 such link scores. Before using these link impact scores to calculate corridor impact scores, an additional step was required to provide adjustments in numeric scoring for links identified relative to opportunities for right-of-way sharing.

Step 5 (Numeric Scoring of Opportunities for Right-of-Way Sharing). The link impact scores produced in Step 4 for links P-100 through P-129 (identified relative to existing rights-of-way) were adjusted to reflect the assumption that environmental impacts would be minimized where rights-of-way of existing utilities could be shared. The impact score for each such link was reduced by 33 percent, according to a formula set by the USDI, to reflect the reduced right-of-way clearing required next to an existing cleared right-of-way. While the standard right-of-way width required for a 345 kV transmission line would be 150 feet, running transmission lines parallel to existing utilities would require only 100 feet* of clearing (in addition to the right-of-way already cleared). i.e., a reduction by approximately a third. Note that the reductions for these links reflected only changes in relative widths required for rights-of-way; the scores for some links, even after adjustments for right-of way sharing, were often quite high since locations of existing rights-of-way were often found to have undesirable environmental impacts.

After completion of the numeric scoring steps for all links, the link impact scores were carried over into the corridor ranking process for use in calculating total corridor impact scores .

Corridor ranking. Ranking of 'least impact' corridors was, in essence, a final aspect of the corridor evaluation process, required to total the quantitative link impact scores for different alternative corridors and to evaluate the corridors according to qualitative criteria as well. Final corridor raknings are shown in the far right column of Figure 3-5. These rankings were produced relative to both quantitative and qualitative considerations (specifically, by checking the quantitative corridor "rankings by total impact" against the qualitative considerations).

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*This dimension, supplied by the USDI, is approximate. If transmission lines were, in fact, introduced next to existing rights-of-way, the width of the right-of-way clearing required in addition to the existing one would depend upon construciton options selected for supporting structures and other factors that will be assessed in more detail during the transmission route and right-of-way phases of the Dickey/Lincoln School project.

Quantitative impact scores were calculated for all alternative corridors within each system plan segment. Corridors were ranked, according to these scores, within ten different segments (some of them, for example, the segment between Comerford and Granite, common to more than one system plan). On the figure, only the top-ranked corridors for each segment are shown (designated, for convenience, alphabetically); in fact, the number of corridors evaluated and numerically scored per segment was often as high as fifteen. In two additional segments (between Dickey and Lincoln, and between Lincoln and Fort Kent), segment length was relatively short and both segments were incorporated in all system plans. Also indicated on the figure are the numbered coterminal links that were identified as components of each alternative corridor.

The quantitative considerations evaluated before arriving at final corridor rankings included, as shown on the figure: total corridor length (in miles), total corridor impact score and corridor rank by impact score, average impact per mile score and corridor rank by average impact per mile.

Total corridor length was calculated by adding the lengths of component links for any given corridor and was used primarily in calculating average impact per mile. With the exception of the corridors in the short segments noted, corridor lengths ranged from about 30 to 258 miles. Within any given segment, however, the alternative corridors ranked were of fairly uniform length. For example in the segment between Dickey and Chester, the range of lengths was only from 126 to 130.5 miles; in that between Dickey and Comerford, from 250.5 to 257.5 miles.

The primary consideration in the quantitative corridor ranking was the "total corridor impact score" for each alternative corridor, which was calculated by summing the impact scores for component links. As described in the previous subsection (Step 4), impact scores were produced for each link relative to six different CAMs; thus,the six link impact scores for each link were summed first, before adding total impact scores for all coterminal links within a given corridor. The "corridor rank by total impact" was a straightforward ordering of the corridors in each segment according to their total impact scores. The top-ranked corridor in each segment, assigned the number 1, has the lowest total impact score and thus represents the least potential environmental impact on resources located within that corridor.

While the total impact score reflects impacts on all resources within a given corridor, an additional quantitative impact consideration was average impact on resources occurring per mile of a given corridor. This average impact/mile score was calculated for each corridor by dividing the total corridor impact score by total corridor length and was used as an additional means of ordering the corridors in each segment (as indicated in the "corridor rank by impact/mile" column of the figure). The corridor having the lowest average impact/mile score in each segment was ranked number 1.

