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STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION

# INTERSTATE ROUTE

287

## STUDY AND COST ESTIMATE

from Route 202 Township
of Montville to Route 17
Township of Mahwah

PROPERTY OF
NEW JERSEY STATE
DEPARTMENT OF
TRANSPORTATION
168 W. State St.
Trenton, N.J.

1967

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
Consulting Engineers
FAIRFIELD, NEW JERSEY

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DEPARTMENT OF TRANSPORTATION

DAVID J. GOLDBERG, COMMISSIONER

TRENTON 08625

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ROUTE I-287 DATE 11-20-67

MONTVILLE TO MAHWAH (RIVER ROUTE)

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Keith Rosser

Keith Rosser
Director of Planning

21. Morris County
22. Passaic County
23. Bergen County
24. Montville Township
25. Kinnelon Borough
26. Pequannock Township
27. Riverdale Borough
28. Lincoln Park Borough
29. Bloomingdale Borough
30. Pompton Lakes Borough
31. Wanaque Borough
32. Wayne Township
33. Oakland Borough
34. Franklin Lakes Borough
35. Mahwah Township
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HOWARD, NEEDLES, TAMMEN & BERGENDOFF
CONSULTING ENGINEERS
387 PASSAIC AVENUE, FAIRFIELD, N.J. 07006
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September 21, 1967

Mr. Keith Rosser
Director, Division of Planning
New Jersey Department of Transportation
1035 Parkway Avenue
Trenton, New Jersey 08625

Re: Interstate Route 287, Route 202
Montville to Route 17 Mahwah
West of Ramapo River

Dear Mr. Rosser:

We are pleased to transmit herewith a Report of a Study and Cost Estimate for Interstate Route 287 in accordance with our Agreement for Engineering Services, dated February 14, 1967.

This report presents the results of our studies for the location of Route I-287 on the westerly side of the Ramapo River from Route 202 in the Township of Montville, Morris County, northward to Route 17, through the municipalities of Kinnelon, Pequannock and Riverdale, in Morris County; Bloomingdale, Pompton Lakes and Wanaque, in Passaic County; and Oakland and Mahwah, in Bergen County.

The estimated cost of the 18.6 miles, including engineering, right-of-way, construction and contingencies, is approximately $81,400,000 as compared to the Public Hearing alignment with a length of 19.6 miles and an estimated cost of approximately $ 62,700,000.

In addition to economy, we have studied other pertinent route location determinants in accordance with the general policy established by the Federal Bureau of Public Roads. A comparison of these determinants for both the River Route and the Public Hearing alignment clearly shows that, in our opinion, the Public Hearing alignment will provide greater benefits to the general region.

We have, therefore, recommended that the Public Hearing alignment for Route I-287 be retained by the Department from Route 202 in the Township of Montville to Route 17 at the New York State Line in the Township of Mahwah.

We wish to express our appreciation to the personnel of the New Jersey Department of Transportation, particularly Mr. S. G. Link, Supervising Engineer, for their assistance and cooperation in preparing this report.

Very truly yours,
Howard, Needles, Tammen & Bergendoff

James F. Finn

STATE OF NEW JERSEY

# INTERSTATE ROUTE

DEPARTMENT
OF TRANSPORTATION

DAVID J. GOLDBERG
Commissioner

RUSSELL H. MULLEN
Assistant Commissioner of Highways

HERBERT A. THOMAS, JR.
Assistant Commissioner of Public Transportation

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
Consulting Engineers

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# I-287 RIVER ROUTE

## INTRODUCTION

This report summarizes the results of a study and cost estimate of an alignment for Interstate Route 287 along the westerly side of the Ramapo River as suggested by the Township of Wayne, Route I-287 Committee. A comparison of the results of this study and the results of the study which recommended the alignment of I-287 as presented by the Department at Public Hearings is given. The River Route alignment passes through the municipalities of Montville, Kinnelon, Pequannock and Riverdale in Morris County; Bloomingdale, Pompton Lakes and Wanaque in Passaic County; and Oakland and Mahwah in Bergen County.

This report will also summarize the results of a study and cost estimate for the Fyke Road alignment as suggested by the Township of Mahwah. A comparison is also made between the Fyke Road alignment and the previously recommended Public Hearing alignment. The Fyke Road alignment is situated entirely within the Township of Mahwah, Bergen County.

## RECOMMENDATION

This report discusses route location determinants for the River Route alignment, Railroad Alternate, Fyke Road alignment and the Public Hearing alignment and recommends adoption of the Public Hearing alignment from the Township of Montville, Morris County, northward to the New York State Line in the Township of Mahwah, Bergen County.

## DESCRIPTION

### Scope

Our agreement with the New Jersey Department of Transportation called for a study and cost estimate comparable to the 1965 FAI Cost Estimate – 104(b) 5 – previously prepared for the Department. We were to contact pertinent agencies and municipalities and attend all meetings as directed by the Department. Studies were to be made on photographically enlarged United States Geological Survey maps supplemented by recent aerial photography. Studies were to be developed at a scale of 1'' = 600' and to include feasibility studies for interchange locations; a preliminary review of soil conditions in

the field; drainage studies and a review of river and stream crossings including potential development of the Ramapo River Basin; provide a summary of route location determinants for the subject route location along the westerly side of the Ramapo River and the Public Hearing alignment. Finally, to prepare a report with recommendations based on the preliminary studies mentioned above.

### Procedure

We obtained new aerial photography covering the study area in January, 1967. A meeting was held in February, 1967 with representatives of the Department of Transportation, the Bureau of Public Roads, Passaic and Bergen Counties and the Township of Wayne to review the purpose of this study and the general alignment suggested by the Township of Wayne, Route I-287 Committee. A meeting was held in March, 1967 with representatives of the Department and the Bureau of Public Roads to review our preliminary evaluations of the alignment, typical sections and other major considerations prior to beginning the 600-scale studies.

We then developed the 600-scale studies for the River Route alignment which subsequently included a partial alternative termed "Railroad Alternate." Tax maps were obtained for each of the municipalities as well as a determination of sufficient property ownership for evaluation of land-locked parcels and right-of-way costs by the Department.

The results of the River Route alignment and the Railroad Alternate were discussed with the Department and the Bureau of Public Roads at a meeting in May, 1967. As a result of the substantially higher cost of the River Route as indicated by the cost estimates, we were directed by the Department to proceed with a study and evaluation of the Fyke Road alignment in the Township of Mahwah. A meeting was then held with the Department in June, 1967 to review the results of the Fyke Road study and cost estimate. We were then directed to begin preparation of the Report. A final meeting was held in July, 1967 to discuss certain comments by the Bureau of Public Roads which resulted in the Department directing us to make additional minor studies on several areas of the River Route alignment.

## RIVER ROUTE ALIGNMENT

The River Route alignment begins at Route 202 in the Township of Montville, Morris County, where the presently constructed northernmost portion of I-287 now terminates. It proceeds northeasterly and crosses under the Erie Railroad, through Abbott Road and over Glen View Road. Continuing northeasterly it crosses under Waughaw Road



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along the base of Waughaw Mountain approximately 500 feet to the west of the Newark YMCA and YWCA Day Camps which are located approximately 800 feet to the west of the intersection of Jacksonville Road and Brook Valley Road. The Alignment then curves eastward crossing into the Borough of Kinnelon under relocated Brook Valley Road and over relocated Voormis Road where it then enters the Township of Pequannock and curves towards the north to cross under West Sunset Road. The alignment proceeds northward to the west of a residential development along Mountain Avenue, climbing the slope of the Waughaw hills at this point and riding this slope northeastwardly, crosses into the Borough of Riverdale through the Houdaille Construction Co. borrow pit operation and over Route 23 to the west of the Riverdale Cement Block Co.

It then curves to the northeast over the Paterson-Hamburg Turnpike and the Pequannock River into the Borough of Bloomingdale. It continues to the northeast over the New York Susquehanna and Western Railroad after which it curves towards the north along the base of Federal Hill through the Passaic Crushed Stone Quarry staying west of the Erie Railroad where it enters the Borough of Pompton Lakes. The alignment proceeds northward to the west of the Telemark television station and antenna tower in the Borough of Pompton Lakes. It then curves to the east crossing into the Borough of Wanaque, over the Erie Railroad, Lower Twin Lake and Ringwood Avenue to the south of the intersection of Union Avenue and Ringwood Avenue and then through the A & P shopping center. Continuing generally eastward over the north end of Lake Inez – it crosses the Wanaque River at this point – and under an access road to Ramapo Lake. It then enters the Borough of Oakland and proceeds to the northeast on a long curve approaching to within approximately 500 feet west of the New York Susquehanna and Western Railroad and then crossing under a relocation of Skyline Drive and the future Route 208 extension. (North of Route 208 the alignment is located to the west of the Ramapo River, along the base of the easterly slopes of the Ramapo Mountains, adjacent to residential developments at Crystal Lake in the Borough of Oakland and Deer Haven in the Township of Mahwah).

Continuing northeasterly from the Route 208 crossing, the alignment enters the Township of Mahwah and would cross over Glen Gray Road, a private road in the Deer Haven development, a relocation of Bear Swamp Road, access roads to MacMillan Reservoir and Havemeyer Reservoir, and Stag Hill Road where it would then join existing Route 17, opposite the Ford Motor Company plant.

Feasibility studies for interchange locations have been made and interchanges have been considered at the following locations.

1. Existing Route 202 – partial
2. Jacksonville Road Extension
3. Route 23
4. Ringwood Avenue
5. Future Route 208
6. Darlington Avenue Extension
7. State Route 17

### Railroad Alternate

During preliminary evaluations of the River Route, it became apparent that one of the most expensive portions of the alignment would be a segment from the Pequannock River to the approximate vicinity of Skyline Drive. We were directed to study an alternative alignment running along the westerly side of the New York Susquehanna and Western Railroad which appeared to have the advantage of reduced earthwork costs but the disadvantage of taking a larger number of homes.

Beginning about 300 feet north of the Pequannock River, the Railroad Alternate leaves the previously described River Route as it skirts the base of Federal Hill. It then curves to the east crossing over the Erie Railroad, Ringwood Avenue and the Wanaque River. The Railroad Alternate stays generally parallel to and about 200 feet west of the New York Susquehanna and Western Railroad from the vicinity of Federal Hill to the point where it rejoins the River Route alignment in Oakland. Within this area the alignment crosses over several minor local roads and a railroad spur into the Du Pont Company powder works in Pompton Lakes.

## FYKE ROAD ALIGNMENT

The Fyke Road alignment begins in the vicinity of the boundary line between the Borough of Franklin Lakes and the Township of Mahwah and proceeds northerly along the eastern edge of the Campgaw Reservation of the Bergen County Park Commission. It then curves northwesterly through the Reservation, to the east and north of the proposed ski center, crossing over Fyke Brook approximately 1,000 feet south of the Immaculate Conception Seminary pool. A relocation of the existing Reservation entrance road is required with a structure carrying the entrance road over the Fyke Road alignment. It proceeds on a long curve to the north over Route 202, a relocation of the Ramapo River and the access road to MacMillan Reservior. It then joins the River Route alignment on the west side of Ramapo River south of the Darlington Avenue Interchange.

For the purposes of this study and cost estimate, the interchange for the Fyke Road alignment is considered to be the same as that used for the River Route at the extension of Darlington Avenue.

## DESIGN CRITERIA

### General

We have assumed traffic volumes for this study to be of a similar magnitude to those indicated for the Public Hearing alignment which required four lanes of main line traffic from Route 202 in Montville northward to the Route 208 Interchange and six lanes from Route 208 to Route 17. A typical roadway section with a minimum median width of

sixty (60) feet has been held with twelve (12) foot outer shoulders and three (3) foot inner shoulders used for each roadway.

A design speed of 70 m.p.h. has been used for determining horizontal and vertical alignment standards. The horizontal alignment was designed using a minimum radius of 2,400 feet. Generally, however, much larger radii have been employed. A maximum profile grade of 4% has been used in many areas of this alignment in an attempt to reduce earthwork quantities. Potential future development of the Ramapo River Basin has been taken into account by maintaining a minimum roadway elevation which is based on a proposed dam north of Crystal Lake with a spillway elevation of 273.

## Engineering Geology

The soils and geological information described in this report were mainly obtained from the Rutgers University "Engineering Soil Survey of New Jersey" Reports No. 3, Passaic County; No. 4, Bergen and Hudson Counties; and No. 9, Morris County. Additional information was obtained by a field reconnaissance which was mainly of rock cut areas because of their significant affect on the project cost.

The area traversed by the River Route south of Route 23 is covered by soils mainly of glacial origin. The glacial soils are stratified drift deposits, with some ground moraine deposits and a limited area of glacial lake deposits. There are also some limited areas of post glacial alluvial deposits. The stratified deposits contain sand and gravel and are excellent soils. The moraine deposits contain soil sizes ranging from silt up to boulders. No problems are expected with these soils. The glacial lake deposits contain varved silts and clay soils and may be the source of some embankment settlements. The post glacial alluvial deposits are mainly sands, silts, and gravels.

North of Route 23 the River Route traverses an area consisting mainly of bedrock with little or no soil cover. The remainder of this area consists of stratified and ground moraine glacial deposits and post glacial alluvial deposits.

The bedrock is a Pre-Cambrian gneiss, generally quite hard, and having most of the weathered rock removed by glaciation. Field observations indicate that this rock should be stable in cuts up to 100 feet deep with at least one horizontal on two vertical slopes.

Generally, the soil conditions along the proposed line are quite good. Some settlements may be caused by the glacial lake deposits south of Route 23 but they are judged to be minor. There are numerous sources of excellent select material.

A shrinkage factor of 10% in earth and a swell factor of 20% in rock were estimated for this project.

The proposed Fyke Road alignment traverses an area of glacial ground moraine which consists mainly of silts and sands. The underlying bedrock is predominantly shale with some sandstone and is generally encountered at depths in excess of 10 to 20 feet. In the area just west of Fyke Brook, basalt rock is encountered beneath the glacial ground moraine at shallow depths, usually less than 10 feet.

