State of New Jersey
Department of Transportation

PRESERVATION PLAN
FOR THE
ROUTE 1 & 9 CORRIDOR

ESSEX & HUDSON COUNTIES, NEW JERSEY

MAY 1998

Submitted by:

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New Jersey's highways, bridges, roads, and rail lines constitute the circulation system supporting the state's economic, cultural and social pattern. Maintaining state highways and structures as functioning arteries is a critical responsibility for the Department of Transportation. At the same time, the Department is cognizant of its responsibilities to protect those elements of its system that have unique historical or cultural value. It is the need to develop a preservation plan that helps balance these two goals that gives rise to this study.

A. BACKGROUND

Routes U.S. 1&9 serves as a major north-south commuter and truck arterial which carries traffic through heavily urbanized areas in northern New Jersey. At the Route's intersection with the Tonnele Avenue Circle in Jersey City, Route 139 branches off to form a connection with the entrance to the Holland Tunnel. This tunnel, which is owned and operated by the Port Authority of New York and New Jersey, provides access to the southern part of Manhattan.

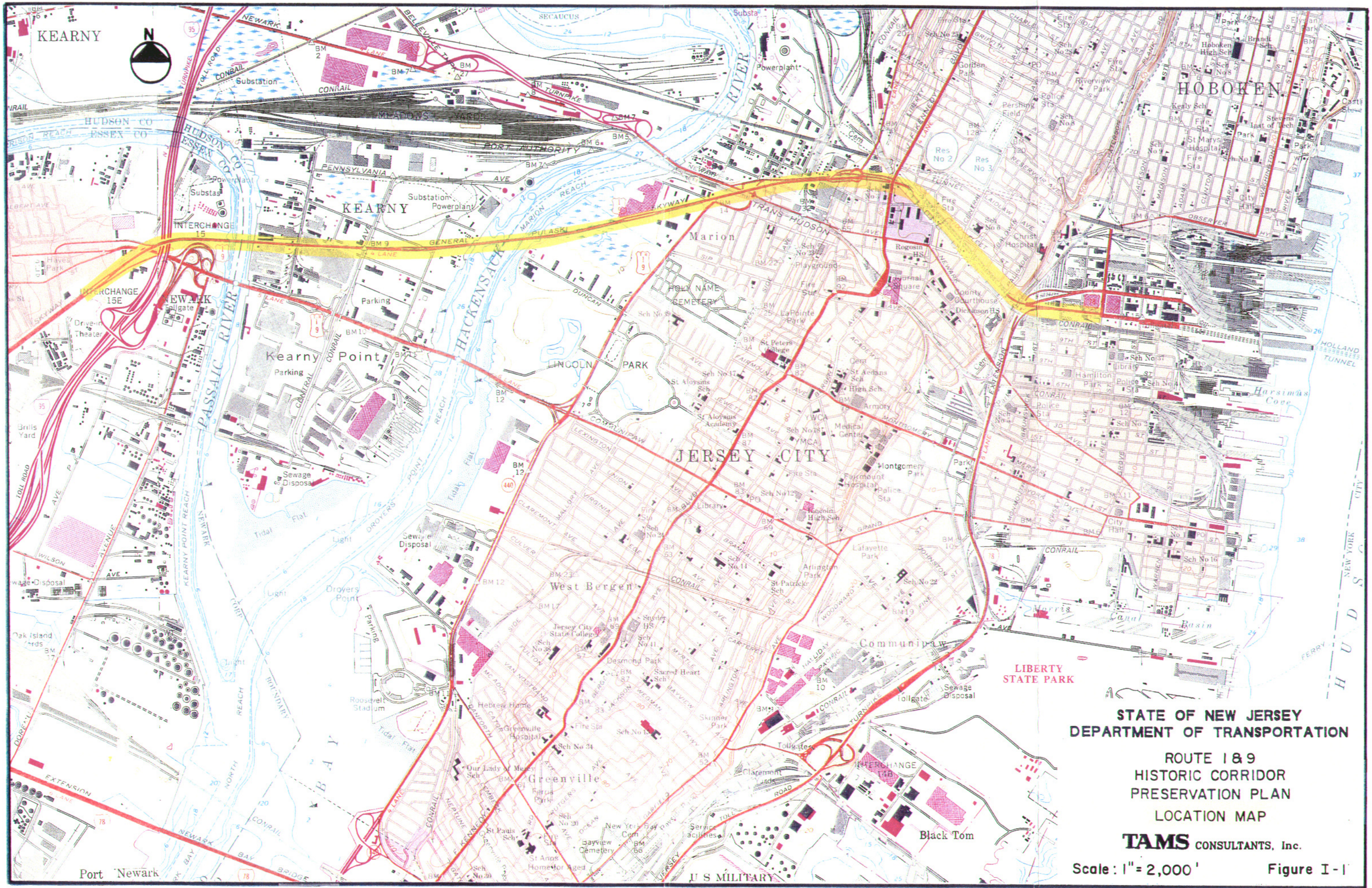
Due to heavy traffic volumes and substandard roadway conditions, which have impeded traffic operations and safety along the entire roadway, the New Jersey Department of Transportation has implemented a long term program to correct existing deficiencies and provide improvements that will accommodate current and future travel demands. As part of these improvements significant modifications and/or demolition may be required for several of the structures on this highway.

In accordance with the requirements of Section 106 of the National Historic Preservation Act of 1966 (NHPA), historic research and an analysis of integrity and significance was performed for a 13.2 mile section of the Routes U.S. 1&9 and Route 139 roadways. The results of this study, completed by TAMS in August of 1991, is documented in the report Historical Narrative and Assessment of Significance and Integrity. Based upon this effort, elements of the original corridor were determined to be eligible for the National Register of Historic Places.

Deteriorated physical conditions and substandard conditions necessitated the demolition of three of the eligible structures in the original corridor. As part of the Memorandum of Agreement (MOA), dated September 2, 1992 related to this adverse effect, and in preparation for other future actions on the corridor, the Department of Transportation agreed to prepare a Preservation Plan for corridor's remaining eligible elements. The purpose of this document is to evaluate the existing conditions in the corridor and identify broad goals and specific strategies related to their preservation.

B. LIMITS OF STUDY

The Corridor, as included in this plan, consists of a 4.75 mile stretch of roadway which includes the entire (approximately 1.5 mile) length of Route 139, together with approximately 3.25 miles of Routes U.S. 1&9. The corridor is located in Hudson and Essex Counties and has a northern boundary of the Route 139 intersection with Jersey Avenue in Jersey City (see Figure I-1), and a southern boundary at the southern end of the structure designated as the Pulaski Skyway, located in the City of Newark, near the intersection with Foundry Street.



STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION

ROUTE 1 & 9
HISTORIC CORRIDOR
PRESERVATION PLAN
LOCATION MAP

TAMS CONSULTANTS, Inc.

Scale: 1" = 2,000' Figure I-1

The highway has had various designations over its lifetime, including the Route 1 Extension (its historic name) and Route 25. For simplicity, this document will refer to the section as Route 1&9 or the Corridor.