Note that, in some segments, these rankings do not agree with the rankings "by total impact". In the segment between Dickey and Chester, for example, the corridors ranked 2 and 3 according to average impact/mile are the reverse of those ranked 2 and 3 according to total impact. The differences, however, were not significant enough to require a change in the corridor rankings by total impact. (In this example, the impact/mile score for the second-ranked corridor was 16.3; that for the third-ranked corridor, 16.8, or a difference of only 0.5.)

The quantitatively described impacts and the corridor rankings based upon them do not consider identifiable environmental resources (beyond the resources depicted in various shadings on the CAMs and used to derive link impact scores). Numeric scoring was therefore supplemented by qualitative considerations that could be assessed by reference to resources mapped in the resource-data file. The 25 different factors evaluated are shown on Figure 3-5 under the heading "Qualitative Considerations" and reflect potential impacts* of corridors on different resources, including:

- Number of Streams and Rivers Crossed
- Projected Accessibility (Low)
- Projected Accessibility (Moderate)
- Projected Accessibility (High)
- Number of Wild and Scenic Rivers Crossed
- Number of Anadromous Fisheries Crossed
- Number of Road Crossings
- Number of Scenic Road Crossings
- Number of Scenic Trail Crossings
- Proximity to Town Centers
- Proximity to National and State Parks and Forests
- Proximity to Scenic Wayside Areas
- Proximity to Intensive Recreation Areas
- Proximity to Archaeological Sites
- Proximity to National Register Historic Sites
- Proximity to State Register Historic Sites
- Proximity to Potential State and National Historic Sites
- Proximity to Unique Resources
- Proximity to Critical Areas: Maine
- Proximity to National Natural Landmarks
- Proximity to Natural Scientific Research/Wilderness Study Areas
- Proximity to Endangered/Threatened Wildlife Species
- Proximity to Wildlife Species of Special Concern
- Proximity to Wildlife Restoration Areas
- Proximity to Endangered/Threatened Vegetation Species

Tabulations were performed relative to each such consideration by placing the map of evaluation lines and numbered links (Appendix A, Map 2) over the appropriate resource-data map from the resource-data file and counting the number of times an evaluation line crossed or was located in

*Precise impacts on different resources would depend entirely on the exact siting of transmission lines relative to the resource and on mitigation measures incorporated in later stages of the project to minimize impacts.

proximity to the various resources; where an evaluation line was located in proximity to the resources on the resource-data map, all resources located within 1 1/2 miles on either side of the evaluation line were counted. These tabulations were then reviewed (by the project team and by USDI representatives) relative to the top-ranked corridors evaluated quantitatively.

The qualitative considerations tabulated, like the quantitative considerations of average impact per mile, did not significantly affect the corridor rankings depicted on Figure 3-5 as "Corridor Rank by Total Impact." The "Final Rankings" shown on the figure therefore correspond to the quantitative rankings by total impact. This correspondence is not surprising since each resource-data item considered qualtitatively had already been incorporated in the A-level analysis maps (CAMs) that were used to delineate the links from which the various impact scores were derived/ The qualitative considerations, thus, served basically as a final check on the quantitative scorings. The corridor rankings by total impact, available for each system plan segment, were then carried forward for use in recommending system plans

CHAPTER 4

CHAPTER IV

ALTERNATIVE SYSTEM PLANS: RECOMMENDATIONS

The product of evaluation -- alternative corridors (1-10 miles wide) ranked within each system plan segment -- are the basis for recommending alternative system plans for further consideration and possible implementation. The 'best' corridors recommended in Chapter III for each segment are those that would entail 'least impact' on the study area's existing environment, as indicated not only on the various CAMs but also by both quantitative and qualitative considerations.

To insure that recommended system plans would include corridors with least environmental impact, the top-ranked corridors for the twelve segments evaluated (each corridor having the lowest "total corridor impact score" for a given segment, as shown on Figure 3-5) were connected according to the system plans identified by the USDI, then evaluated to produce system plan impact scores. Where certain segments were common to more than one system plan, the same top-ranked corridor was included in different system plans.