## COST ANALYSES

Cost estimates have been prepared for each alignment following methods established by the U.S. Department of Commerce, Bureau of Public Roads for estimating the interstate highway system. Initial right-of-way cost estimates were developed by our firm for use in determining preliminary results. Later, as the studies neared completion, plans were submitted to the Department for final evaluation of right-of-way acquisition costs. These costs have been received from the Department and are reflected in the total cost presented herein. The unit prices for the various construction items are the same as those used for the Public Hearing alignment. The estimate of earthwork for the River Route alignment indicates that a balance of cut and fill occurs in the vicinity of the Route 208 interchange and again at Route 17. The Fyke Road alignment requires a relatively high borrow of approximately three million cubic yards. Additional studies were made to reduce total borrow required to approximately 2,000,000 cubic yards.

The construction cost, including construction engineering and contingencies, for the 18.6 miles of River Route alignment from Route 202 in Montville northward to the New York State line is approximately $69,900,000, an average cost of $3,700,000 per mile. Total cost, including preliminary engineering and right-of-way acquisition cost, is approximately $81,400,000. This alignment would necessitate the removal of approximately 87 buildings.

The Public Hearing alignment had a construction cost for the 19.6 miles of alignment of approximately $48,200,000, an average cost of $2,500,000 per mile. Total cost is approximately $62,700,000. The Public Hearing alignment requires the taking of approximately 129 buildings.

The construction cost of the Railroad Alternate for the 17.8 miles of alignment is approximately $63,800,000 with a total cost of approximately $76,100,000. It requires the taking of approximately 142 buildings.

The construction cost for the 6.5 miles of Fyke Road alignment from the Franklin Lakes-Mahwah boundary line to the New York State line is approximately $17,900,000 with a borrow requirement of approximately 3,000,000 c.y., an average cost of $2,800,000 per mile. (If the profile is lowered to achieve an earthwork balance, similar to the River

Route and Public Hearing alignments, an increase in construction cost will result due to the more expensive cost of excavation. A reduction of 1,000,000 c.y. of borrow would result in an increased construction cost of approximately $1,000,000). Total cost, including preliminary engineering and right-of-way acquisition cost is approximately $20,700,000. This alignment would necessitate the removal of approximately 10 fewer buildings than the Public Hearing alignment. The comparable portion of the Public Hearing alignment has a construction cost of $15,400,000 for 6.3 miles of alignment, an average cost of $2,400,000 per mile and a total cost of $18,600,000.

A Road User Benefit Analysis was made for all alternatives, including the Public Hearing alignment. Existing Route 202 was assumed to be the basic condition to which all alternatives were compared. The results of this analysis are as follows:

| | |
|---|---|
| (Existing Route 202) | 1.00 |
| Public Hearing Alignment | 2.93 |
| Railroad Alternate | 2.78 |
| Fyke Road Alternate | 2.69 |
| River Route | 2.54 |

# CONCLUSIONS

## River Route Alignment

It is our opinion that the most significant result of this study is the considerably higher construction cost which is indicated for the River Route alignment. Cost estimates indicate that the River Route alignment has a total cost of approximately 81.4 million dollars as compared to the Public Hearing alignment's total cost of 62.7 million dollars, an increase of approximately $18.7 million dollars.

There are forty two fewer buildings taken by the River Route alignment as compared to Public Hearing alignment. While this is a substantial difference, we feel it is more than offset by the much higher cost.

Other location determinants which were considered are as follows:

**Economic Activity** – It is our opinion that the Public Hearing alignment would be more beneficial to economic activity in the region since its location will provide better service for anticipated traffic desires in an area which is undergoing significant commercial and industrial development both presently and in the near future.

**Maintenance** – Maintenance of the River Route alignment would be more costly due to the frequent use of maximum grades and the large number of deep rock cuts required by topographic conditions throughout the northern two-thirds of the alignment.

**Esthetics** – It is our opinion that the River Route alignment would provide a more scenic location. The northern portion, along the Ramapo River, would be especially picturesque.

**Residential Character and Location** – The River Route alignment location has a generally less harmful effect on residential character.

**Conduct and Financing of Government** – The River Route alignment has a lower right-of-way acquisition cost which indicates a lower total loss of tax ratables as compared to the Public Hearing Alignment. We do not feel that the magnitude involved would cause a serious burden to the affected communities.

**Miscellaneous** – We feel that there is little difference between alternatives as to national defense, recreation, fire protection, public utilities, safety, religious institutions and practices, rights and freedoms of individuals, conservation, replacement housing and education and disruptions of school district operations.

## Railroad Alternate

The Railroad Alternate has two major differences from those mentioned above for the River Route alignment. These differences are:

1. The cost is indicated to be less expensive than the River Route by approximately 5.2 million dollars due to a reduction in excavation quantities, but is still $13.4 million dollars more expensive than the Public Hearing alignment.
2. It requires the taking of approximately 142 buildings, which is significantly higher than the River Route, and approximately 13 more than the Public Hearing alignment.

**Summary** – It is our conclusion that the significantly lower cost and superior service provided to the region by the Public Hearing alignment far outweigh the advantages in esthetics and lesser harm to the residential character of the area through which the River Route alignment traverses. We recommend that the Public Hearing alignment for Route I-287 from Montville to the New York State Line be retained by the Department for the location of this route.

## Fyke Road Alternate

The Public Hearing alignment is indicated to be approximately $2 million dollars less expensive than the Fyke Road alignment but requires the taking of 10 additional buildings.

Other location determinants which have been considered are as follows:

**Conservation and Recreation** – The Campgaw Reservation of the Bergen County Park Commission is adversely affected by the Fyke Road alignment. Approximately 200 acres are either acquired or separated from the main body of the Reservation property.

**Residential Character and Location** – The Fyke Road alignment takes 10 fewer buildings by avoiding the residential area adjacent to Route 202, Riverview Terrace and Clove Brook Road. It has a less harmful effect on residential character than the Public Hearing alignment.

**Conduct and Financing of Government** – The Fyke Road alignment has a lower right-of-way acquisition cost which indicates a lower loss of tax ratables. We do not feel that the indicated loss of tax ratables would pose a serious burden to the community.

**Miscellaneous** – We feel there is little difference between alternatives as to national defense, fire protection, public utilities, economic activity, safety, esthetics, religious institutions and practices, rights and freedoms of individuals, replacement housing and education and disruptions of school district operation.

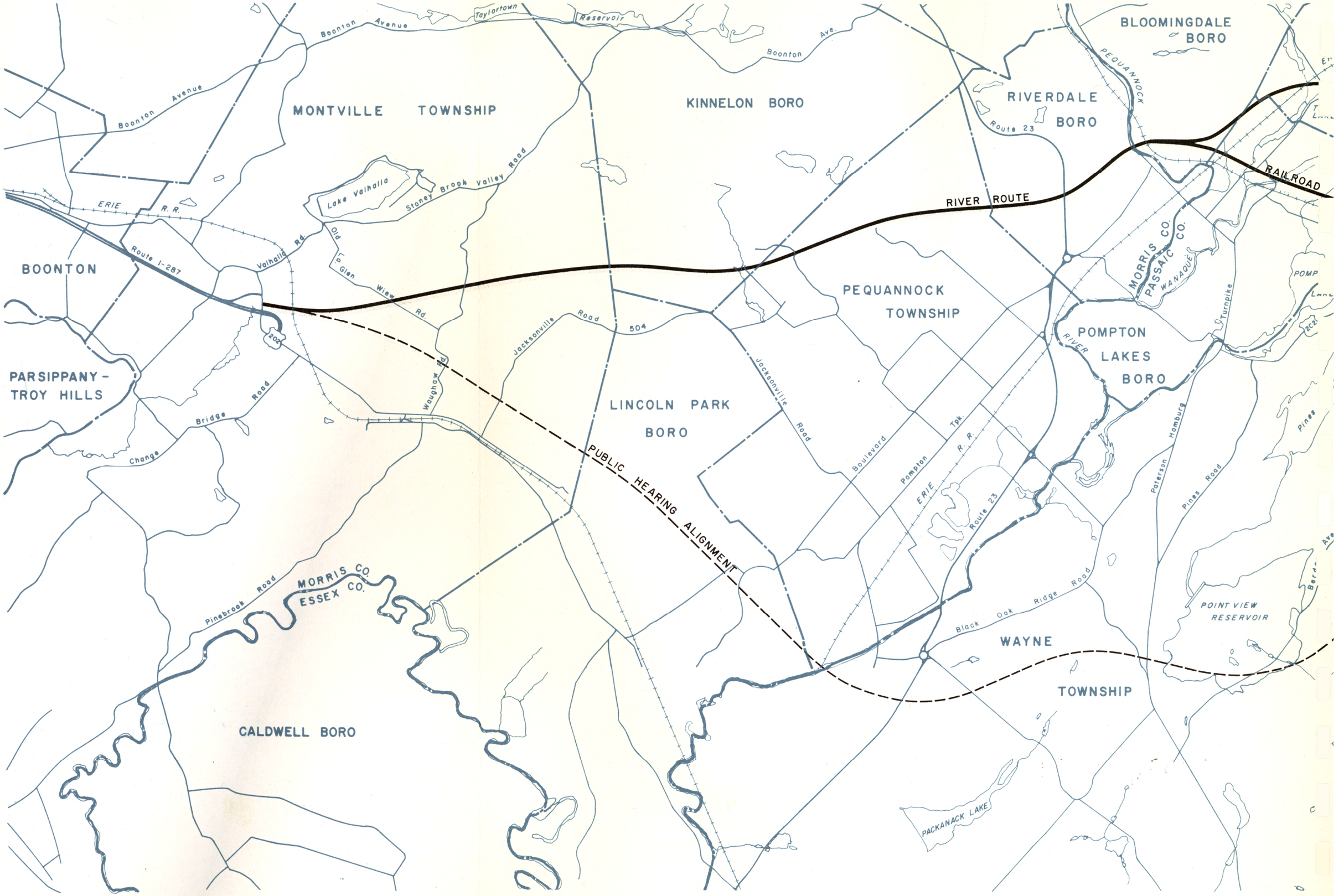
**Summary** – It is our conclusion that the indicated lower cost and the appreciably less harmful impact to the Campgaw Reservation is of greater importance than the relatively minor adverse impact to an existing residential area and the loss of ratables. It is also concluded that future residential development will not be seriously affected. We recommend that the Public Hearing alignment for Route I-287 from the Franklin Lakes-Mahwah boundary to Route 17 be retained by the Department for the location of this route.

# COST SUMMARY

## ( $1000 )

| Item | G. & O. Public Hearing Alignment | HNTB Public Hearing Alignment | Total Public Hearing Alignment | Total River Route | Total Railroad Alternate | Fyke Road Alternate | Public Hearing Alignment Comparison |
|---|---|---|---|---|---|---|---|
| Length - Miles | 7.4 | 12.2 | 19.6 | 18.6 | 17.8 | 6.5 | 6.3 |
| Improved Properties | 55 | 74 | 129 | 87 | 142 | 24 | 34 |
| 1. Preliminary Engineering | 825 | 1,269 | 2,094 | 3,048 | 2,776 | 779 | 651 |
| 2. Right-of-way | 4,498 | 7,955 | 12,453 | 8,460 | 9,719 | 2,067 | 2,600 |
| 3. Clearing & Grubbing | 136 | 258 | 394 | 699 | 627 | 143 | 161 |
| 4. Utility Adjustments | 587 | 1,193 | 1,780 | 1,411 | 1,440 | 335 | 738 |
| 5. Grade & Drain, Minor Structures | 6,567 | 10,382 | 16,949 | 35,527 | 29,532 | 7,873 | 5,290 |
| 6. Base; Surfacing; Shoulders | 2,252 | 4,752 | 7,004 | 6,585 | 6,392 | 2,719 | 2,743 |
| 7. Railroad Grade Separations | 198 | 452 | 650 | 322 | 416 | 0 | 0 |
| 8. Highway Grade Separations without Ramps | 1,324 | 3,470 | 4,794 | 4,235 | 4,754 | 2,089 | 2,240 |
| 9. Interchanges, Complete | 3,649 | 3,800 | 7,449 | 11,102 | 10,406 | 1,327 | 975 |
| 10. Other Bridges, Tunnels | 1,249 | 376 | 1,625 | 1,163 | 1,747 | 400 | 376 |
| 11. Walls | 0 | 591 | 591 | 591 | 591 | 591 | 591 |
| 12. Guardrail, Fencing, Lighting, etc. | 349 | 508 | 857 | 537 | 596 | 162 | 235 |
| 13. Roadside Improvements | 445 | 1,042 | 1,487 | 1,302 | 1,296 | 556 | 597 |
| 14. All Other Items | 147 | 71 | 218 | 39 | 43 | 39 | 53 |
| 15. Sub-Total, Lines 3 thru 14 | 16,903 | 26,895 | 43,798 | 63,513 | 57,840 | 16,234 | 13,999 |
| 16. Construction Engineering Costs | 1,690 | 2,688 | 4,378 | 6,351 | 5,784 | 1,623 | 1,399 |
| 17. Total Estimated Costs | 23,916 | 38,807 | 62,723 | 81,372 | 76,119 | 20,703 | 18,649 |

# EXHIBITS


MONTVILLE TOWNSHIP
KINNELON BORO
BLOOMINGDALE BORO
RIVERDALE BORO
BOONTON
PARSIPPANY - TROY HILLS
LINCOLN PARK BORO
PEQUANNOCK TOWNSHIP
POMPTON LAKES BORO
WAYNE TOWNSHIP
CALDWELL BORO
Boonton Avenue
Taylortown Reservoir
Boonton Ave.
Lake Valhalla
Stoney Brook Valley Road
ERIE R.R.
Route 1-287
Valhalla Rd.
Old Glen View Rd.
Jacksonville Road
504
Waughaw Rd.
Bridge Road
Change
Pinebrook Road
MORRIS CO.
ESSEX CO.
PUBLIC HEARING ALIGNMENT
RIVER ROUTE
RAILROAD
Route 23
PEQUANNOCK
MORRIS CO.
PASSAIC CO.
WANAQUE
RIVER
Turnpike
Boulevard
Pompton
ERIE R.R.
Hamburg
Paterson
Pines Road
Black Oak Ridge Road
POINT VIEW RESERVOIR
PACKANACK LAKE