The limits of the study area were chosen to be consistent with the limits of the Corridor's original structures which were determined to be eligible for the National Register of Historic Places by consultation among the New Jersey Department of Transportation, the Federal Highway Administration and the New Jersey Historic Preservation Office. These determinations of eligibility were based on the study for the corridor completed by TAMS in August of 1991. Other structures which may be eligible based upon a possible association with the original Corridor were not included in the scope of this study. These structures include facilities such as the 14th Street Viaduct and the St Paul's Avenue Viaduct both of which are located in Jersey City.

C. HISTORIC TRANSPORTATION CORRIDORS

The concept of Historic Transportation Corridors, or at the least, a transportation corridor such as the Route 1&9 corridor comprised of eligible structures and roadway, is a fairly recent development in the preservation community. It is presently used to describe a wide variety of linear historically significant entities from aboriginal trails to modern day canals, parkways and railroads. The Historic Transportation Corridor, however, is more than just the road or other linear features, it includes its defining elements such as bridges, viaducts and access ramps.

Based upon our interviews with numerous staff members of historic and transportation organizations, the designation of a functioning, high traffic volume arterial roadway as a Historic Transportation Corridor appears to be without precedent. While other roadways have been designated historic, the reason for their significance was often due to the surrounding natural features (e.g. Skyline Drive and the Blue Ridge Parkway). Other roadways, that have been determined eligible based upon their transportation related significance, have low traffic volumes or are of sections of roads located in parks (e.g. Route 66 and the National Road). In addition, in most of the historic corridors one of the key aspects of the preservation activities is the potential benefits from recreational usage or increased tourism. Thus the typical designations and methods of preservation (including scenic byway, historic trail and heritage corridor) are not applicable to Route 1&9.

D. PRESERVATION PLAN ELEMENTS

The term preservation, when related to an historic resource, is defined in the Secretary of the Interior's Standards as, "generally, saving from destruction or deterioration old and historic buildings, sites, structures and objects and providing for their continued use by the means of restoration, rehabilitation or adaptive use." Specifically, "the act or process of applying measures to sustain the existing form, integrity, and material of a building or structure.... It may include stabilization work, where necessary, as well as ongoing maintenance of the historic building materials."

In order to preserve these historic resources, a plan is often developed to :

- Identify and evaluate existing circumstances
- Gain consensus regarding future goals and objectives
- Formulate specific strategies to address the goals

This plan, typically referred to as a preservation plan, can include a range of possible strategies for keeping historic properties in place, maintaining their integrity, and, in the words of the National Historic Preservation Act, "letting them exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations" (16: U.S.C. 470-1(1)). A realistic preservation plan will also include provision for those instances in which historic resources cannot be physically preserved - when other community needs demand that they be removed, (or) demolished.[1]

The most common use of a preservation plan, in New Jersey, is for communities to include an historic preservation plan element as part of their master plan. (Both Jersey City and Newark have a historic preservation element included as part of their Master Plans, although neither deal specifically with the Route 1&9 Corridor.) The State Historic Preservation Office (HPO) participates in the preservation planning process by certifying local governments and delegating them with limited preservation responsibilities. One of the most critical criteria for this designation, however, is the adoption of an historic preservation plan. Once adopted by the local government agency, it is their responsibility to make subsequent actions consistent with the plan in order to maintain their designation.

While the concept of an historic preservation plan is not unique, its use on the elements of a highway corridor like Route 1&9 is without precedent in New Jersey. The elements of the plan and the basic philosophy behind its need, however, remain the same. The preservation planning process for the Corridor is like that for any other cultural resource and involves the four elements included in this document:

- Historic research,
- Inventory and documentation of existing conditions,
- Site analysis; and
- Preservation treatment selection.

E. DEFINITIONS

Because the majority of normal preservation activities focus on individual and groupings of buildings, and the goal of this plan is to preserve an engineering accomplishment, basic terms related to preservation activities require definition. This need is especially true for terms such as

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[1] Patricia L. Parker, Guidelines for Local Surveys: A Basis for Preservation Planning (Washington, D.C.: National Park Service, revised 1985), p.61.

rehabilitation which can have an entirely different meaning to the engineering and preservation communities. With respect to the Route 1&9 Corridor, the following general definitions of terms will apply in this Preservation Plan.[2]

Rehabilitation

"The act or process of returning a property to a state of utility through repair or alteration which makes possible an efficient contemporary use while preserving those portions or features of a property which are significant to its historical, architectural and cultural values." (Secretary of the Interior's Standards).

Renovation

Modernization of an old or historic structure that may produce inappropriate alterations or elimination of important features and details.

Restoration

"The act or process of accurately recovering the form and details of a property and its setting as it appeared at a particular period of time by means of the removal of later work or by the replacement of missing earlier work." (Secretary of the Interior's Standards).

Stabilization

"The act or process of applying measures designed to reestablish a weather resistant enclosure and the structural stability of unsafe or deteriorated property while maintaining the essential form as it exists at present." (Secretary of the Interior's Standards).

Since a resource such as a highway corridor is inherently different from other structures, these definitions will, in some cases, require interpretation. Alterations to highways occur both continuously and of necessity, to meet current design standards and provide the safe mobility of people and goods. The Route 1&9 Corridor itself, as discussed in the prior TAMS' report served as an experimental bed for the development of components such as expansion joints which were continuously refined during the course of the highway's construction. Therefore, the extent, or nature, of any proposed alterations and their potential effect on the historic integrity of the resource also need to be evaluated in terms of their overall purpose in relation to the function of the roadway.

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[2] Definitions taken from Diane Maddex, Ed., The Brown Book: A Directory of Preservation Information (Washington: The Preservation Press, National Trust for Historic Preservation, 1983).

F. BROAD PURPOSES AND GOALS

The planned, long term, operational character of the Route 1&9 Corridor is entirely consistent with its original purpose: to provide high speed, efficient and cost effective access to the Holland Tunnel from northern New Jersey. The Corridor, however, is now more than sixty years old and, despite work undertaken in prior years, requires extensive investment and construction in order to maintain its current (and historical) function as an arterial highway.

The physical conditions and needs of the individual elements of the Corridor, as will be discussed in a subsequent section, are different. All, however, have existing substandard features and are in varying degrees of deterioration. To address these needs, some of the possible approaches can be consistent with the broad goals of historic preservation, while others would clearly not be preferred. As indicated in a prior part of this section, rehabilitation, as per the Secretary of the Interior's Standards, is "the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historical, architectural and cultural values."

One broad purpose of the plan, therefore, is to obtain a consensus between the Department's goal of upgrading and maintaining the corridor for its original and current "contemporary use" as an arterial highway and the cultural resource goal of preserving "those portions and features" which are "significant to its historic, architectural and cultural values." However, prior to undertaking any significant modifications to the corridor's elements, the consensus of the surrounding communities should also be obtained.