Of the six system plans provided by the USDI, two are recommended for further investigation, one for each level of service (Authorized or Ultimate). No comparable recommendations were required to compare the Authorized relative to the Ultimate system plan; such recommendations would involve electrical-system planning considerations that were not within the scope of analysis of the Transmission Corridor Assessment but are currently being studied by the USDI.

For each system plan, separate recommendations are provided according to construction options for transmission-line supporting structures (steel towers or wood poles), in order to reflect possible differences in environmental impacts due to different right-of-way widths in areas where double-circuit lines are required. As explained in

Chapter I of this report, the Transmission Corridor Assessment primarily evaluated environmental impacts associated with single-circuit transmission lines requiring a 150-foot right-of-way clearing (a dimension established by the USDI). Where double-circuit transmission lines are required, the right-of-way width would vary according to the construction type chosen. Steel towers would maintain the 150-foot width; parallel sets of wood poles would require 250 feet (i.e., an additional 100 feet) of right-of-way clearing.

According to present USDI system planning considerations, the only system plan segments requiring double-circuit lines and therefore offering construction options are those between Dickey and Comerford and between Dickey and Chester. The former segment occurs in System Plan C (both Authorized and Ultimate versions); the latter occurs in Authorized and Ultimate System Plans A and B. In the ranking of system plans, which (like the evaluation process) was conducted by using impact scores, adjustments in impact scores were required for these segments to reflect the possibility of additional impacts associated with increased right-of-way widths if parallel sets of wood poles are used.

System Plan Ranking

The various system plans were ranked according to both quantitative and qualitative considerations. Six system plans were provided by the USDI. As previously noted, because Authorized System Plans A and B differed only in the requirement of double-circuit transmission lines for some segments, they were considered identical for purposes of the Transmission Corridor Assessment (which was primarily concerned with environmental impacts and not with electrical-system considerations)and were designated "Authorized Plan A-B."

The various rankings produced for the system plans are displayed in Figure 4-1, according to different system plans and construction options. For each system plan, the relevant top-ranked corridors, alphabetically designated, that were the products of evaluation are indicated on the figure.*

Quantitative considerations used in arriving at the system plan "Final Rankings" (shown in the far-right column of Figure 4-1) included: total plan length; total plan impact score and plan rank by total impact; average impact per mile score and plan rank by average impact per mile; normalized length impact score and plan rank by normalized length. The primary consideration was the "Plan Rank by Total Impact", which was based directly on the impact scores of the corridors included in each system plan (that were, in turn, derived by the analysis methods described throughout this report). These rankings were based on the potential environmental impacts of the proposed system plans, without considering possible variations in levels of service provided by different system plans or other system planning considerations that are within the purview of the USDI. Similarly, calculations of plan length were of interest in considering environmental impacts that might be associated with longer or shorter plans but were not a primary consideration in determining final rankings. The various different impact scorings were thus provided mainly as a check on the "Plan Rank by Total Impact" and, as in the evaluation process ,

* The links that are components of each corridor are listed on Figure 3-5 ("Corridor Rankings") and displayed graphically in Appendix A, Map 2. Where corridors are located within segments requiring double-circuit lines and therefore having construction options (Dickey to Chester and Dickey to Comerford), the corridors cited on the figure are marked by asterisks. As indicated, these construction options are being considered only for two corridors -- Corridors A and D -- which recur in a number of different system plans.