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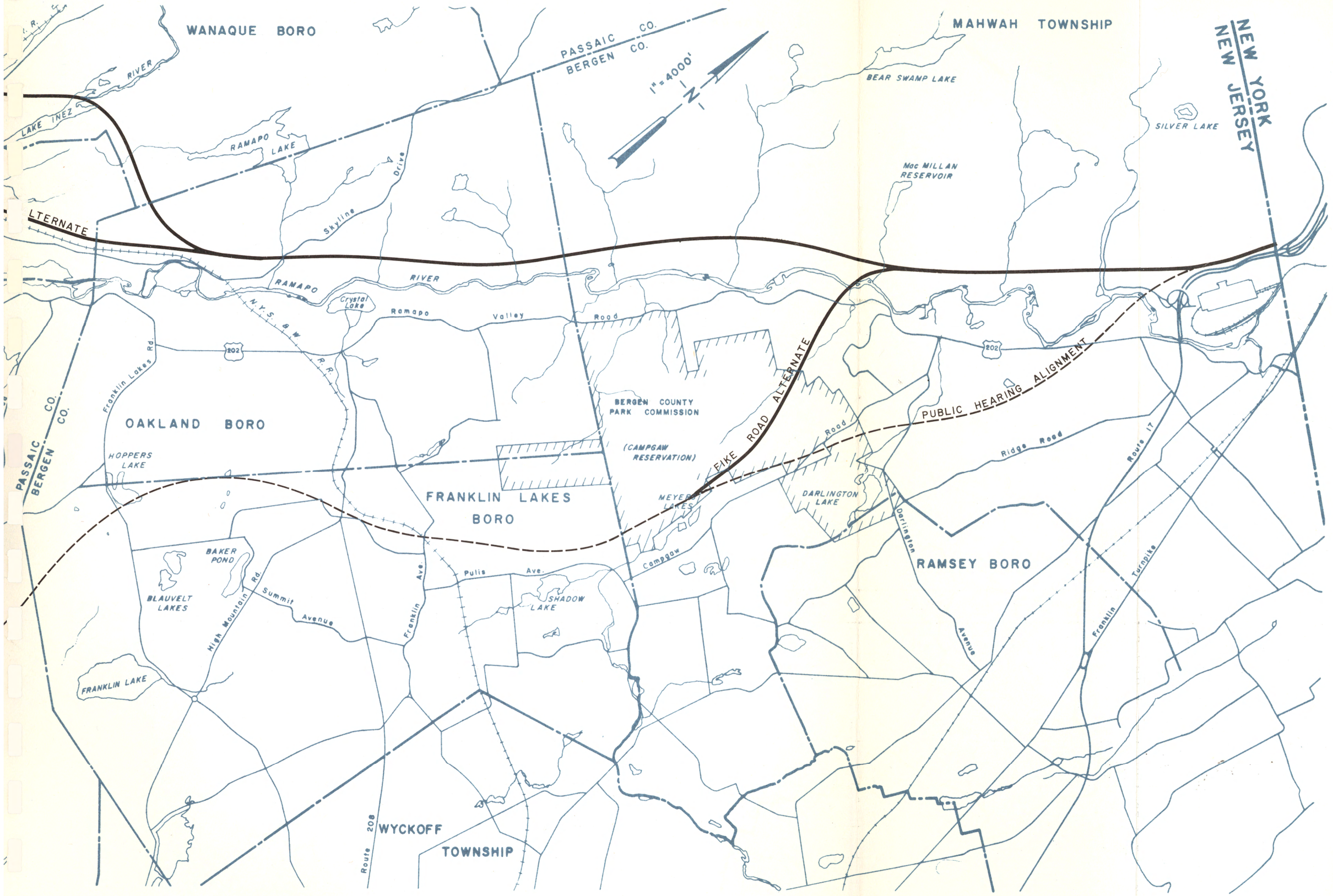
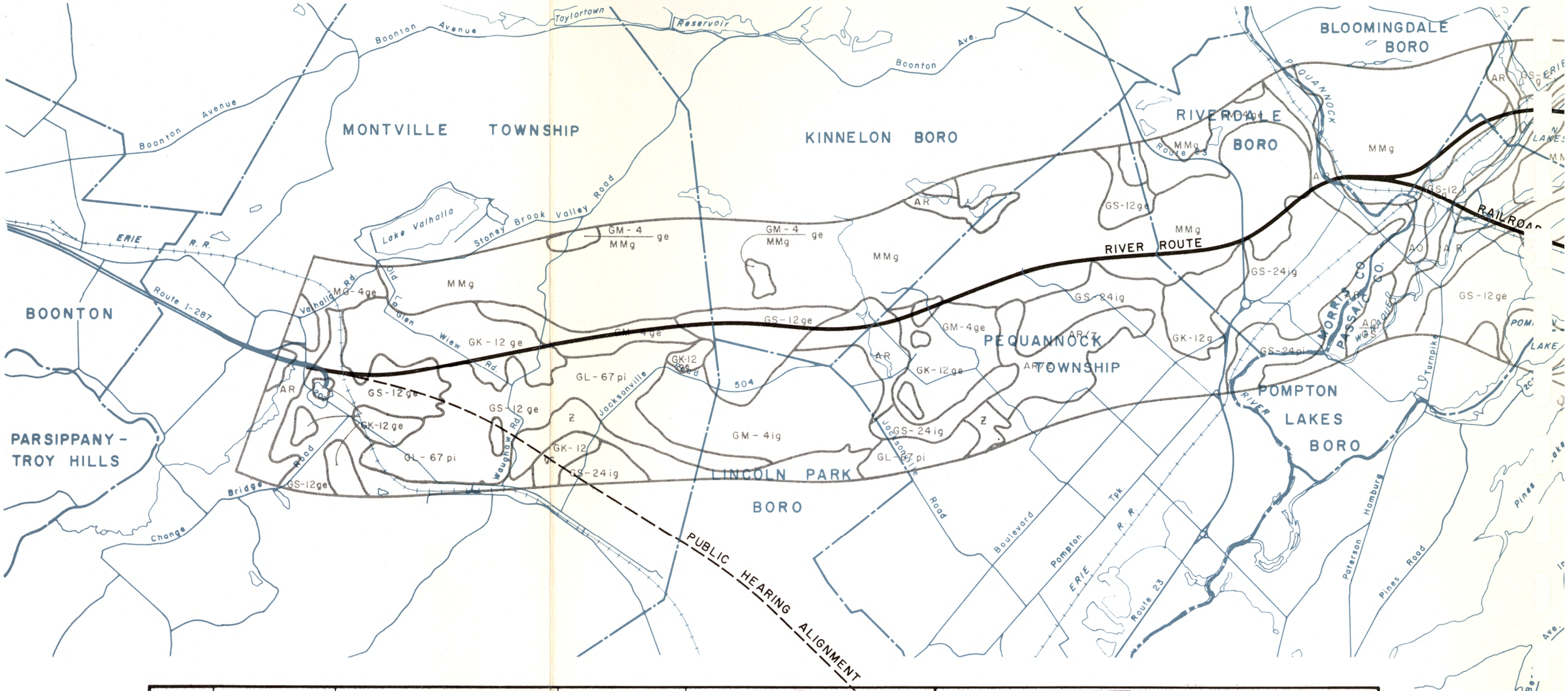
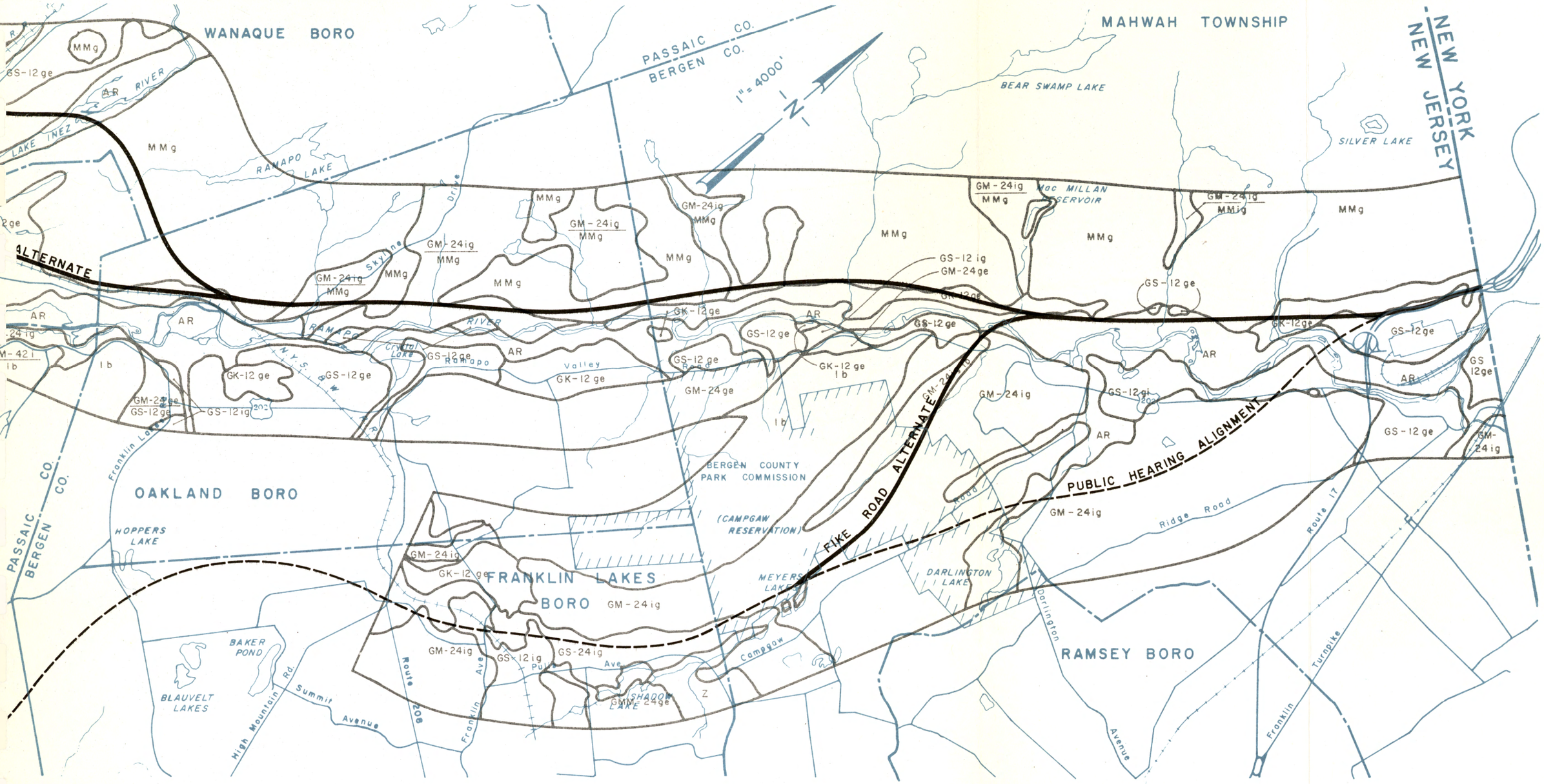



LOCATION PLAN

PLATE 1




| SYMBOL | GEOLOGIC FORMATION | DESCRIPTION | DEPTH TO BEDROCK | SOIL TYPE | ENGINEERING PROPERTIES | |
|---|---|---|---|---|---|---|
| | | | | | EMBANKMENT MATERIALS | PAVEMENT SUPPORT |
| GKF | Glacial Kame Field | Non-residual, stratified materials deposited during the Wisconsin glaciation | Generally greater than 20 feet | Silty sands and gravels, sandy gravels, and gravelly sands | Usually excellent | Excellent Suitable for use as Subbase |
| GE<br>GK | Glacial Eskers<br>Glacial Kames | | Generally greater than 10 feet | Silty sands and gravels, sandy gravels, and gravelly sands. GE soils are usually more gravelly than GK soils | Usually excellent Occasional layers of A-3 (HRB classification) materials are present | Excellent Suitable for use as Subbase |
| GS | Glacial Stratified Field | | Generally greater than 10 feet | Silts, silty sands, silty gravels, sandy gravels and gravelly sands. Finer materials generally at the surface | GS-12 excellent, GS-24 acceptable | GS-12 excellent, GS-24 good to excellent |
| GL | Glacial lake bed deposits | Non-residual, stratified materials deposited during the Wisconsin glaciation | Variable, usually at great depth | Alternating thin layers or varves of silts and clays with occasional sand lenses | Very poor | Very poor |
| GM | Glacial Ground Moraine | Non-residual, unstratified materials deposited during the Wisconsin glaciation | Generally expected to exceed 10 to 20 feet. | Sandy silts and silty sands, with occasional silts, silty clays and clays in depressions | Generally suitable | Fair to good |
| AR<br>AO | Recent Alluvium | Non-residual, stratified materials deposited by alluvial action | Varies considerably | Variable, but generally quite silty and often organic | Quality must be verified | Usually poor with minor areas fair |
| Z | Swamp | Swampy conditions | Usually the same as the surrounding deposits | Surface or near-surface soils generally high in organic content. Underlying materials usually same as the surrounding deposits | Very poor | Very poor |
| Ib<br>Ss<br>MMg | Bedrock | Basalt (Ib).<br>Sandstone (Ss).<br>Gneiss (MMg). | Variable, but usually thin | Unconsolidated glacial materials, if any, similar to GM materials | Suitable | Effect of shallow bedrock on moisture content of subgrade must be considered |




**GENERAL NOTES:**

All soil and geological information shown on this sheet taken from Rutgers University Report No. 3, Passaic County, Report No. 4, Bergen and Hudson Counties and Report No. 9, Morris County "Engineering Soil Survey of New Jersey".

The various soil areas are identified by symbols which are comprised of three parts:-

First, a designation of the parent material or geologic formation from which the soil is derived, using upper-case letters. A brief description of this part of the symbol, together with general soil types and engineering properties, is summarized in the table shown.

Second, an identification of the soil texture and consistency, using the figure that follows the letter "A" in the Highway Research Board classification system. Thus, a soil ranging from A-2-4 to A-6 is identified by the numbers 26.