Another broad purpose of the plan is to allow the State Historic Preservation Office to delegate to the Department of Transportation, after the adoption of the plan, certain preservation-related decisions that are consistent with the intent of the plan. This delegation of responsibility will allow the Department to implement improvements to the Corridor in an efficient manner without going through the often time consuming regulatory approval process, for actions predetermined to be required and consistent with the overall intent of the plan.

These broad purposes required the identification of goals on which consensus can be gained and formulation of specific strategies to address them. In order to gain this consensus, it is first important to define the term "goal" within the context of this historic preservation plan. A "goal" will be defined as a broad, general, statement regarding desired outcomes. To meet these goals, however, will require the use of specific strategies. These strategies will be called "tasks" and will be defined in a subsequent section.

The goals for the historic preservation of the elements of the Route 1&9 Corridor are as follows:

Goal 1: Document the Existing Corridor

Purpose: Provide a permanent record of the historic elements of the Corridor, while it maintains its current state of integrity and before the current deterioration of some of its elements requires the Department to make repairs or initiate rehabilitation which could possibly alter the historic characteristics.

Goal 2: Improve Physical Condition of the Structures

Purpose: Stabilization, rehabilitation or, where necessary, replacement of elements of the Corridor is required due to their existing conditions and functional requirements. The determination should be made based upon an analysis of these alternatives. The analysis should consider the net effect on the structure with emphasis placed on minimizing adverse effects on the features which provide the historic character.

Goal 3: Improve Traffic Safety Throughout the Corridor

Purpose: Provide improvements throughout the corridor which allow the Department to meet its mission of safely moving people and goods. The improvements, however, should be selected and designed such that they consider the net effect on the Corridor with emphasis placed on minimizing adverse effects on the features which provide its historic character.

Goal 4: Develop Maintenance Procedures/Standards for the Corridor

Purpose: A drawback to rehabilitation and reuse of older bridges and other structures is an increased maintenance demand. In addition, complex structures, like the Pulaski Skyway, have more specialized requirements. The plan will address these issues and suggest possible procedures and/or standards to meet the needs of maintaining the historic elements of the Corridor.

Goal 5: Improve the Physical Appearance of the Corridor

Purpose: The location of the Corridor is such that it acts as the entrance to New Jersey for traffic from the Holland Tunnel. Its urban location, age and usage as a primary truck route have lead to a physical appearance which is not in character with its historical importance. The plan will identify possible techniques which could be implemented to improve the appearance to the users of the highway.

Goal 6: Improve Public Awareness of the Corridor's Historic Significance

Purpose: An important strategy in promoting historic preservation is improving the public's awareness of its historical importance. This improved awareness will be focused both on the engineering community to make them more aware of its role in the development of highway planning and transportation design and to the general public to make them more aware of its importance to the state's development.

It is with these goals in mind that the subsequent portions of the plan should be developed..

For this project, information was gleaned from the collection and review of Department of Transportation records, plans, correspondence, reports, and bid documents, historical documents, and newspaper articles.

The Route 1&9 Corridor, originally called the Route 1 Extension, is significant due to its contribution to the growth and development of the highway movement in New Jersey and because the Pulaski Skyway and the other significant structures illustrate the developing technology for planning and design of roadway construction in the late 1920s and early 1930s.

The highlights of the research findings on the background of the Corridor and a discussion of its defining characteristics and its historical significance are summarized below. A more complete discussion of the Corridor's history can be found in TAMS' report on the Corridor's Historical Narrative and Assessment of Significance.

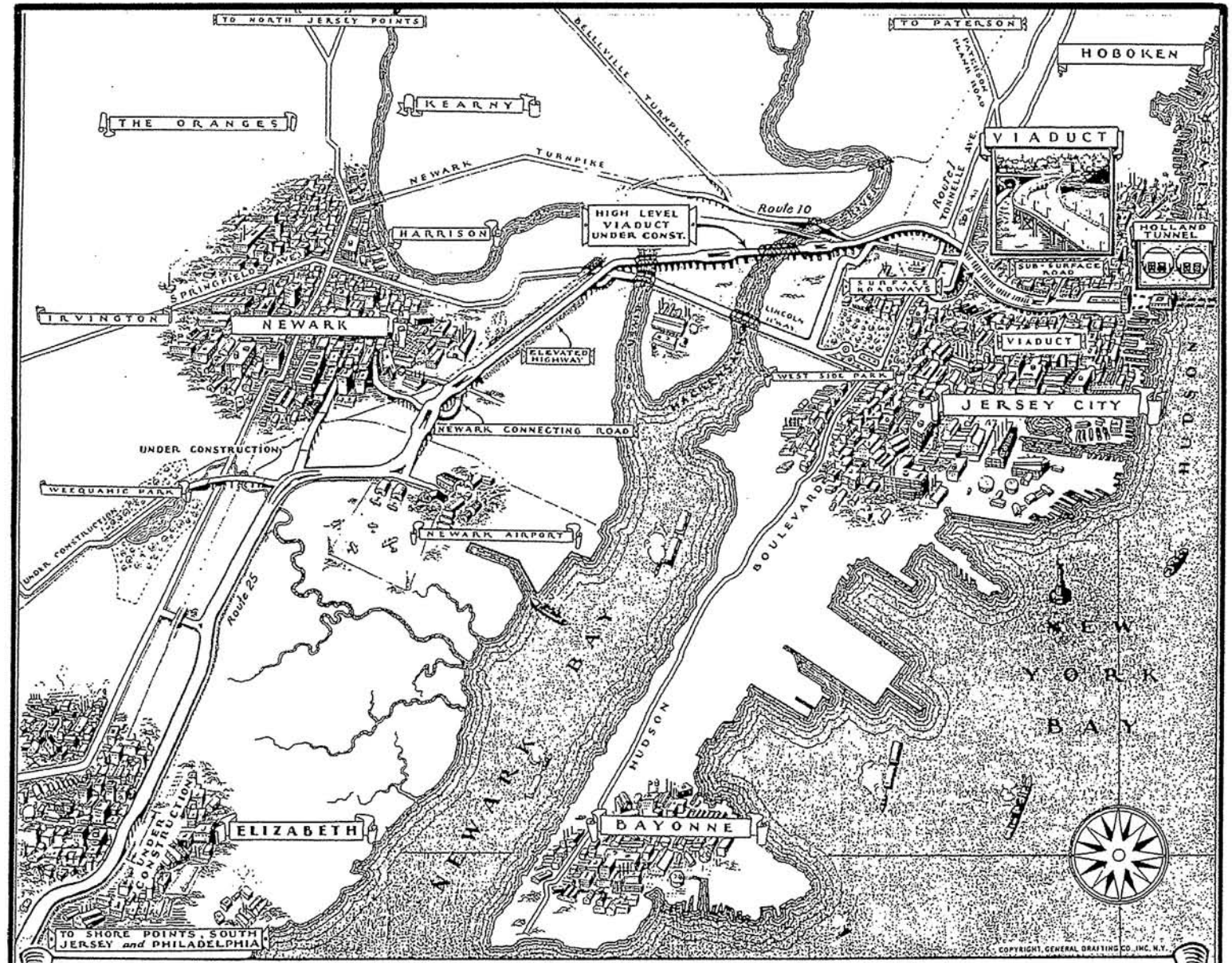
A. HISTORICAL NARRATIVE

The Route 1 Extension project, when completed in 1932, was the single largest highway construction project undertaken in the United States to that date (see Figure II-1 for a 1930 schematic drawing of the Corridor). It was built as a direct response to the New York and New Jersey State Legislatures' 1919 decision to construct a vehicular tunnel under the Hudson River between New York and New Jersey--the Holland Tunnel.