Plan Group	System Plans	Type of Construction (by Corridor)	Corridors Evaluated	Total Plan Length (Miles)	Total Plan Impact Score	Plan Rank by Total Impact	Average Impact/Mile Score	Plan Rank by Impact per Mile	Normalized Length Impact Score	Plan Rank by Normalized Length	Numbers of Streams and Rivers Crossed	Projected Accessibility: Low	Projected Accessibility: Moderate	Projected Accessibility: High	Number of Wild and Scenic Rivers Crossed	Number of Anadromous Fisheries Crossed	Number of Road Crossings	Number of Scenic Road Crossings	Number of Scenic Trail Crossings	Proximity to Town Centers	Proximity to National and State Parks and Forests	Proximity to Scenic Wayside Areas	Proximity to Intensive Recreation Areas	Proximity to Archaeological Sites	Proximity to National Register Historic Sites	Proximity to State Register Historic Sites	Proximity to Potential State and National Register Historic Sites	Proximity to Unique Resources	Proximity to Critical Areas: Maine	Proximity to National Natural Landmarks	Proximity to Natural Scientific Research/Wilderness Study Areas	Proximity to Endangered/Threatened Wildlife Species	Proximity to Wildlife Species of Special Concern	Proximity to Wildlife Restoration Areas	Proximity to Endangered/Threatened Vegetation Species	FINAL RANKING
AUTHORIZED SYSTEM PLANS	A-B**	STEEL TOWER	A* G U a J X	450.0	7,338	2	16.3	1	7,338	1	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4	3	6	28	13	2
	A-B**	WOOD POLE	A G U a J X	450.0	8,724	4	19.4	3	8,724	3	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4	3	6	28	13	4
	C	STEEL TOWER	D* G	280.5	4,750	1	17.0	2	7,632	2	130	82	74	127	1		114	7		10		7	11	6	2	1	1	8		2	2		2	8	1	1
	C	WOOD POLE	D G	280.5	7,651	3	27.3	4	12,278	4	130	82	74	127	1		114	7		10		7	11	6	2	1	1	8		2	2		2	8	1	3
ULTIMATE SYSTEM PLANS	A	STEEL TOWER	A* a U X G J R P	639.0	10,952	4	17.13	2	10,952	2	310	50	99	493		26	395	5	2	90	28	31	21	7	20	28	24	24		11	5	5	10	40	22	4
	A	WOOD POLE	A G R U a P J X	639.0	12,338	6	19.3	3	12,338	3	310	50	99	493		26	395	5	2	90	28	31	21	7	20	28	24	24		11	5	5	10	40	22	6
	B	STEEL TOWER	A* G U a J X	450.0	9,836	3	21.8	4	13,956	4	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4	3	6	28	13	3
	B	WOOD POLE	A a U X J G	450.0	11,222	5	24.9	5	15,928	5	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4	3	6	28	13	5
	C	STEEL TOWER	D* G M	324.5	5,552	1	17.11	1	10,930	1	154	86	83	158	1		138	10	1	14	18	11	13	6	2	2	4	11		3	2		2	14	2	1
	C	WOOD POLE	D G M	324.5	8,453	2	26.0	6	16,630	6	154	86	83	158	1		138	10	1	14	18	11	13	6	2	2	4	11		3	2		2	14	2	2

Columns 5–11 (Total Plan Length through Plan Rank by Normalized Length) are grouped as QUANTITATIVE CONSIDERATIONS; columns 12–36 (Numbers of Streams and Rivers Crossed through Proximity to Endangered/Threatened Vegetation Species) are grouped as QUALITATIVE CONSIDERATIONS.

* Indicates corridors in which steel tower or wood pole construction is an option.
** Authorized System Plans A & B are treated in the same manner for purposes of this assessment.

System Plan Rankings

figure 4·1

the "Final Rankings" were found to correspond directly to the rankings according to total impact on environmental resources.

The quantitative calculations used in deriving and checking the Final Rankings were:

- Total Plan Length, a straightforward measurement corresponding to the sum of the lengths of corridors included in each system plan. Corridors were measured along the evaluation lines drawn for each system plan segment.

- Total Plan Impact Score, a summation of the "Total Corridor Impact Scores" (that were shown on Figure 3-5) for the corridors comprising each system plan (indicated in the "Corridors Evaluated" column on Figure 4-1).

- Plan Rank by Total Impact, an ordering of system plans according to the "Total Plan Impact Score" results. For both Authorized and Ultimate system plans, the plans with the lowest total impact scores were ranked number 1.

- Average Impact/Mile Score, which was calculated by dividing the "Total Plan Impact Score" by the "Total Plan Length (in miles)."

- Plan Rank by Average Impact/Mile, an ordering of system plans according to the "Average Impact/Mile Score" results.