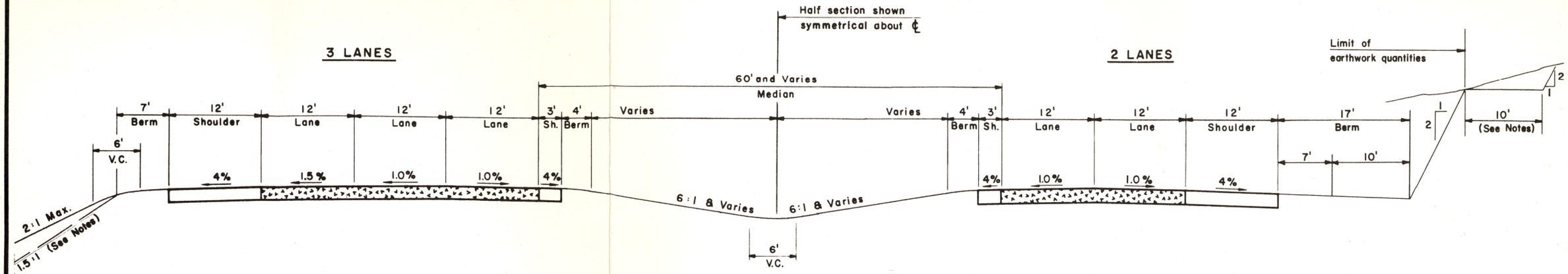
Third, an indication of the prevalent ground-water conditions in the area, using lower-case letters. Conditions are classified as ranging between the descriptive limits: excellent (e), good (g), imperfect (i), poor (p), and very poor (v). Thus, good to excellent is denoted as ge, very poor to poor as vp, etc.

The symbols AR and Z are used without additional designations because of the variation of the soils in these areas; also, the symbols Ib, Ss and MMg, which denote bedrock types.

The use of two symbols in the form of a fraction indicates that the material denoted by the upper part of the fraction appears at the ground surface and is underlain at variable, but usually shallow, depths by the material indicated by the lower part of the fraction.

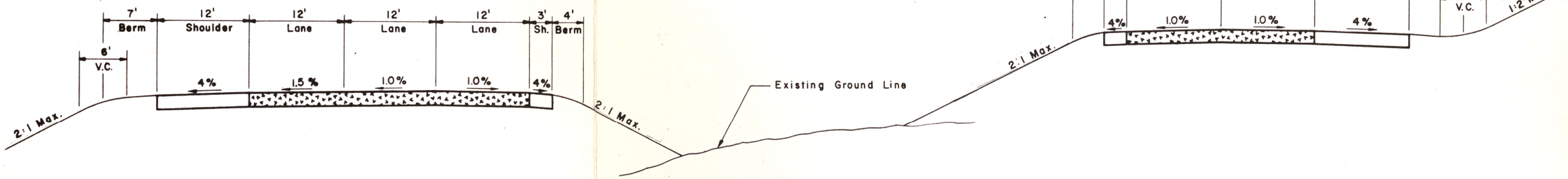
## SOILS MAP

PLATE 2



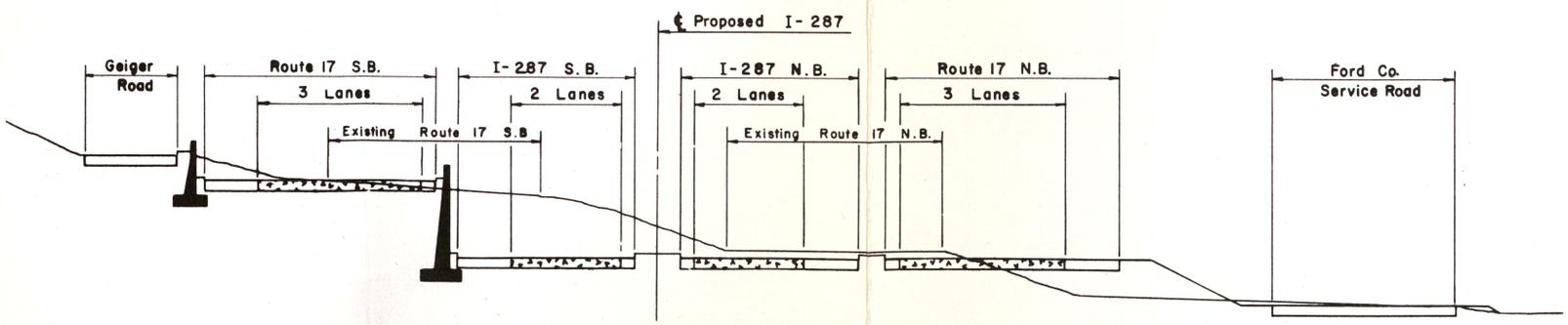

## NORMAL MEDIAN SECTION

SCALE $\frac{1}{16}$"=1'-0"




## INDEPENDENT ROADWAYS — NATURAL MEDIAN

SCALE $\frac{1}{16}$"=1'-0"




## PROPOSED SECTION AT ROUTE 17

SCALE 1"=40'-0"

### GENERAL NOTES

A four lane section is proposed from the present completed section of I-287 in the vicinity of Route 202 north to Skyline Drive. A six lane section is proposed north of Skyline Drive.

Normal Median Section used for computing quantities for all alternative alignments.

Natural Median Section is proposed for those areas where existing topography is suitable.

Truck climbing lanes to be added as warranted.

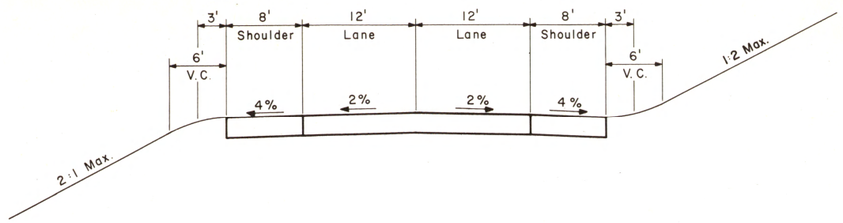
10' top bench to be added when cut exceeds 40'.

1.5 to 1 rock fill slopes to be used in extreme existing slope conditions.

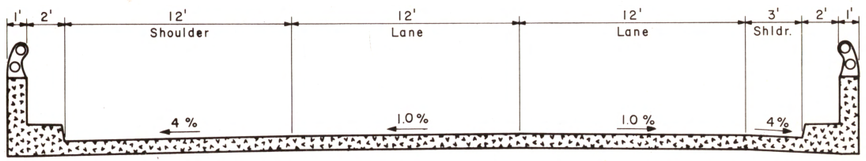
# TYPICAL MAINLINE SECTIONS

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

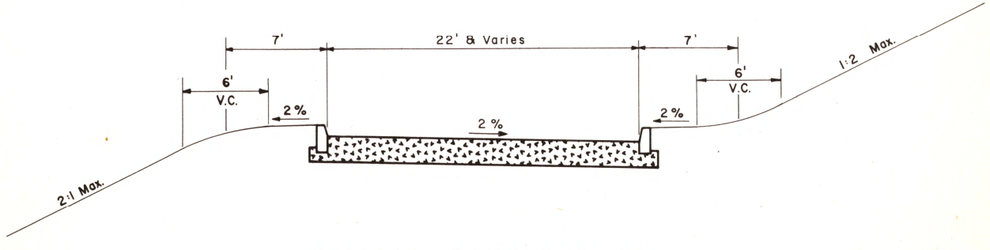
PLATE 3



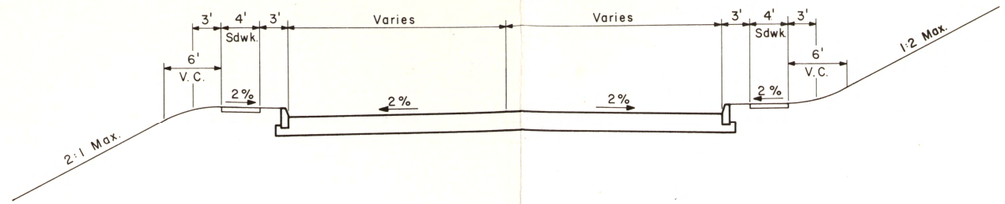

LOCAL ROADS AND ACCESS ROADS
SCALE $\frac{1}{16}$" = 1'-0"



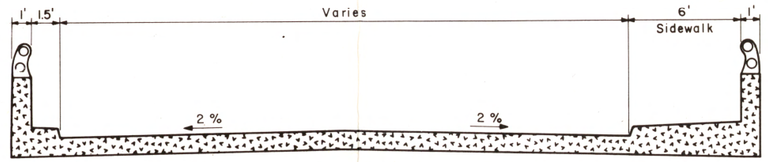

TYPICAL TWO-LANE MAINLINE SECTION
SCALE $\frac{1}{8}$" = 1'-0"




TYPICAL RAMP SECTION
SCALE $\frac{3}{32}$" = 1'-0"




COUNTY ROADS
SCALE $\frac{1}{16}$" = 1'-0"




TYPICAL LOCAL ROAD
SCALE $\frac{1}{8}$" = 1'-0"

GENERAL NOTES

A four lane section is proposed from the present completed section of I-287 in the vicinity of Route 202 north to Skyline Drive. A six lane section is proposed north of Skyline Drive.

Normal Median Section used for computing quantities for all alternative alignments.

Natural Median Section is proposed for those areas where existing topography is suitable.

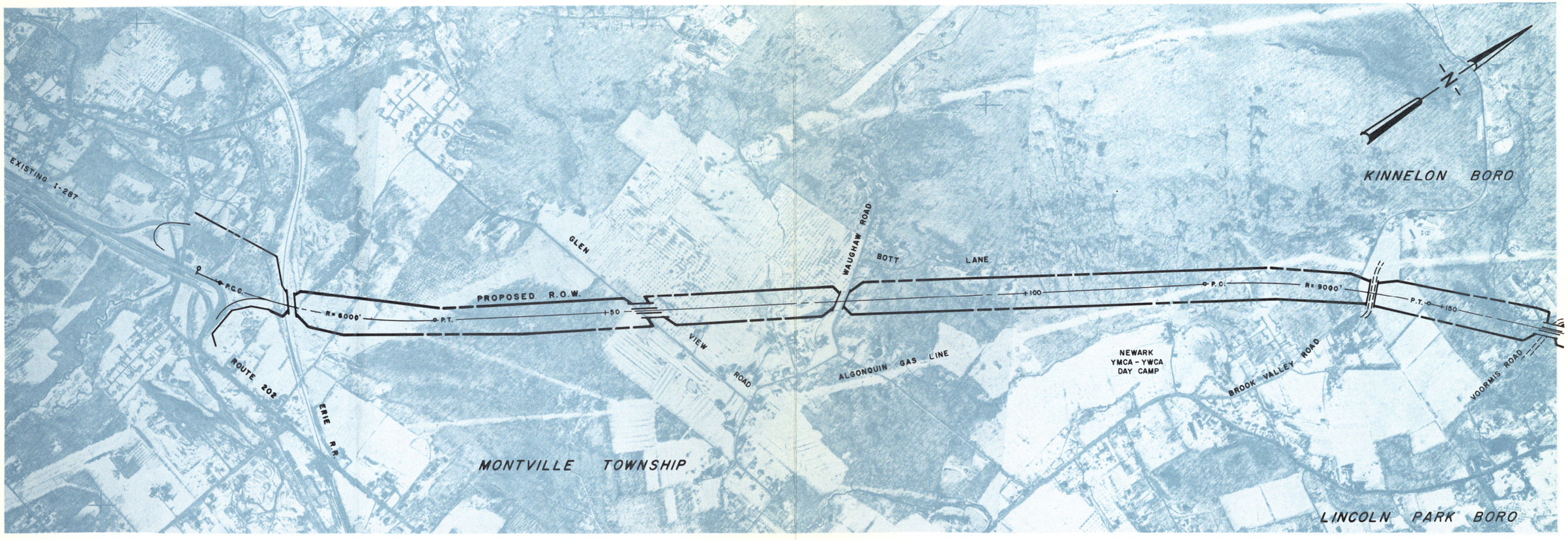
Truck climbing lanes to be added as warranted.

10' top bench to be added when cut exceeds 40'.

1.5 to 1 rock fill slopes to be used in extreme existing slope conditions.