The need for a tunnel was the result of the historical development of the Port of New York. The majority of the port's shipping piers were located in Manhattan and Brooklyn, while the railroad yards were located in New Jersey, creating an excessively complicated goods handling system. Using trucks, railroad lighters in the bay, warehouses at piers, railroad cars, and ferries, the system was easily overloaded by a sudden surge in demand, such as that created during World War I. By November 1917, 180,000 railroad cars were trapped in Eastern ports, unable to unload, creating dramatic coal and food shortages, particularly in Manhattan.[3]

Following the war, many elaborate solutions to the problem of port congestion were offered; few were adopted, primarily due to the unwillingness of the railroads to undertake any new construction. The most promising was the creation of a ring railroad around the Manhattan and Brooklyn ports, linked by tunnels to New Jersey. However, in part in reaction to the monopolistic attitudes of the railroad, and in part a rejection of the transportation mode that created the problem, the proposal that received the greatest support was one that had been studied since 1906: the creation of a motor vehicle tunnel connecting New York's piers with New Jersey's railroad yards.

[3] For a full discussion of the Port of New York during the war, see: Carl Condit, The Port of New York (Chicago: University of Chicago Press, 1981): pp. 111-122.



Holland Tunnel Approach Roads built by the New Jersey State Highway Commission

The planning and construction, begun in 1923 have been carried steadily forward. Viaduct, sub-surface highway in Jersey City, and elevated roadway by-passing Newark are completed and carrying traffic. The construction is designed to handle present day traffic and future needs of this congested Metropolitan Area.

This work is considered by engineers to be the foremost step in modern highway engineering in this country.

Figure II - 1

The design of the tunnel was largely completed by late 1919 and contracts were let in 1921. With a design capacity of 1,900 vehicles per hour and a planned completion date of 1926,[4] it was imperative that New Jersey begin to plan and to provide adequate roads to accommodate such an artery. At the time the concept of developing large limited access highways expressly for motor traffic was a relatively new idea and only two other major highway projects had been constructed in the metropolitan area. The two projects, the Bronx River Parkway and the Long Island Motor Parkway, however, had an entirely different design and purpose than the Route 1 Extension.

1. The Highway Movement

From 1910 - 1920 The call for the improvement of the road system in America, known as The Highway Movement, was supported by an amalgam of commercial lobbies including car makers, oil refiners, road builders, private citizens, powerful interest groups. The movement achieved its first major success in the passage of the Federal Aid Act of 1916 providing $75 million over the next five years to states with responsible highway departments. In 1921, the highway promoters obtained the passage of the first Federal Highway Act, mandating that federal aid be focused upon "such projects as will expedite the completion of an adequate and connected system of highways, interstate in character."[5] Despite federal aid, progress in the development of a national highway system continued slowly. Areas around major ports such as New York and San Francisco experienced worsening road congestion due to increasing automobile registrations and auto speeds. The Highway Movement's subsequent success in lobbying for federal funds to ease congestion of the roads in those areas marked the end of the pioneer period of American highway development, establishing motor transport as the primary means of communication for the rest of the century.

2. General Concept of the Superhighway

The general concept of the superhighway as a limited access, multi-lane, express roadway had its genesis in the early 1920s, but the etymology, as yet, remains obscure. The first definition of such a highway appears to have been offered in 1918 by Maryland Highway Commissioner H.G. Shirley. He described this type of road as one with divided lanes on a separated grade, shallow, banked curves, and hills of no more than three to five percent grade.[6] In the early 1920s, this concept was accepted by the engineering community. In 1923, Detroit developed a master plan that included superhighways.[7] In the mid-1920s, Robert Moses began to plan the parkway systems of Long Island and Westchester County.

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[4] Trevor I. Williams, A Short History of Twentieth Century Technology (New York: Oxford University Press, 1982), p. 228.

[5] Ibid., p. 245.

[6] Bruce Seely, Building the American Highway System (Philadelphia: Temple University Press, 1987), p. 146.

[7] Seely, op. cit., pp. 150-151.

3. New Jersey's Response

When the New Jersey Interstate Bridge and Toll Commission and the New York Board of Transportation and Commerce adopted plans for what was to be the Holland Tunnel, it became imperative that New Jersey begin to plan to provide adequate roads to service that facility. The Tunnel would concentrate a large volume of traffic at a single point in Jersey City, which was then only accommodated by local roads already congested with local commercial traffic. Consequently in 1921, the New Jersey Legislature provided for the Extension of Route 1 from its terminus in Elizabeth to connect with the vehicular tunnel.

Planning for the extension of State Highway Route 1 from the Hudson River Vehicular Tunnel (the Holland Tunnel) began in earnest in May 1923 with the appointment of the Advisory Board to the New Jersey State Highway Commission. The Board was requested "to devise plans for handling such probable traffic in accordance with the above, such plans to embrace the location of routes and types of construction, and to compile the results of the above work in a report to be furnished to the State Highway Commission."[8]

The Board's Report, submitted on August 8, 1923, formed the general basis for the present Route 1&9 Corridor. The Board outlined five points that defined the overall plan and construction approach:

- The use of economical grades;
- The elimination of curvature;
- The elimination of grade crossings, both with regards to street and railroads;
- The elimination of drawbridges; and
- Other considerations affecting the facility and safety of travel.

The proposed road was to be approximately 50 feet wide, sufficient to accommodate five traffic lanes (two in each direction, plus an additional 10 foot lane for emergency use). In order to keep the volume of traffic, estimated at 5,500 vehicles per hour, moving continuously without interruption grade crossings with other highways were kept to a minimum. All connections to important highways were made by ramps entering and leaving the Route 1 Extension in the direction of traffic, a major innovation in highway design at the time.

4. Key Management, Planning and Design Staff for the Route 1 Extension

Once the Report was accepted by the Highway Commission, William G. Sloan, the New Jersey State Highway Engineer and Chairman of the Advisory Board, began staffing the project. Sloan an expert railroad engineer, hired another railroad man, Frederick Lavis, to implement his plan.

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[8] Advisory Board to the New Jersey State Highway Commission, Report of the Advisory Board to the New Jersey State Highway Commission: Recommendation for Methods of Handling Traffic in Jersey City and Vicinity Incident to the Construction of the Vehicular Tunnel Between New York and New Jersey (Trenton, New Jersey: MacCrellish & Quigley Co., 1924), p. 5.