- Normalized Length Impact Score, a comparison of the impacts of each system plan assuming that all system plans are the same length. To equalize system plans that did, in fact, entail different lengths, this score was obtained by: 1) taking the longest system plan length for both Authorized and Ultimate system plans (e.g., 450 miles for Authorized Plan A-B) and individually subtracting the lengths of each of the other system plans (in the Authorized system plans, 280.5 miles for System Plan C); 2) then multiplying the difference in plan lengths from step 1 (169.5 miles) by the"average impact/mile score" of the individual system plans(in this case, Plan C=17.0) whose lengths were subtracted to derive an additional average impact/mile score adjusted according to length (2,881.5 additional impact); and finally

3) summing this additional impact score with the appropriate original "total plan impact score" (Plan C = 4,750.0) to obtain the normalized length impact score (Plan C = 7,632.0).

- Plan Rank by Normalized Length, an ordering of system plans according to the "Normalized Length Impact Score" results. For both Authorized and Ultimate System Plans, the plans with the lowest normalized length impact scores were ranked number 1.

Each system plan was also reviewed relative to the 25 qualitative considerations used in corridor evaluation and again listed on Figure 4-1. As previously discussed, these qualitative factors were considered relative to resources identifiable on the maps in the resource-data file, and two types of calculation were performed: to count the number of times evaluation lines within the corridors in each system plan directly crossed the resources and the number of times the evaluation lines were located in proximity to the resources. Again, resources within 1 1/2 miles on either side of an evaluation line were counted.

System plan recommendations were based on the Final Rankings produced by reviewing the quantitative and qualitative considerations relative to each other. The top-ranked system plans -- those with the lowest total impact scores -- are recommended for further consideration and possible implementation.

Recommended System Plans

As indicated by the lowest numbers in the "Final Ranking" column of Figure 4-1, the recommended system plans are:

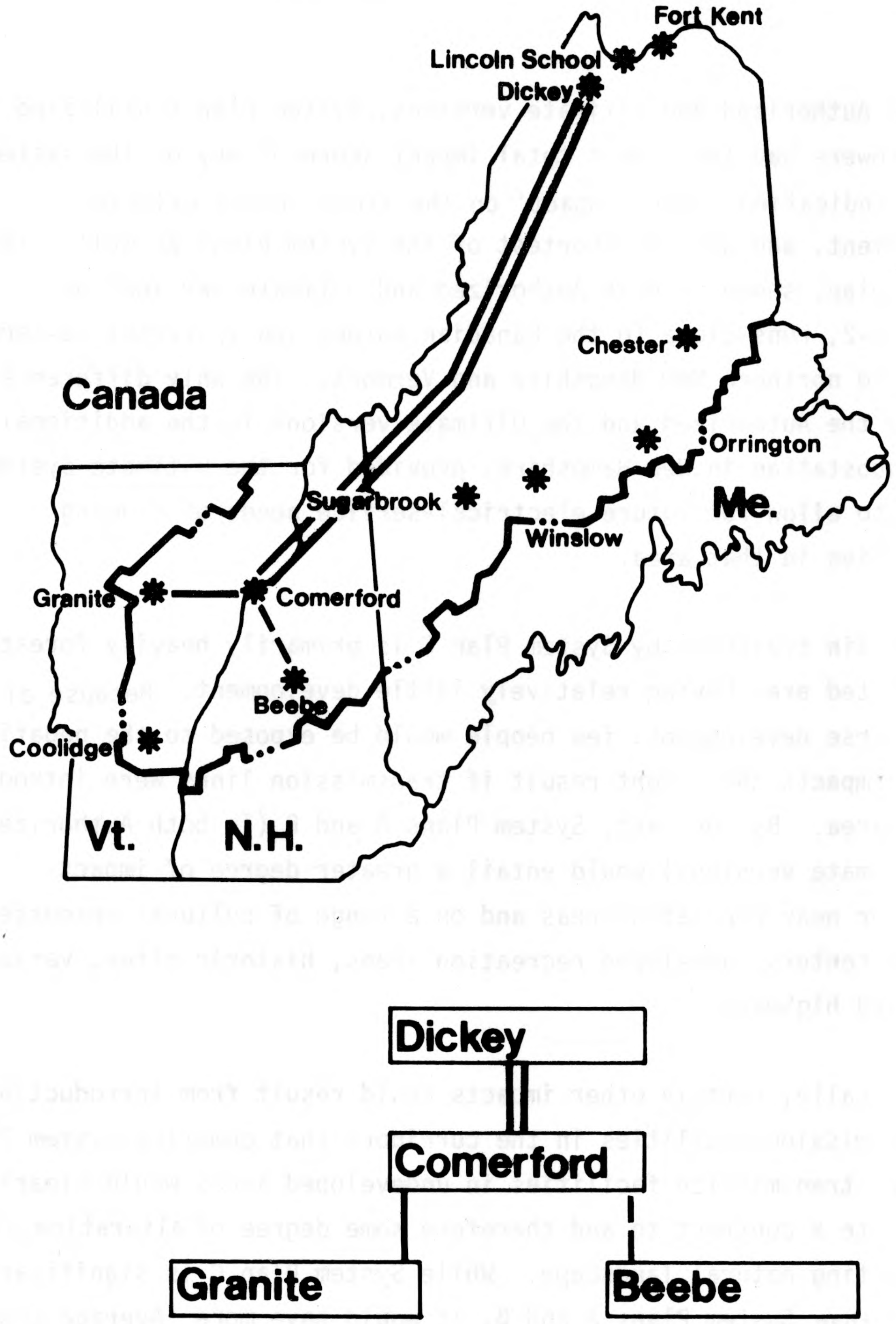
- At the Authorized level of service, System Plan C utilizing the steel-tower construction option.