# TYPICAL SECTIONS

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

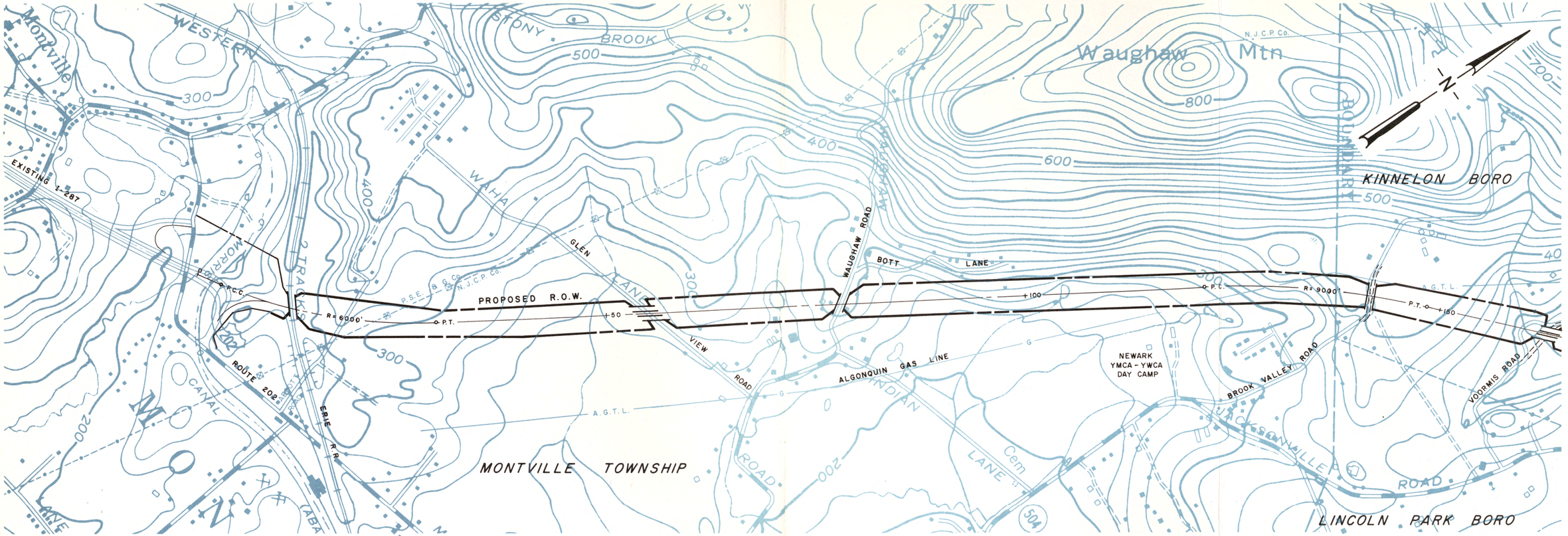


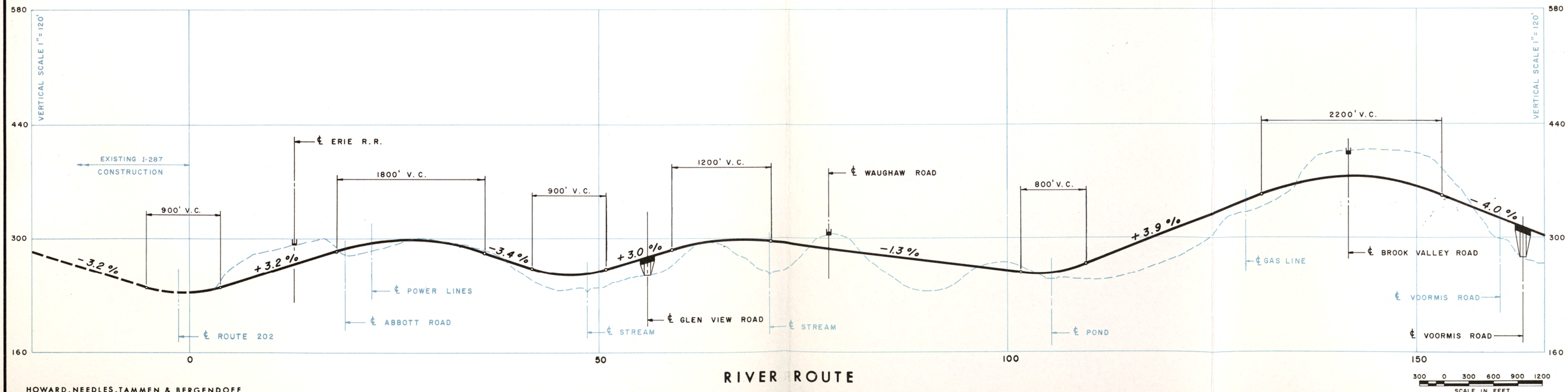

RIVER ROUTE

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

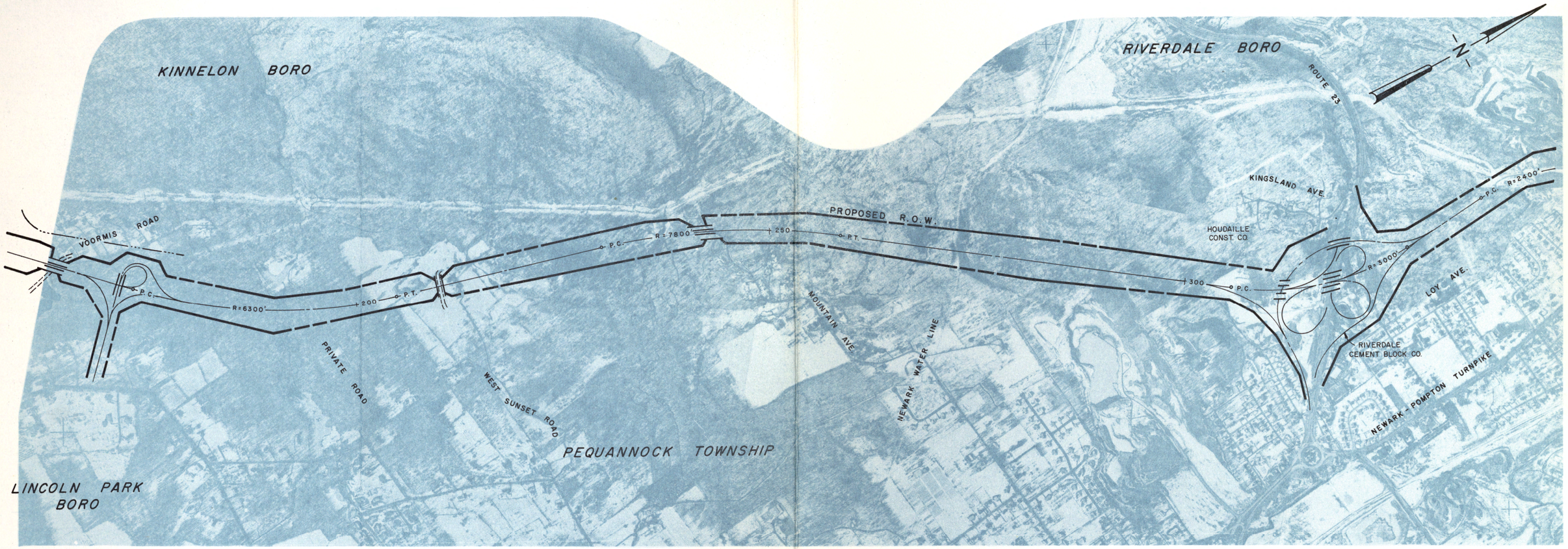
300 0 300 600 900 1200
SCALE IN FEET

PLATE 5A




HOWARD, NEEDLES, TAMMEN & BERGENDOFF



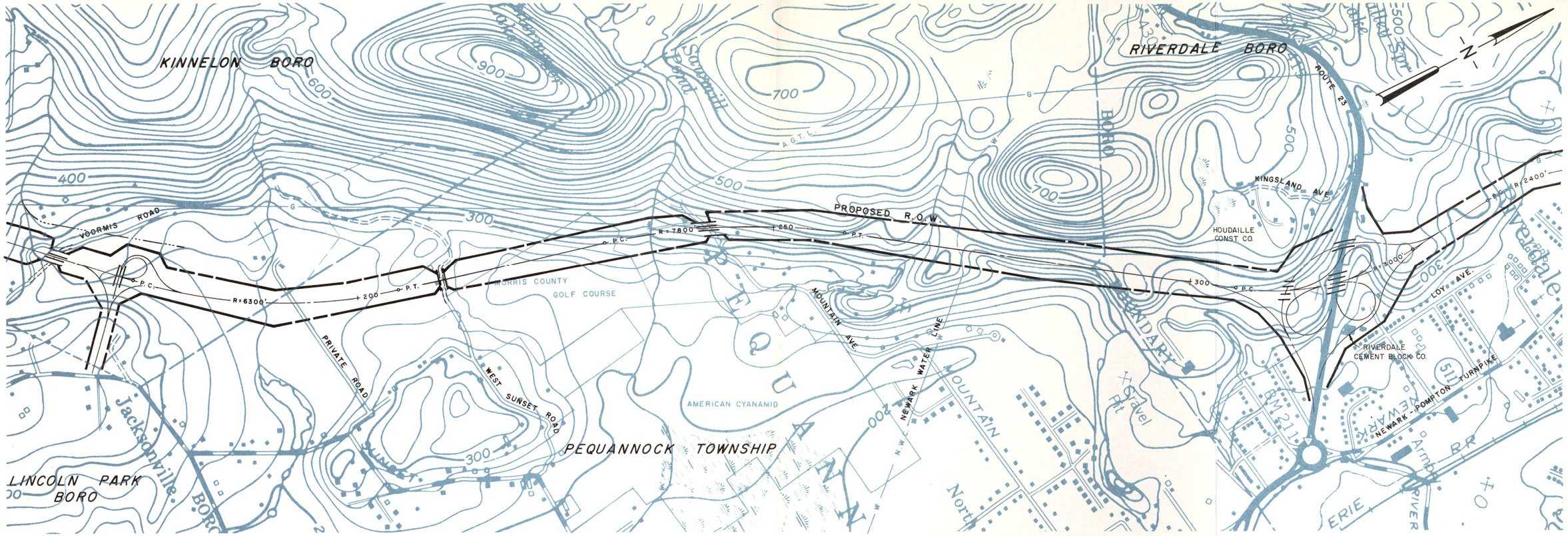

RIVER ROUTE

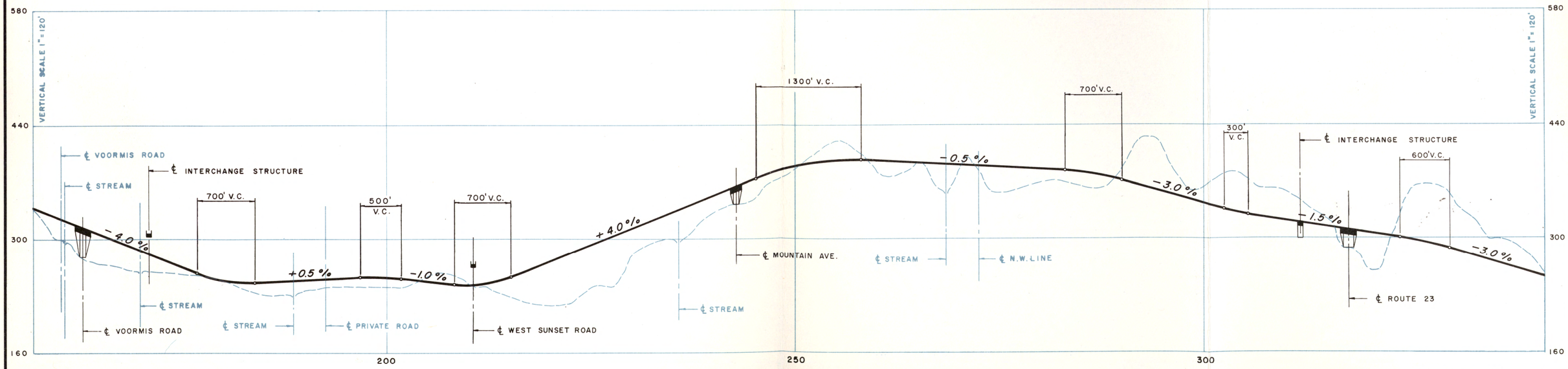
300 0 300 600 900 1200
SCALE IN FEET

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

PLATE 6A

# INTERSTATE ROUTE 287



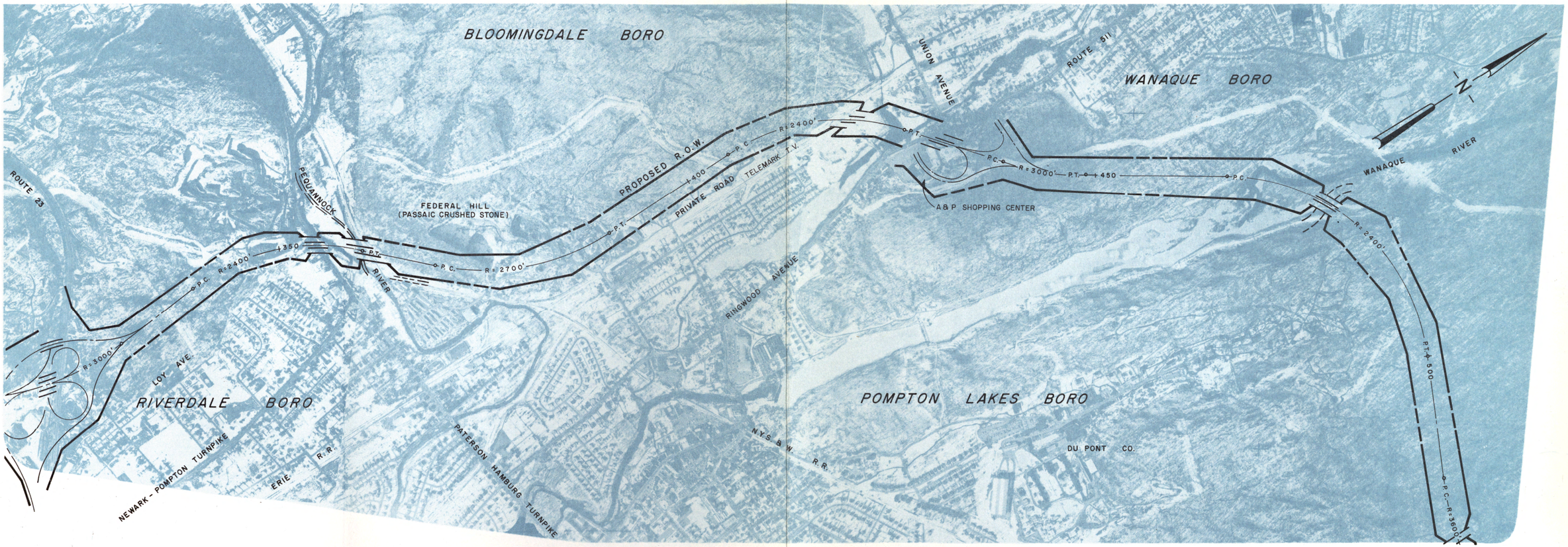




## RIVER ROUTE

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

300 0 300 600 900 1200
SCALE IN FEET