Lavis was a consulting engineer with tremendous world-wide experience in the transportation industry, including involvement with the New York City subway system, Pennsylvania Railroad. and, the Pan American Railroad and the Panama Canal. Lavis remained with the project until 1928, leaving to run the International Railways of Central America. In 1930 he won the Arthur M. Wellington Prize from the American Society of Civil Engineers for his work related to the Route 1 Extension. With the exception of the portion now called the Pulaski Skyway, their original plan for the route was completed as envisioned.

Sigvald Johannesson, a Dane, was a civil engineering graduate of the University of Copenhagen was the third important member of the team. An engineer for the London Underground before coming to New York to work with Lavis on the Hudson River tubes for the Pennsylvania Railroad, he also assisted in the construction of the tunnels for the Hudson and Manhattan Railroad (now the PATH Tunnels) and was a member of the technical staff of New York's IRT Subway. Joining the New Jersey Highway Department for the project, he became an expert in highway economics, publishing the seminal work on the subject in 1931. He stayed on with the Department until his retirement in 1948, after serving as head of the Division of Planning and Economics.[9]

5. Economic Basis for Highway

Lavis, charged with the routing and planning of the road, was the first engineer to bring sound economic theory to the building of roads, using "Wellington's Economic Theory of Railway Location" as a basis for computing, comparing, and evaluating all of the costs involved in the road.[10] Suddenly, highways, for the first time, were considered limited access corridors (routes) for the movement of large volumes of commercial traffic rather than as access routes for adjacent property owners. Using his railroad experience as a basis, Lavis developed mathematical models to evaluate factors he identified as:

- The Economic Effect of Distance;
- The Effect of Curvature, Rise and Fall;
- The Cost of Delay; and
- The Cost of Vehicle Operation.

Such calculations had previously only been successfully applied to railroad construction. Adapting his calculations for highway traffic, Lavis successfully argued that the extra expense of the construction of a separated-grade road justified its limited access from cross streets and offset the additional expense through the cost savings to the users, and for the public good.

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[9] "S. Johannesson, 75, A Civil Engineer," New York Times, February 23, 1953, p. 25.

[10] Frederick Lavis, "Highways as Elements of Transportation," Transactions of the American Society of Civil Engineers 95 (No. 1783, 1931), p. 1020.

6. Non-Economic Factors in the Design of the Project

Economic factors were considered essential in the planning of the Route 1 Extension, but they were modified in light of what Lavis called "Governing Point,." conditions that were beyond the control of the road planners. These "Points," or constraints, included local jurisdictional preferences, site specifications, or availability of desired rights-of-way. Without such impediments the economics of the roadway dictated a straight, level highway with a tunnel beneath Jersey City connecting to the Holland Tunnel.

Several of the "Points" created a major diversion from the proposed path of the Route 1 Extension in Jersey City. Due to political influence, the Route 1 Extension was required to make connections with the local street system including Hudson County Boulevard (now JFK Boulevard) and Route 1 (now Routes U.S. 1&9) leading to the proposed bridge at 178th Street (the George Washington Bridge) to the north. In addition, the municipality objected to a proposed open cut through to the tunnel, finding that the open cuts for the Erie and Pennsylvania Railroads had already created undesirable barriers across the city. The Erie Railroad objected to the use of its property to the south of 12th Street because it conflicted with its plans for warehouse development. In order to resolve these conditions, the highway was located alongside the northern edge of the Erie Cut, and was covered and topped by a roadway. Satisfactory to Jersey City interests, the adopted route also provided good connections with Hudson County Boulevard and Tonnele Avenue.

7. Pulaski Skyway Controversy and Resolution

The road was not built in a sequential fashion because as early as 1925, controversy developed concerning the bridges which were to span the Hackensack and Passaic Rivers and their proposed connecting road through the Meadowlands. In fact, the exact locations and configurations of the crossings were not finalized until 1929.

Initially the Advisory Board had proposed several alternatives for the river crossings, including tunnels and bridges with a 40-foot clearance over the navigable channels. In 1925, the New Jersey Highway Commission applied to the War Department for permission to build two bridges, each with 35 feet of clearance above the two rivers. Permits for these two bridges were denied due to "opposition voiced by navigation interests to additional bridges on these rivers."[11]

Various options were subsequently studied, including shifting the Passaic River crossing (a lift bridge) to a location adjacent to the existing Lincoln Highway Lift Bridge so that both could be operated synchronously. This proposal was rejected by the State Highway Commission because the revised alignment would add approximately 3,000 feet to the highway and would compromise the traffic handling efficiency of the route.

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[11] William G. Sloan to Thomas H. MacDonald, Daniel L. Turner, and William J Wilgus, January 7, 1929, Trenton, New Jersey, Wilgus Papers, Engineering Societies Library, New York.

As a consequence, the State Highway Commission appointed another committee to review the plans for this section. The committee, decided that the Route 1 Extension should be completed by connecting the finished sections via a high level viaduct and bridge system with fixed spans of sufficient height to permit the passage of masted vessels."[12]

This report galvanized the State Highway Commission to rethink the entire configuration for this section which was to be called "the Route 25 Connecting Link." In October of 1929, the State Highway Engineer recommended to the State Highway Commission the construction of high level (135 foot clearance) bridges, for which approvals were received from the Board of Commerce and Navigation and the War Department by the end of 1929.

With this issue resolved, "the Route 25 Connecting Link," which comprises the majority of the current Pulaski Skyway, was completed and the highway was officially opened on Thanksgiving Day, November 23, 1932.

B. DEFINING CHARACTERISTICS

In the initial Advisory Board Report, construction details for the proposed sections of highway that would comprise the Corridor are rather limited. The section from Jersey Avenue to Palisade Avenue was to be a viaduct. This would connect via an open cut to the Pennsylvania Avenue Railroad Yard on the western side of Jersey City. The road would then descend to the meadows on embankments and cross the Hackensack and Passaic Rivers with tunnels into Newark. In addition, even though structure locations were identified, aside from the use of granite block for paving, no other materials were specified.

The final corridor underwent many changes prior to its construction. As noted earlier, the open cut through Jersey City was covered and topped with a roadway to satisfy local interests. The tunnels under the two rivers became the high-level viaduct known as the Pulaski Skyway. However, with the exception of the high-level viaduct section of the Pulaski Skyway, the remainder of the defining historic characteristics of the Corridor are the original design as envisioned by Lavis and Sloan. Included among these defining characteristics are: the profile and viaduct type construction; center access ramps; balustrades and railings and the use of concrete encasement. The following will provide a description of each of these distinctive features:

1. Profile and Viaduct Construction

One of the major factors in the design and planning of the pioneer superhighway was the effort made to minimize delays in the flow of traffic through the elimination of grade crossings. To achieve this goal, the roadway was required to be elevated to provide a minimum clearance of 14 feet over public roads and 22 feet over railroads. Elevating the roadway necessitated the road be supported on either viaduct type construction or on

[12] Ibid., p. 2.

earthen embankment. Although this alignment and its resulting profile was fairly typical for railroads of the period, its use for this highway gives it a distinctive appearance.