- At the Ultimate level of service, System Plan C utilizing the steel-tower construction option.

In both Authorized and Ultimate versions, System Plan C utilizing steel towers had the lowest total impact score of any of the system plans, indicating 'least impact' on the study area's existing environment, and was the shortest of the system plans as well. This system plan, shown in both Authorized and Ultimate versions on Figure 4-2, runs close to the Canadian border and traverses western Maine and northern New Hampshire and Vermont. The only difference between the Authorized and the Ultimate versions is the additional Beebe substation in New Hampshire, provided for the Ultimate System Plan C to allow for future electrical-service needs of growing communities in that area.

The terrain traversed by System Plan C is primarily heavily forested, uninhabited area having relatively little development. Because of this sparse development, few people would be exposed to the negative visual impacts that might result if transmission lines were introduced in the area. By contrast, System Plans A and B (in both Authorized and Ultimate versions) would entail a greater degree of impact within or near populated areas and on a range of cultural resources -- town centers, developed recreation areas, historic sites, various roads and highways.

Realistically, certain other impacts could result from introduction of transmission facilities in the corridors that comprise System Plan C, since transmission facilities in undeveloped areas would clearly constitute a contrast to and therefore some degree of alteration of the existing natural landscape. While System Plan C is significantly shorter than System Plans A and B, it would have more 'Average Impact per Mile' on natural systems than System Plans A and B, especially if the wood-pole construction option were chosen and right-of-way widths accordingly increased.



System Plan C : Authorized & Ultimate

—— authorized

— — — ultimate

figure 4·2

Note, however, that because the interim analysis methods previously described were incorporated as mitigation measures in the Transmission Corridor Assessment -- i.e., to anticipate and avoid severest impacts on environmentally sensitive resources -- the impacts on natural resources that might result from this system plan would not include impacts on a wide range of natural systems: for example, deer wintering yards, waterfowl areas, unique species of vegetation, or any already endangered and threatened species of vegetation and wildlife.

Furthermore, the precise impacts that might occur if the recommended system plans were implemented will be re-assessed during two subsequent stages of the Dickey/Lincoln School project, relative both to alternative transmission routes within the transmission corridors and to alternative right-of-way locations within the transmission routes. Mitigation measures will, thus, be considered again at those times.

In the Transmission Corridor Assessment, a final field reconnaissance was conducted after system plan recommendations were decided in order to insure that ample route locations were possible within the recommended system plans. This ground truth investigation, conducted by project team members and USDI representatives from fixed-wing aircraft, surveyed the locations of resources within the top-ranked corridors in the recommended system plans. Corridors and corridor boundaries were also checked on U. S. Geological Survey quadrangle maps. This visual survey confirmed that the top-ranked corridors included in the recommended system plans, even in their narrowest areas, were sufficiently wide to permit many opportunities for location of transmission routes.