PLATE 6

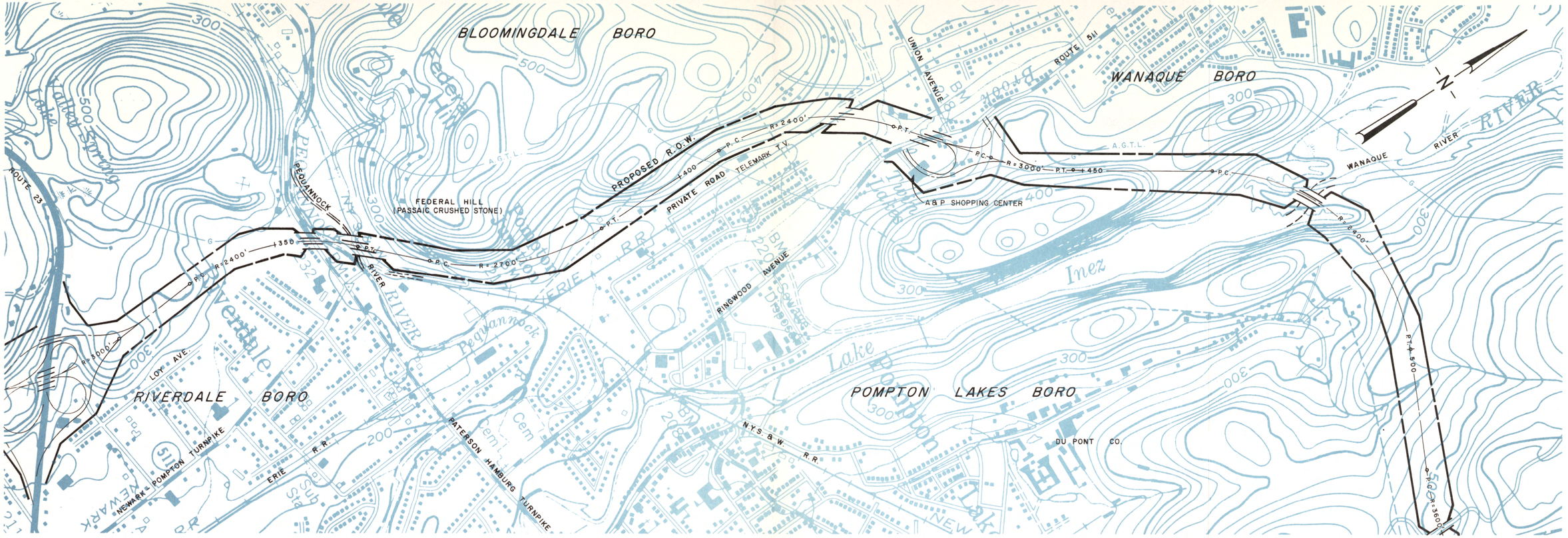


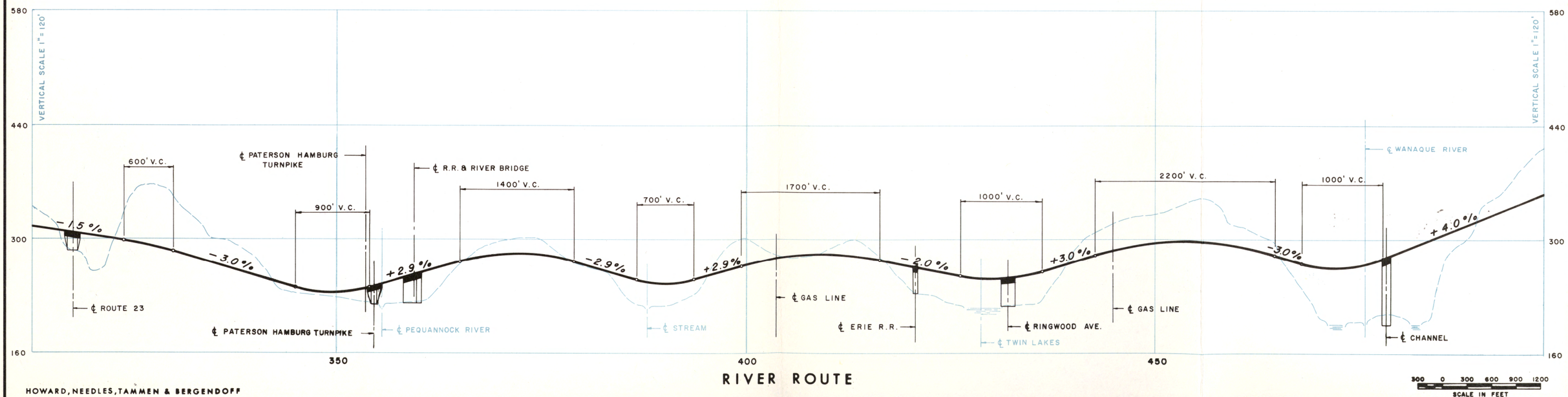

RIVER ROUTE

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

300 0 300 600 900 1200
SCALE IN FEET

PLATE 7A



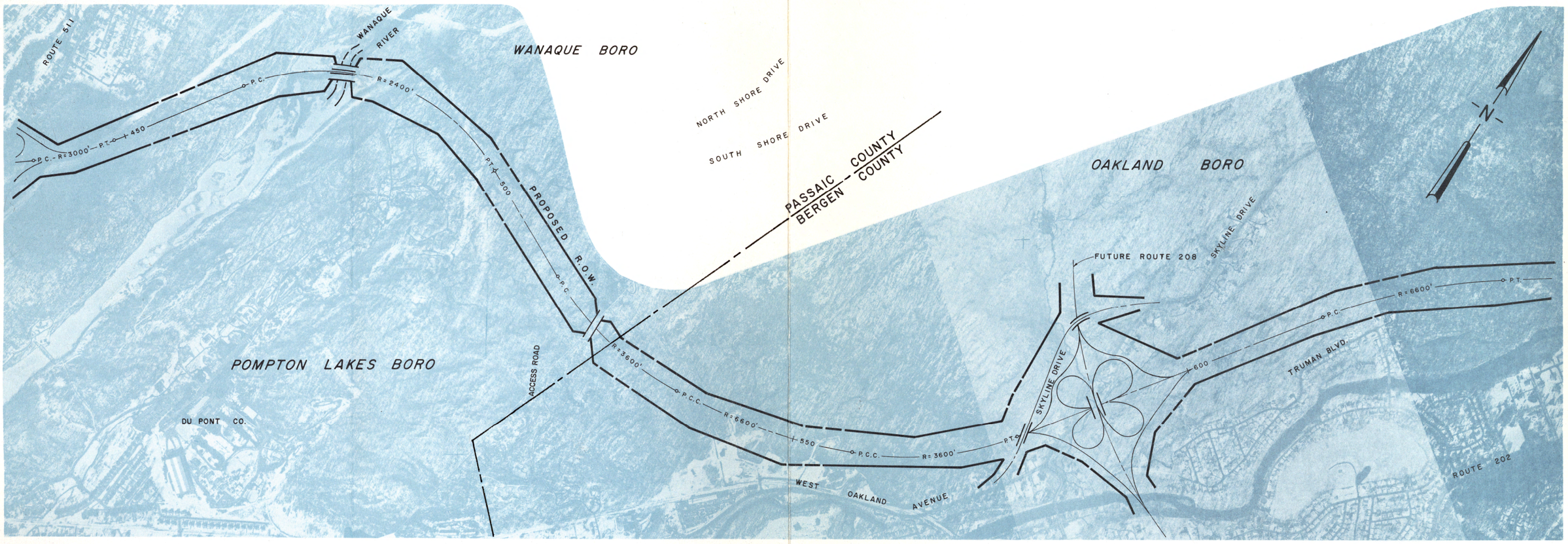




## RIVER ROUTE

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

300 0 300 600 900 1200
SCALE IN FEET

PLATE 7

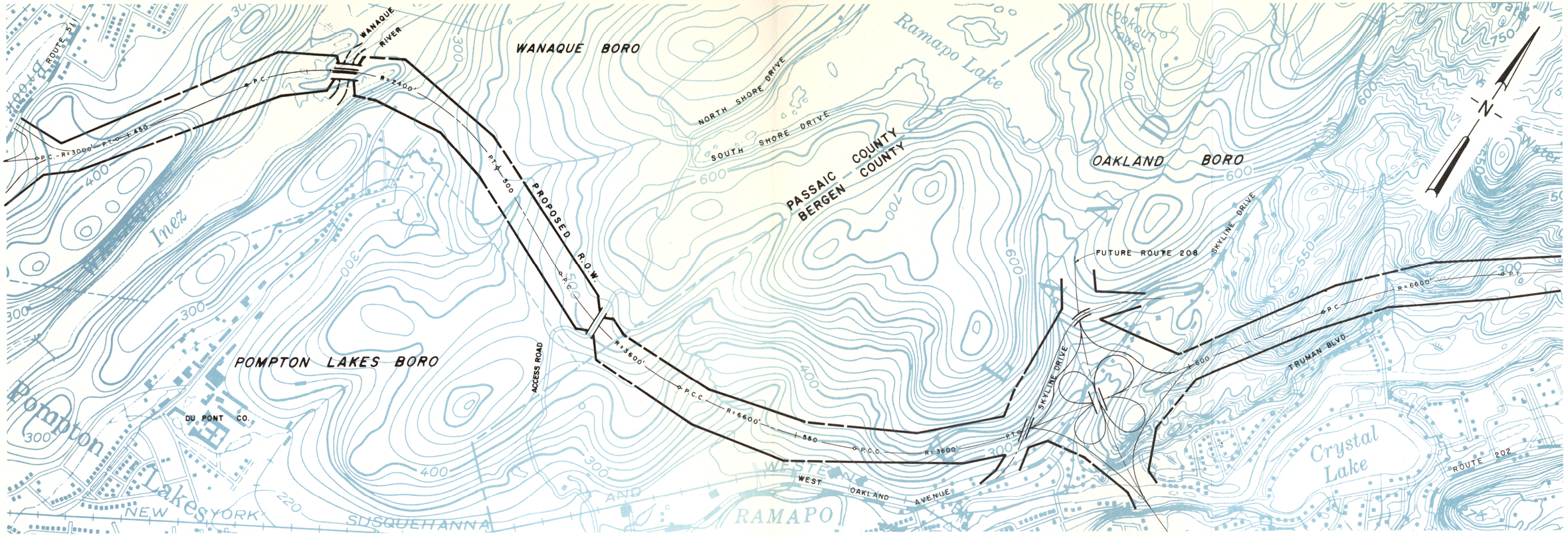


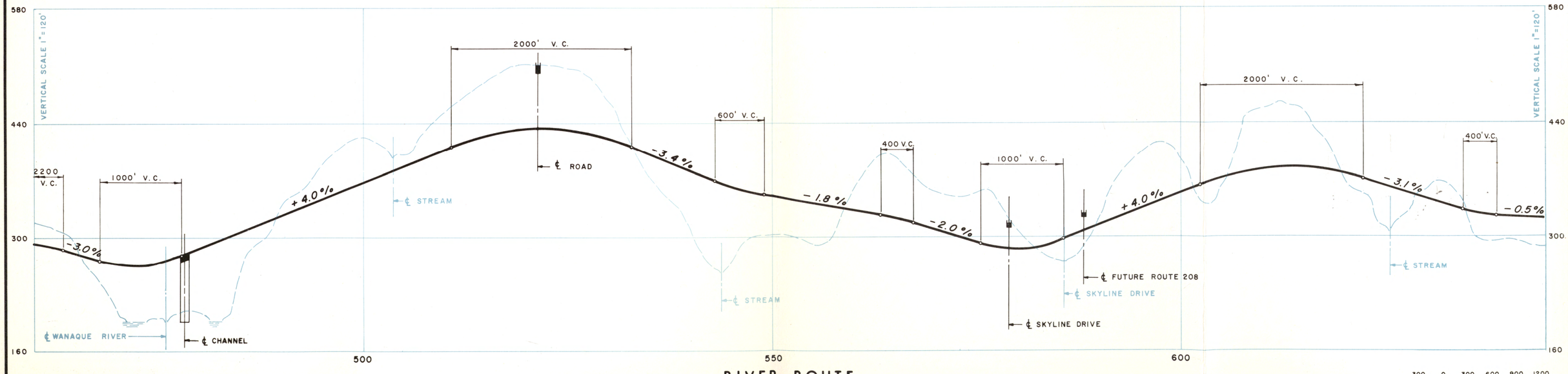

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

RIVER ROUTE

300 0 300 600 900 1200
SCALE IN FEET

PLATE 8A



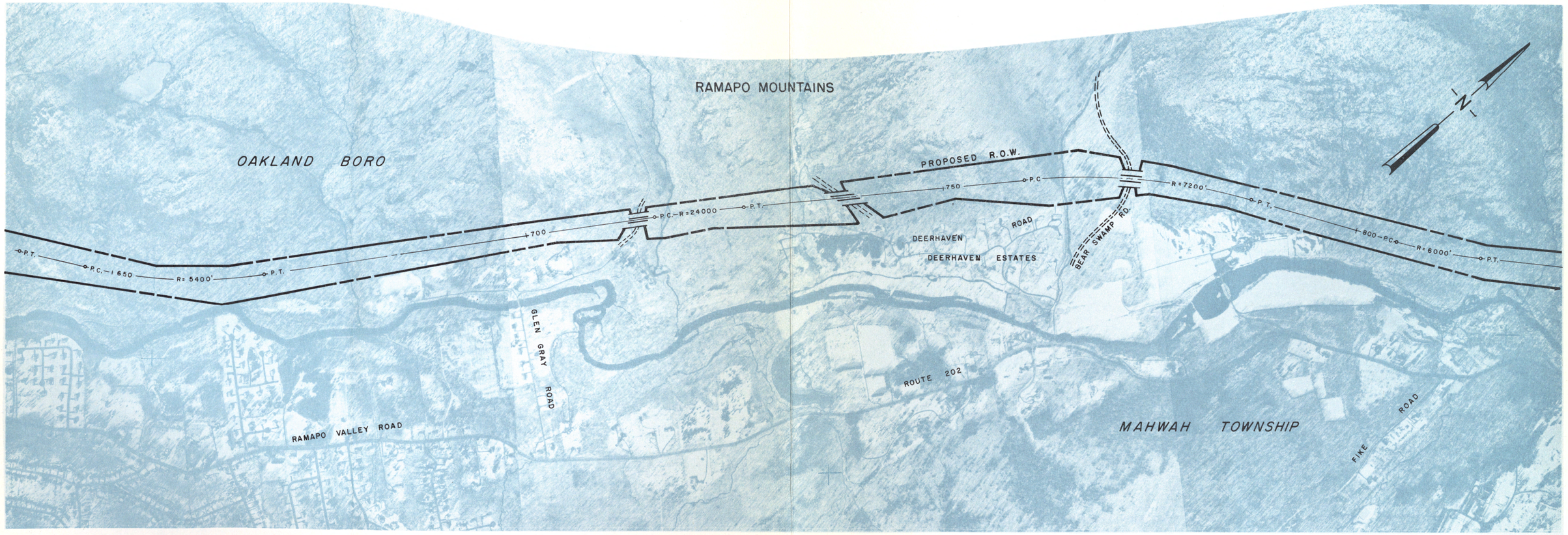




HOWARD, NEEDLES, TAMMEN & BERGENDOFF

## RIVER ROUTE

SCALE IN FEET 300 0 300 600 900 1200

PLATE 8