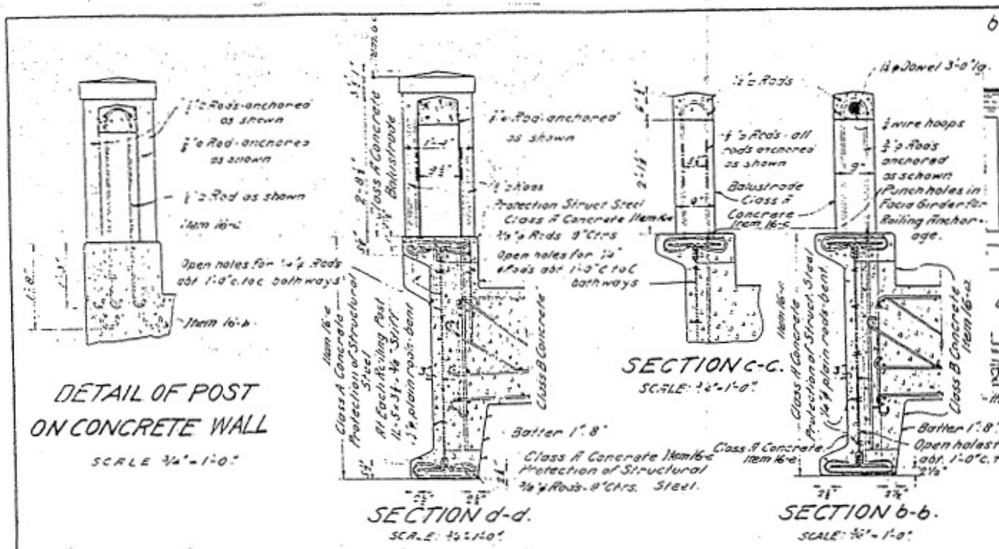
As already discussed, the width of the roadway was specified as approximately 50 feet. The maximum gradient was established at 3.5%. At grade breaks, vertical curves of 67 feet for each 1% of grade change at ridges and 33 to 50 feet at valleys were used. Other guidelines for alignment included a sight distance of not less than 500 feet and curve radii of not less than 1,000 feet. These guidelines would seem to conform to ideal specifications for prevailing speeds in the late 1920s.

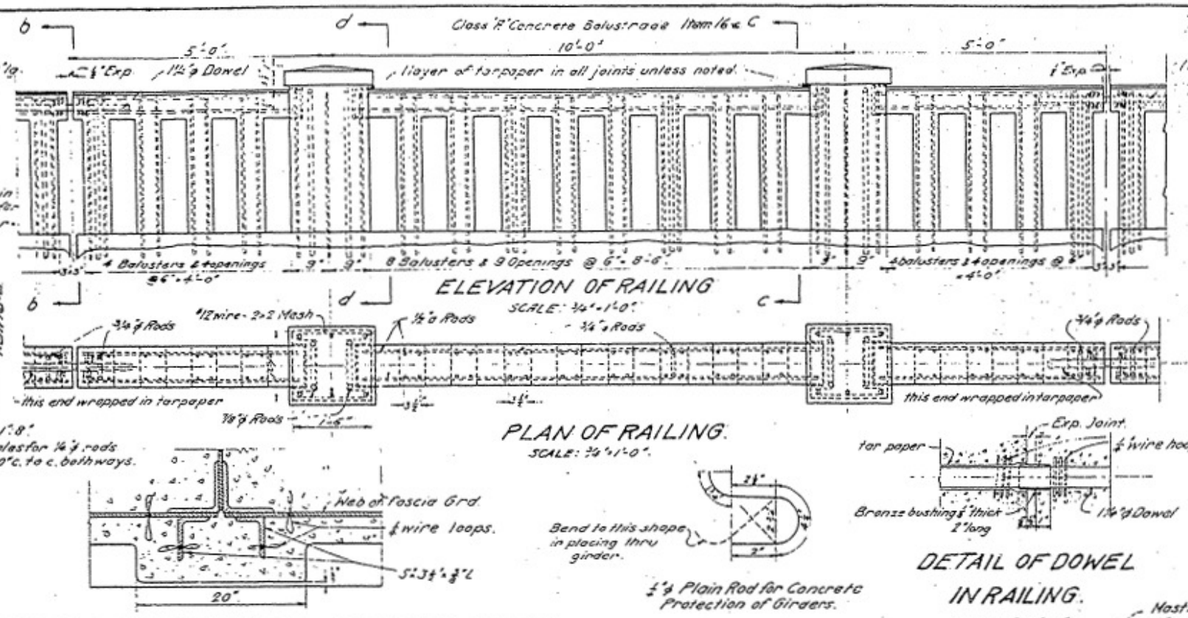
Viaducts make up a major portion of the Corridor. Since no highway design specifications were available as guidelines, the resourceful Johannesson used those of the American Railway Engineering Association. The design load on any one span was assumed to be a live load of two 20 ton trucks per traffic lane plus a uniform load of 80 lb. per sq. ft. on the area not covered by the trucks. In designing the structure, Johannesson made a careful cost/benefit analysis of various structural alternatives and developed a series of generally standardized designs from this study.

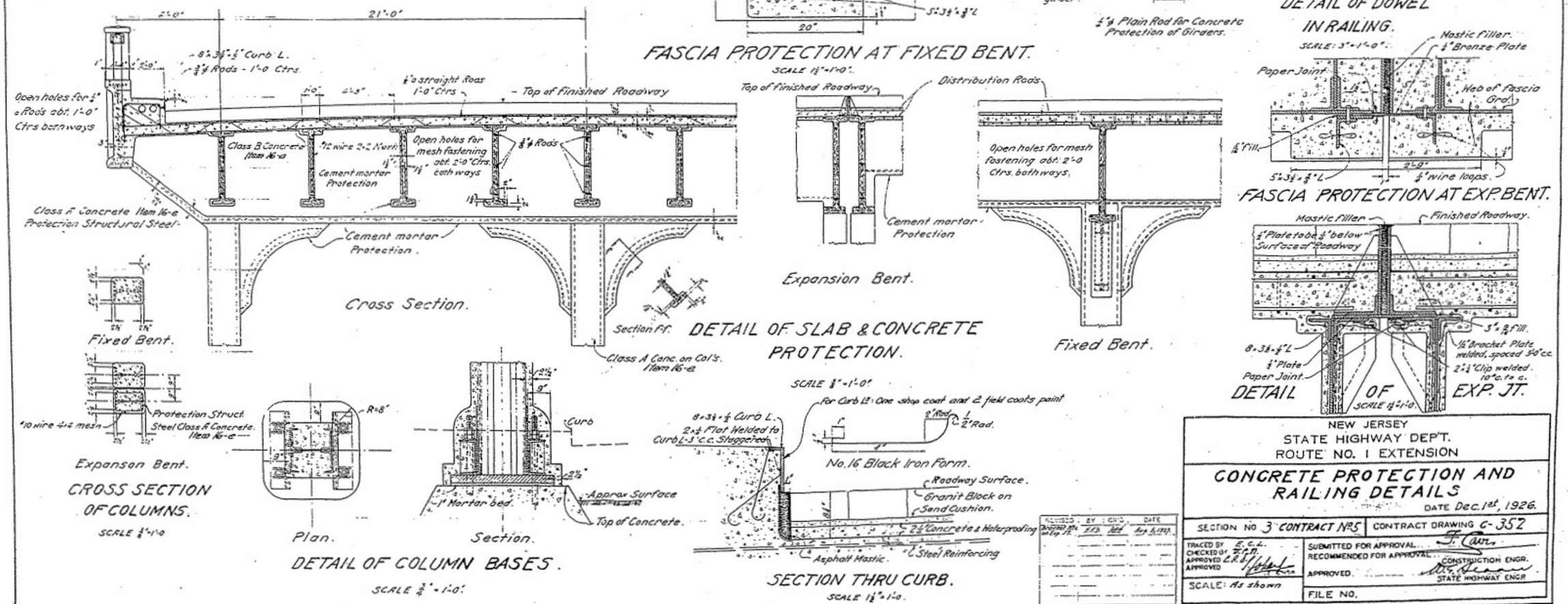
In the viaduct sections of the corridor, the foundation and surface conditions were such that moderate and long span lengths were decided upon and a steel structure of simply supported trusses or girders was identified as the most economical. This solution was also used in other locations where skewed spans or spans of varying lengths were required. If, however, the subsurface conditions were good, and the span lengths were uniform, a reinforced concrete structure with a shorter span length (say up to 40 feet) would be the most economical and was utilized.