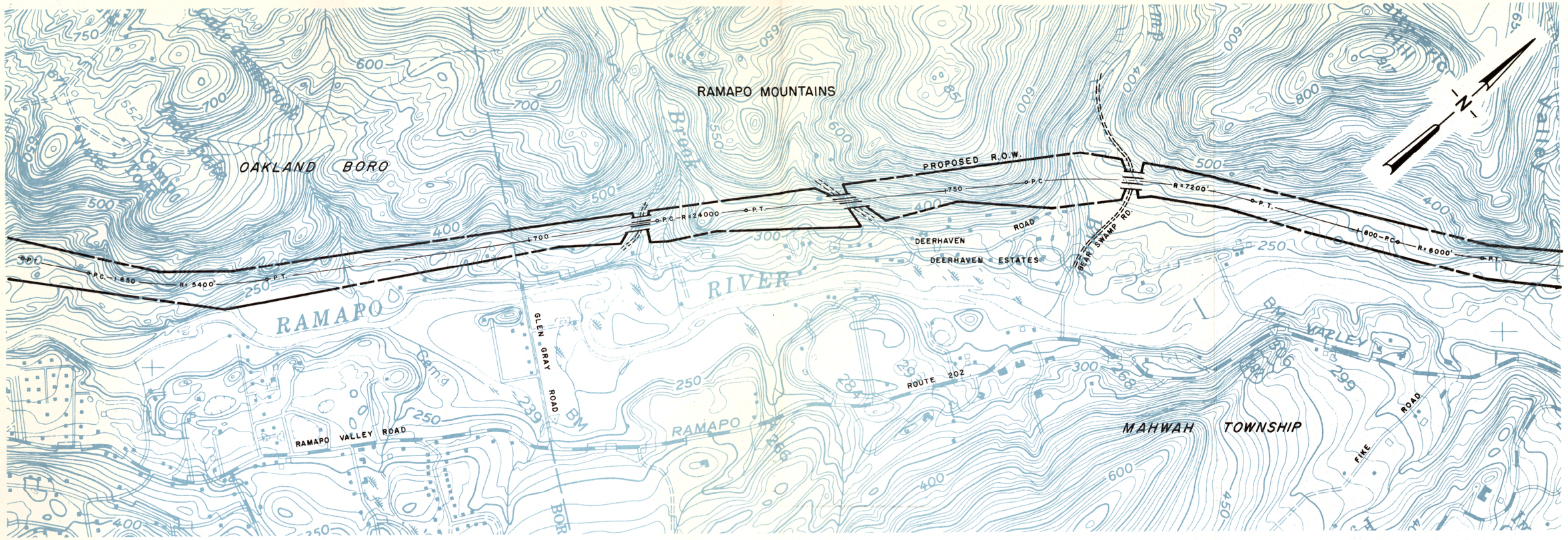


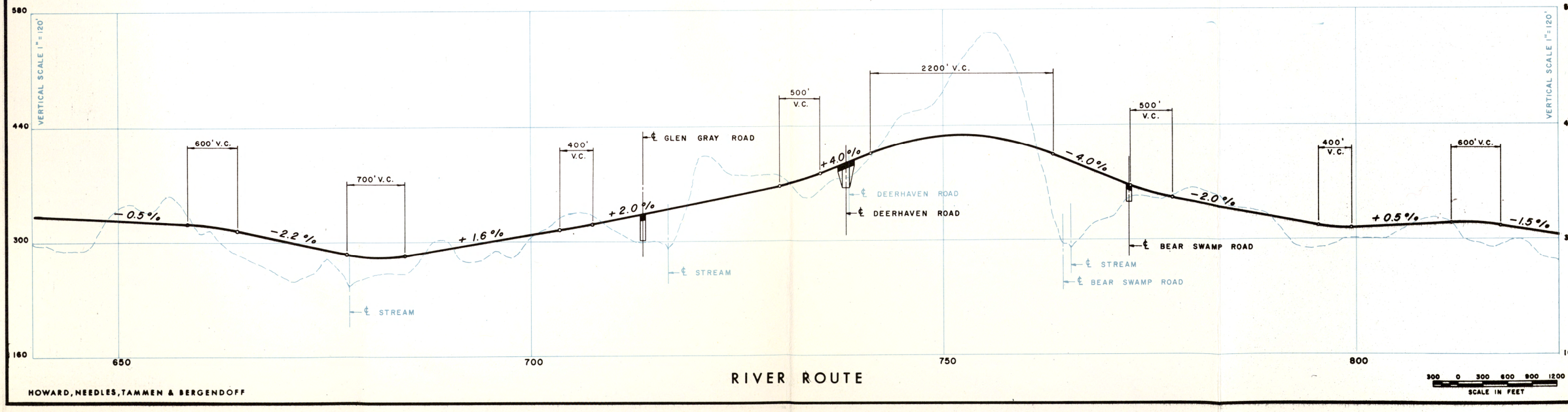

RIVER ROUTE

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

300 0 300 600 900 1200
SCALE IN FEET

PLATE 9A



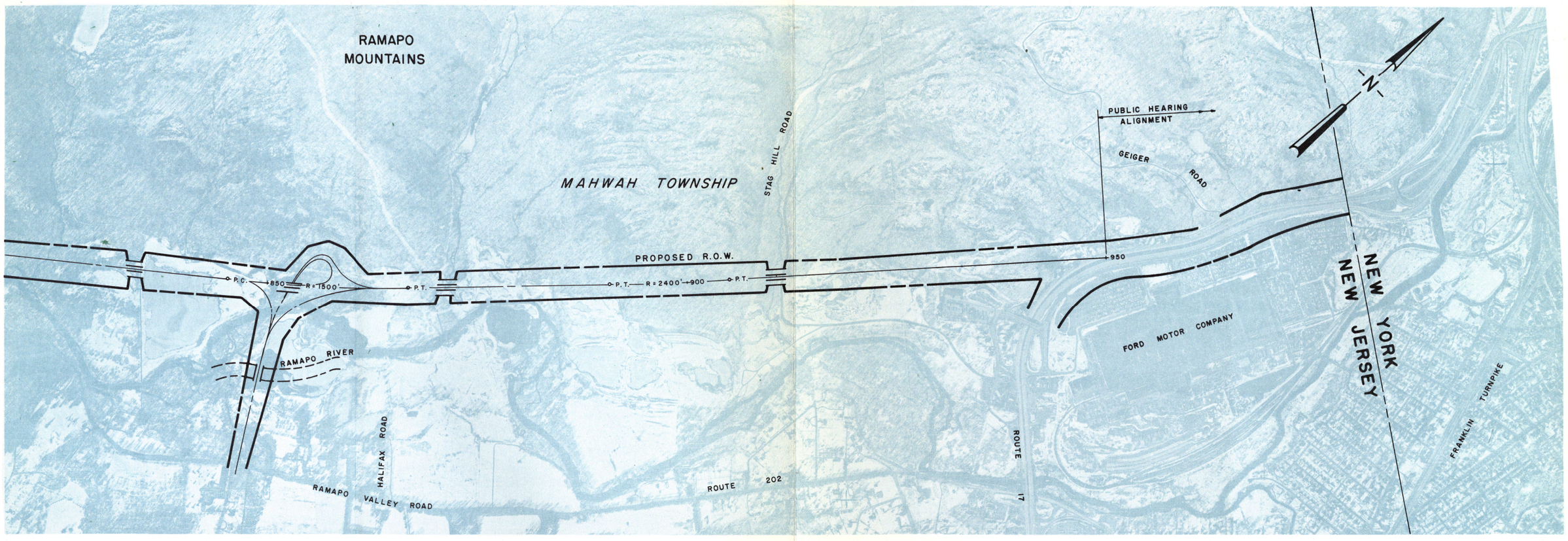




HOWARD, NEEDLES, TAMMEN & BERGENDOFF

RIVER ROUTE

300 0 300 600 900 1200
SCALE IN FEET

PLATE 9




HOWARD, NEEDLES, TAMMEN & BERGENDOFF

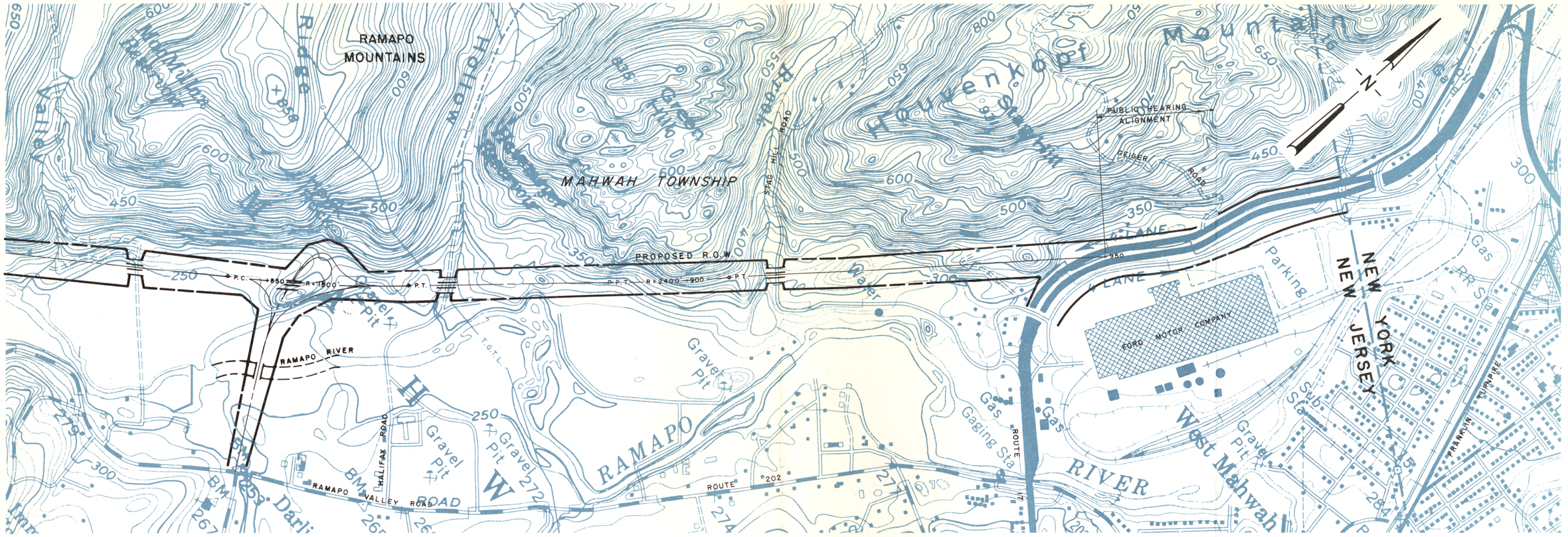
RIVER ROUTE

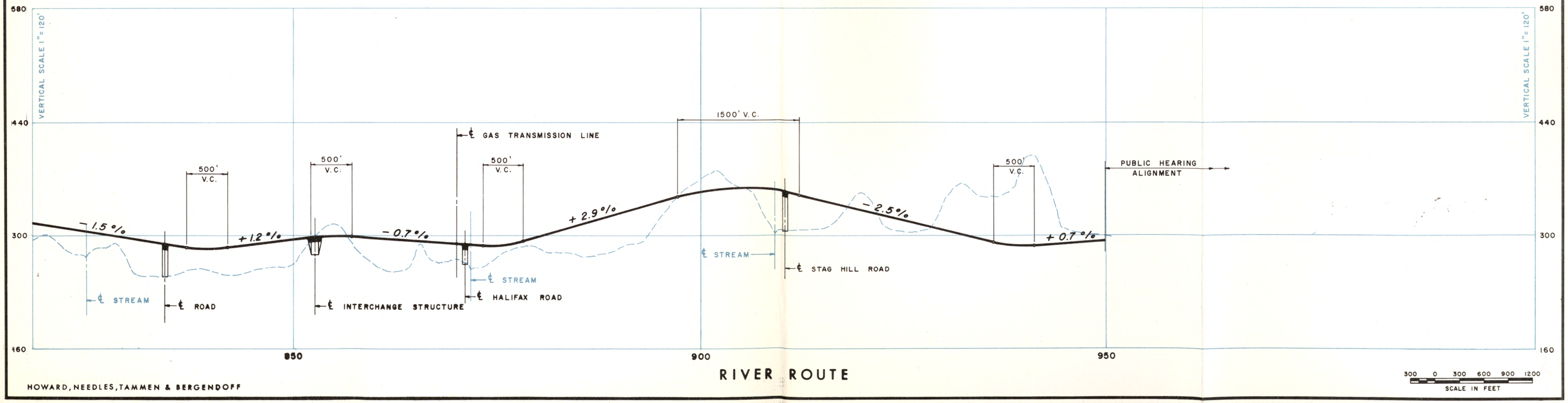
300 0 300 600 900 1200
SCALE IN FEET

PLATE 10A

New Jersey State Library





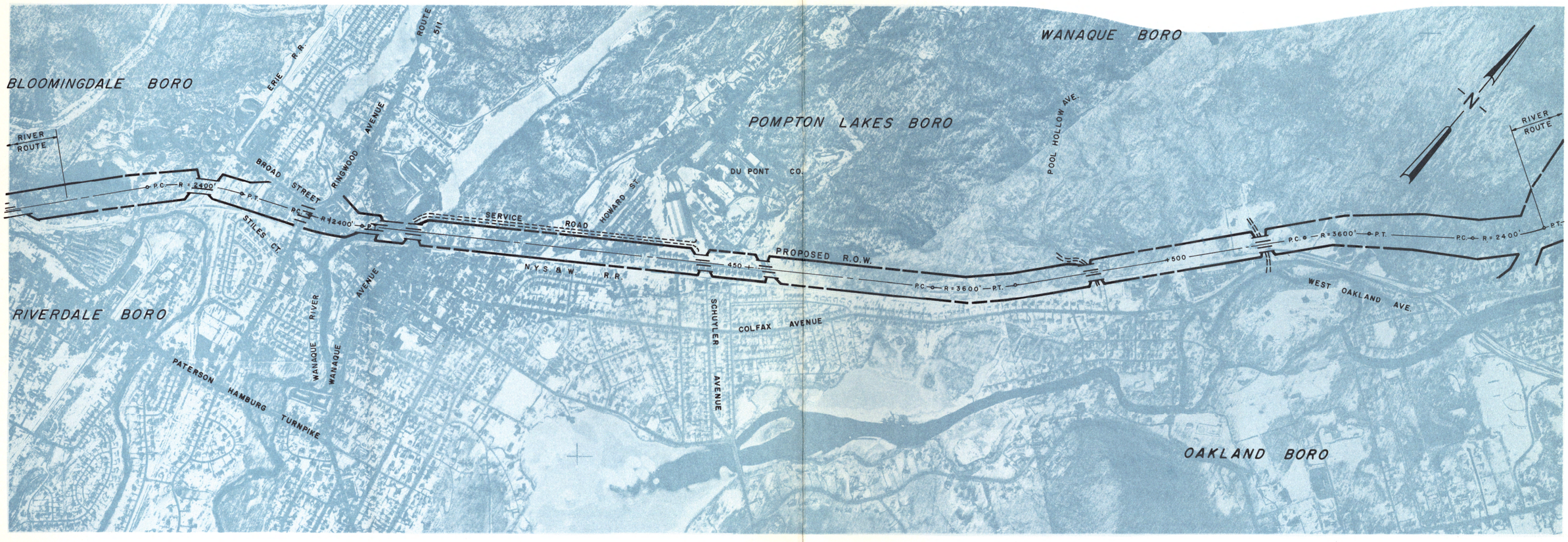




RIVER ROUTE

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

300 0 300 600 900 1200
SCALE IN FEET

PLATE 10

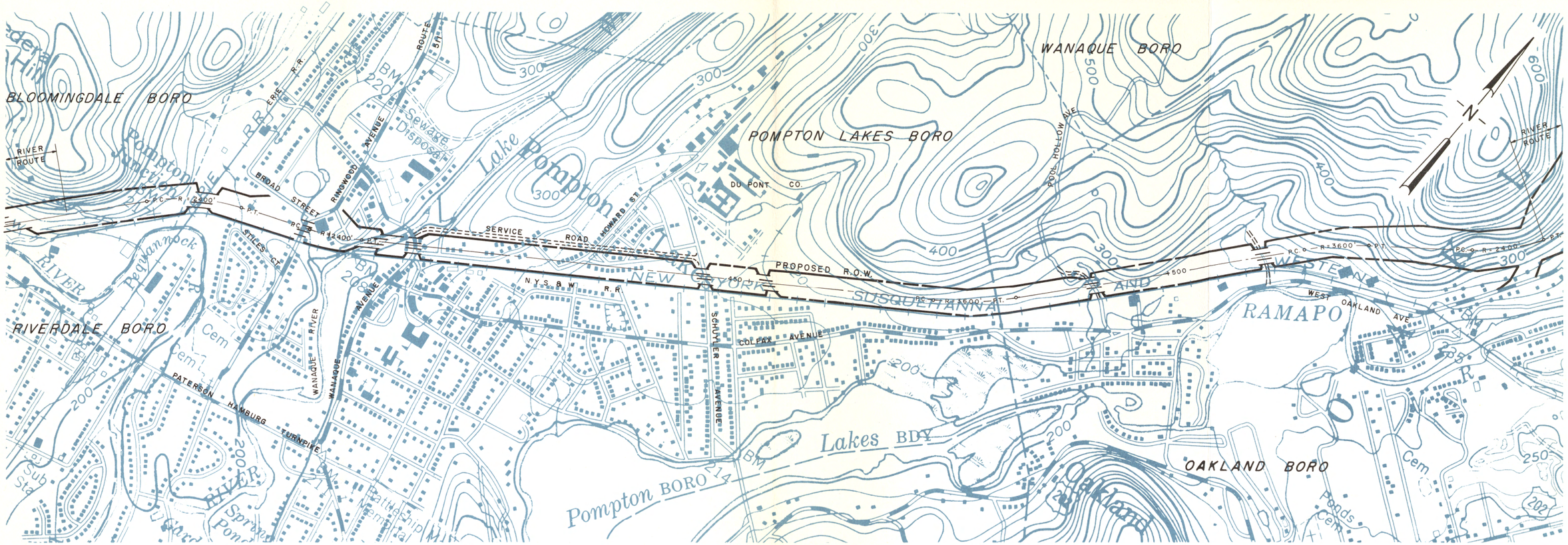