The standard steel viaduct design, which is typical to the Corridor (except for the high-level portion of the Pulaski Skyway), consisted of a concrete slab carried on longitudinal girders spaced 5 feet on center. The longitudinal girders were framed into steel cross-girders which were supported on three steel columns (see Figure II-2 for a Typical Cross Section). The standard concrete viaduct design, used in other areas outside of the Corridor, consisted of monolithic units of four span lengths of 40 feet. Transversely, the structure was composed of a slab supported by longitudinal girders which framed into cross-girders which were supported on column bents. Each column bent had four columns. The foundation, however, united all four columns reducing the chance of uneven settlement.

Although these designs were the standard, "local conditions" required frequent deviations. Where longer spans were required, the design was modified to consist of two or three longitudinal girders or trusses, each carried directly on one of the three columns of the transverse bent. Secondary girders were carried by these longitudinal girders that, in turn, supported longitudinal stringers at the standard spacing. Riveted, built-up, steel plate girders comprise the majority of the length of the viaducts built of this type of construction. In the high-level portion of the Pulaski Skyway, the primary framing consists of a deck truss structure which typically had a Pratt configuration and a







NEW JERSEY
STATE HIGHWAY DEP'T.
ROUTE NO. 1 EXTENSION

CONCRETE PROTECTION AND RAILING DETAILS

DATE Dec. 1st, 1926.

SECTION NO 3 CONTRACT NRS | CONTRACT DRAWING C-352

TRACED BY E.C.L.
CHECKED BY E.C.D.
APPROVED C.K.B.
APPROVED

SUBMITTED FOR APPROVAL F. Cain
RECOMMENDED FOR APPROVAL CONSTRUCTION ENGR.
APPROVED STATE HIGHWAY ENGR

SCALE: As shown

FILE NO.

Figure II-2

curved bottom chord. At the river crossings, the structure changed to a through truss configuration. Aside from the great overall length of the viaducts, their general design was in conformance with standard practice of the period and is fairly typical of railroad construction.

2. Center Access Ramps

As previously stated, the elimination of grade crossing forced the elevation of the highway on structure or embankments. Obviously ramps were needed for access, but there was hardly any precedent for such work. The designers decided that the ramps should enter at the middle of the highway, which was widened and divided at these entry points. This decision forced the introduction of reverse curves, which for the most part had radii of 1000 feet. Generally, these two-way ramps were 24 feet wide and had a maximum gradient of 5.5%. Since virtually no coherent elevated highway network had ever been constructed before, the ramp system and its development must be considered of extreme significance, for it was one of the first attempts to create such an entity. Center access ramps are present in three locations on the Pulaski Skyway.

3. Railings and Balustrades

One quite novel aspect of this highway was the design and construction of the curbs, sidewalks, and railings. Since the road was intended for high speed travel, no provision was made for sidewalks for pedestrians. However, footwalks about 2 feet wide were provided on both sides of the highway for maintenance and emergency purposes. The curb was made high intentionally to keep errant drivers from going off the road. As further protection, the outside of the footwalk ended in a 12 inch curb that was topped by a substantial railing which was designed to be strong enough to withstand the impact of any vehicle that might mount the curb.

In those portions of the Corridor designed under the direction of Lavis and Sloan, these railings were made of reinforced concrete. To help prevent overturning, the railing's reinforcing bar was attached to the flange of the spandrel girders. Balusters were placed every six inches, forming a rather substantial wall (see Figures II-2 and II-3a).

On the high-level portion of the Skyway, the engineers understood that special precautions had to be taken not only to prevent cars from leaving the roadway, but also to "allay the fear of such nervous drivers as are not able to look down from great heights without a qualm."[13] (see Figures II-3b and II-4) Accordingly, the curb height was raised to 16 inches above the roadway surface, making it very difficult for a vehicle of the time to mount the curb. Behind the curb, forming the footwalk, a horizontal plate girder was attached to the main steel structure at each panel point of the supporting trusses and topped with concrete.

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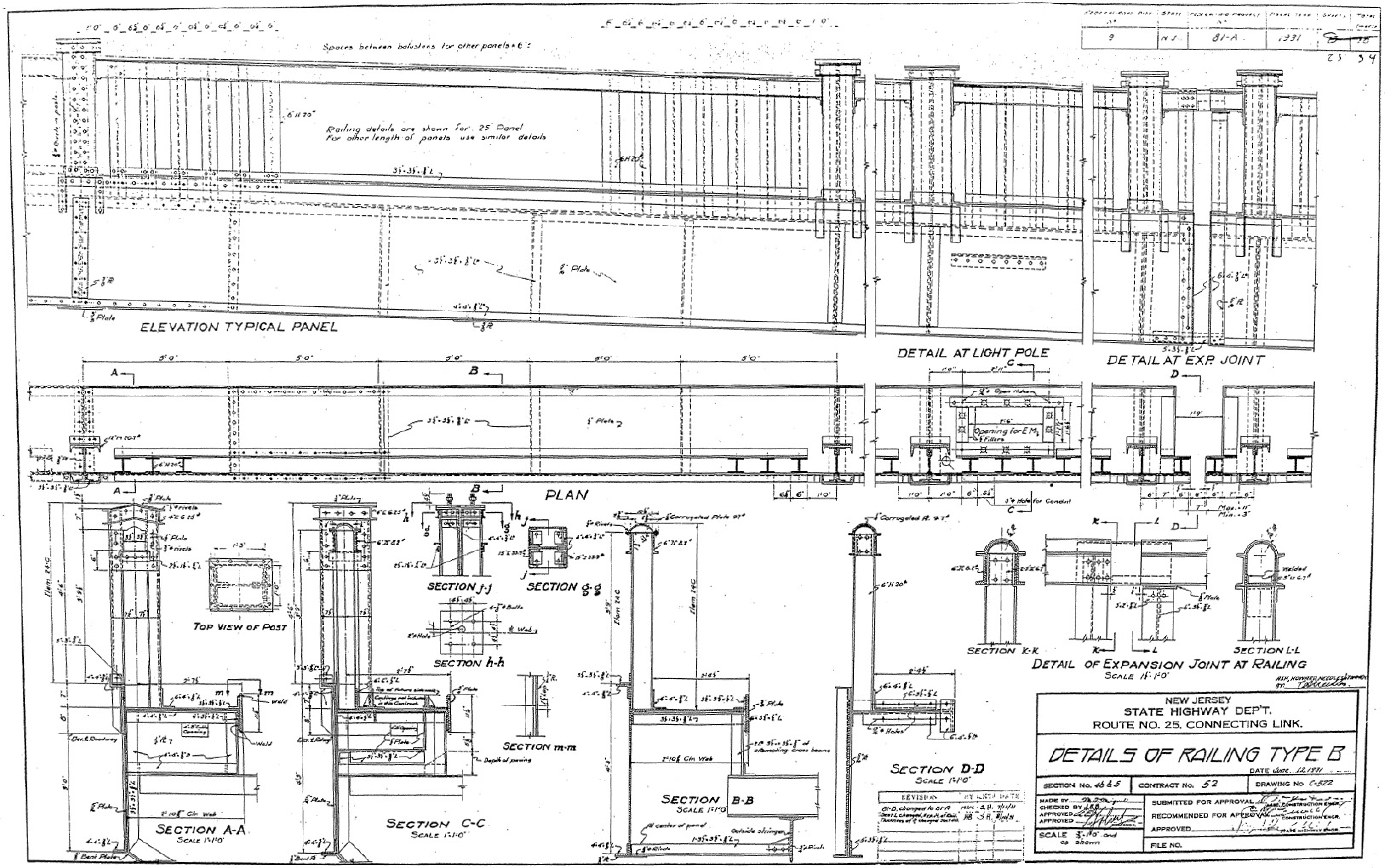
[13] Sigvald Johannesson, "Lincoln Highway from Jersey City to Elizabeth, New Jersey," American Society of Civil Engineers Papers 59 (Nov. 1933), p. 1411.

a) Typical roadway and railing configuration on low-level viaduct of Pulaski Skyway in Jersey City.

b) Typical roadway and railing configuration on high-level viaduct of Pulaski Skyway in Newark.

Figure II-3



Spaces between balusters for other panels = 6"
Railing details are shown for 25' Panel
For other length of panels use similar details
ELEVATION TYPICAL PANEL
DETAIL AT LIGHT POLE
DETAIL AT EXP. JOINT
PLAN
Opening for E.M.
SECTION j-j
SECTION g-g
TOP VIEW OF POST
SECTION h-h
SECTION m-m
SECTION A-A
SCALE 1"=1'0"
SECTION C-C
SCALE 1"=1'0"
SECTION B-B
SCALE 1"=1'0"
SECTION D-D
SCALE 1"=1'0"
SECTION K-K
SECTION L-L
DETAIL OF EXPANSION JOINT AT RAILING
SCALE 1½"=1'0"
NEW JERSEY
STATE HIGHWAY DEP'T.
ROUTE NO. 25. CONNECTING LINK.
DETAILS OF RAILING TYPE B
DATE June 12, 1931
SECTION No. 4B & 5
CONTRACT No. 52
DRAWING No. C-522
SUBMITTED FOR APPROVAL
RECOMMENDED FOR APPROVAL
APPROVED
FILE NO.
SCALE ¾"=1'0" and as shown
9
N.J.
81-A
1931

Figure II - 4

For this railing, the vertical face of the curb consisted of a plate attached to the flange of the horizontal girder. To eliminate the chance of a driver looking over the railing to the meadow below, the top of the railing was raised to 5 feet 5 inches above the roadway surface. The 6 inch wide railing balusters, made of steel sections, were then spaced approximately six inches apart so that the railing would appear solid to a driver looking forward under normal speed conditions.[14]

In comparison with the guard rail design of other highways of the period, as illustrated in textbooks, the solution used here was by far the most substantial and considerate of highway safety. Although it was not discussed by any of the engineers, the design of the railing appears to have been influenced by aesthetic considerations since niceties such as the curved upper railings were not functional necessities.

The majority of the railings have survived on the structures in the Corridor.

4. Concrete Encasement

To protect the steel in their viaducts, Lavis and Sloan made a general decision to cover all exposed steel with concrete in order to decrease the cost of maintenance. Gunite, a relatively new method of placing fine aggregate concrete, was used to cover surfaces that were not immediately visible. On the high-level portion of the Skyway, however, the structural steel is not encased. With a surprising eye to aesthetics, however, the engineers decided to use formed concrete on columns, brackets, and fascia girders because the imprecision of gunite placement made it difficult "to obtain sufficiently pleasing outlines to permit its use where exposed to view."[15]

This type of construction is present on most of the bridges and viaducts in the Corridor with the exception of the high-level portion of the Pulaski Skyway.

C. DISCUSSION OF SIGNIFICANCE

The Route 1 Extension, when completed in 1932, represented the single largest highway construction project undertaken in the United States. Indeed, the conditions leading to its construction foreshadowed the growth in interstate auto travel.

It was the first highway in New Jersey to be planned and laid out according to any rational economic process or formulae. Although these formulae were based on well-established railway engineering principles, it nonetheless, appears that the Route 1 Extension was the first time that these basic concepts were applied to a highway. In terms of its design, the highway is significant

[14] Ibid.

[15] Ibid., p. 1402.

as an early application of highway engineering principles in the sense that it was one of the first roads to be specifically designed solely for high speed automobile and heavy commercial truck use.

The corridor, once described as "the greatest highway project in the United States today," [16] is further significant simply as the largest single roadway project undertaken anywhere to that date. In addition, it is also the first roadway project where public time-saving was used to justify dramatic capital expenditures.

The highway's direct effect on the further development of this section of New Jersey as a manufacturing center could be further studied. One can safely say, however, that without this highway, the level of congestion in the area would have become intolerable, perhaps forcing an exodus of business and limiting the growth of the port towns of New York and New Jersey.

The elements of the original Corridor, that have survived with integrity, are potentially significant under the National Register Criteria A & C in the areas of Transportation and Engineering. Criterion A is applicable because of the Corridor's significant contribution to the growth and development of the highway movement in New Jersey. Criterion C is applicable to the Corridor because the Pulaski Skyway and the other significant structures of the Corridor illustrate the developing technology for the planning and design of roadway construction in the 1920s and early 1930s.

[16] Bruce Seely, Building the American Highway System (Philadelphia: Temple University Press, 1987), p. 153.