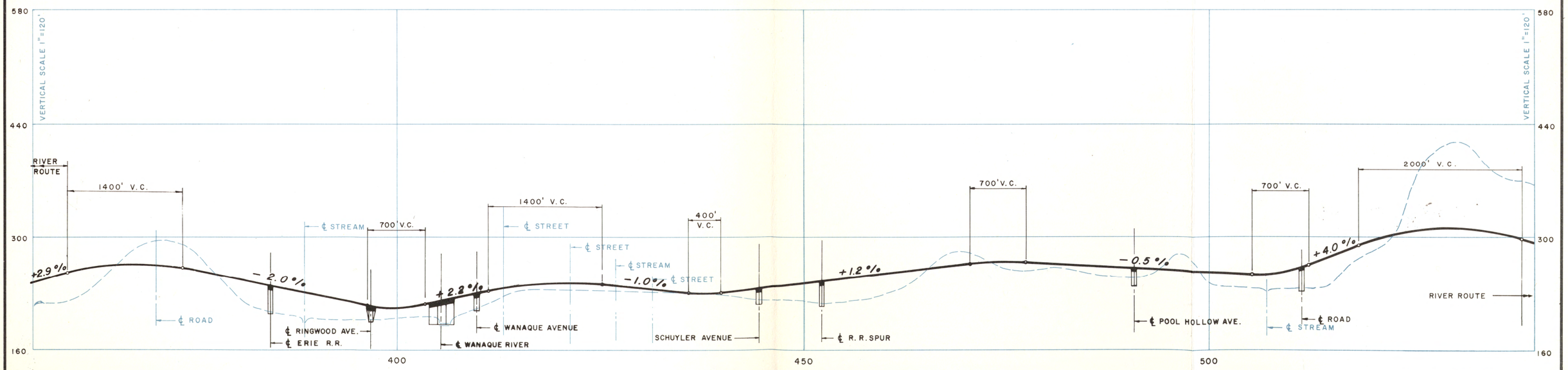

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

R. R. ALTERNATE

300 0 300 600 900 1200
SCALE IN FEET

PLATE 11A



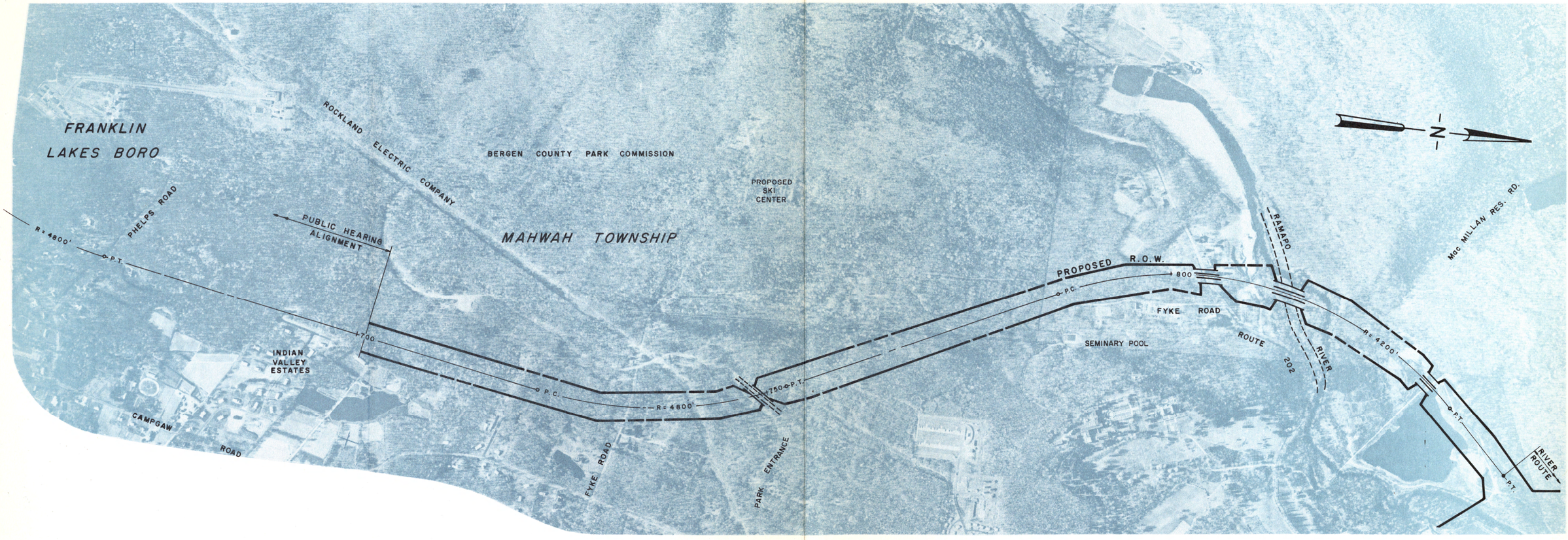




HOWARD, NEEDLES, TAMMEN & BERGENDOFF

## R. R. ALTERNATE

SCALE IN FEET 300 0 300 600 900 1200

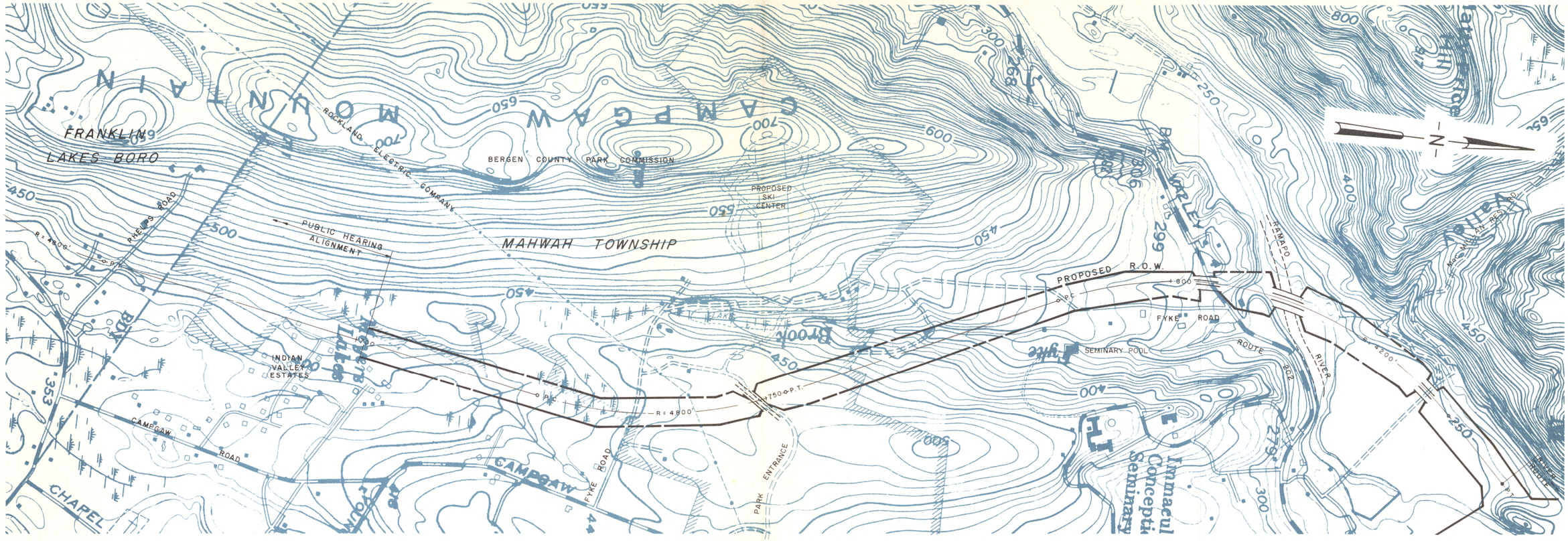
PLATE 11

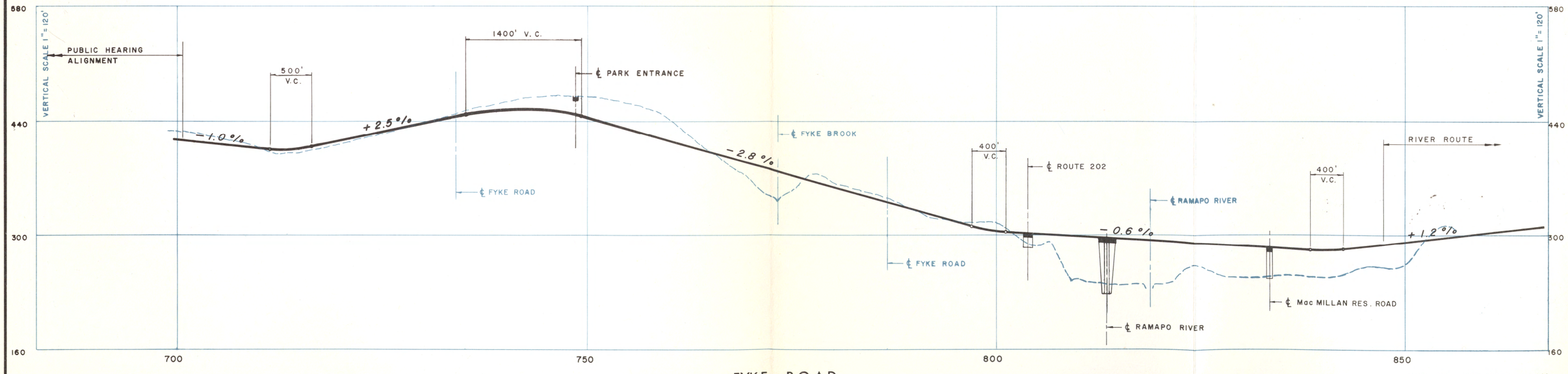



FYKE ROAD

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

PLATE 12A




FYKE ROAD

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

300 0 300 600 900 1200
SCALE IN FEET

PLATE 12

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
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FAIRFIELD, NEW JERSEY