L.R. 1078
PULASKI HIGHWAY

DELAWARE EXPRESSWAY
TO
ROOSEVELT BOULEVARD

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

VOLUME I

MARCH 1976

This document has been prepared in three separate volumes:

VOLUME	I	Text and Tables
VOLUME	II	Plates
VOLUME	III	Appendix

This is Volume I

Report Number: FHWA-Pa.-EIS-76-02-D

Federal Highway Administration
Region 3

L.R. 1078 PULASKI HIGHWAY

DELAWARE EXPRESSWAY

TO

ROOSEVELT BOULEVARD

CITY AND COUNTY OF PHILADELPHIA

COMMONWEALTH OF PENNSYLVANIA

ADMINISTRATIVE ACTION

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

Submitted pursuant to 42 U.S.C. 4332 (2) (C) and 23 U.S.C. 128 (a)

MAR 24 1976
DATE

Donald Hammer, Division Administrator
Federal Highway Administration

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SUMMARY

A. IDENTIFICATION

Federal Highway Administration
Administrative Action Environmental Statement
(x) Draft ( ) Final
( ) Section 4(f) Statement attached

B. CONTACTS

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Pennsylvania Department of Transportation
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St. Davids, Pa. 19087
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C. DESCRIPTION OF THE PROPOSED ACTION

1. Project Identification

The proposed project is known as the General Casimir Pulaski Highway and is designated Legislative Route 1078, L.R. 1078.

2. Project Location

The project is located in the Northeast area of the City of Philadelphia (See Plate 1). The immediate study area includes the neighborhoods of Richmond, Bridesburg, Frankford, Harrowgate, Juniata Park, Frankford Valley, Deni, Maple Lane, Northwood, Summerdale, and Feltonville (See Plates 2 & 3).

3. Purpose of Project

The Pulaski Highway is proposed to serve as a link in the planned circumferential freeway system surrounding the central areas of the City of Philadelphia. Regional transportation studies have verified the need for such a facility as a part of the total transportation (highway and mass transit) system for the Philadelphia metropolitan area. (See Plates 4, 5, and 6).

In performing its regional function, the proposed facility is also expected to provide a more efficient connection between the Delaware Expressway (Interstate Route 95) in the vicinity of the Betsy Ross Bridge and the Roosevelt Boulevard (U.S. Route 1), relieving many local roads of through traffic.

4. Project Description and Status

The project is proposed as an approximately 2.5 mile multi-lane freeway facility linking the Delaware Expressway and the Betsy Ross Bridge with the Roosevelt Boulevard. Along its route, local interchanges are possible at Aramingo Avenue, Wingohocking Street and/or Castor Avenue. The facility will pass either over or under existing local roads.

The highway is often referred to in terms of its design sections (Sections B and C). Section C begins at the Delaware Expressway and ends at Leiper Street (opposite Bristol Street). Section B begins at Leiper Street and continues to Roosevelt Boulevard. (See Plate 7).

As described in detail in Section I, numerous studies have been performed over the last two decades concerning the proposed Pulaski Highway, or as it was earlier called, the Tacony Creek Freeway. At the initiation of this environmental study, corridor location approval had been granted for the entire route (Delaware Expressway to Roosevelt Boulevard). Section C had progressed to the right-of-way acquisition and clearing stage while studies of alternate alignments within Section B were in progress due to the involvement of the original route with Tacony Creek Park. A decision regarding the entire project will be made following the review of this document and following a public hearing.

5. Alternatives

a. General

Due to its later stage of development and approvals, Section C contains only the one highway design alignment. This alignment is common and joins all seven (7) alternate alignments investigated within the Section B area.

b. Viable Alternate Highway Alignments

The seven (7) viable highway alternate alignments which were studied in detail are shown on Plate 7. Alternate D is most similar to the original concept for a route through Tacony Creek Park. Alternates A-1, A-2, B, and F were developed to avoid Tacony Creek Park and generally follow a path closely paralleling Adams Avenue. Alternate C attempts to follow closely the boundary of Oakland Cemetery and Friends Hospital while Alternate E was developed in an attempt to utilize an existing railroad right-of-way through the Northwood community.

Interchange locations and types shown with a particular alternate alignment are in many cases possible with another alternate.

c. No-Build Alternative

The Alternative of not building the Pulaski Highway was also investigated in detail. Required improvements to arterial streets in lieu of construction of the Pulaski Highway are discussed herein.

d. Other Highway Alternatives Considered

During the course of this and previous studies, several alternative highway routes and concepts were proposed by certain individuals and groups. These proposals were investigated during the study process and found to be not reasonable, because they either were proposed to be implemented outside of the corridor (Northeast Transportation Action Council - NETAC Route, terminated short of Roosevelt Boulevard (both Lawncrest-Burholme alternatives), or were engineeringly and operationally infeasible (the United Northeast Civic Association scheme). The latter of these proposals was the basis for the development of Alternate E. The proposals were found to be inconsistent with the regional travel desires and the stated purpose of the facility.

e. Mass Transit Alternatives

The feasibility of mass transportation as an alternative to the Pulaski Highway was investigated and found to be impractical. As stated previously, the Pulaski Highway serves the region as a circumferential highway, accommodating widely diversified travel desires.

With the Frankford Elevated and the proposed Northeast Extension of the Broad Street Subway in operation, the future desires for Northeast Philadelphia to Central Philadelphia travel will be well accommodated by mass transportation. An additional rail line along the proposed route of the Pulaski Highway would do little to enhance central city bound rail patronage and would not provide the facilities required to accommodate the diversified regional transportation demand.

The Pulaski Highway could accommodate exclusive bus/carpool lanes should the demand for such exist. Coupled with the existing bus network in the area, the Pulaski Highway could expedite transit travel to New Jersey via the Betsy Ross Bridge, as well as to center city Philadelphia.

Fringe area parking lots adjacent to and connected with the Pulaski Highway were found to be infeasible due to the large amount of land required. However, park-and-ride lots were found to be feasible underneath the Pulaski Highway viaduct near the Frankford Elevated.

f. Reduced Level of Service

A lower level of service was proposed for the highway by the Philadelphia Planning Commission. This idea was found to be infeasible because the eight (8) lane facility as proposed would operate at a level of service D (the minimum acceptable) in the peak hour, and any decrease in the level of service would result in congestion. The congestion would further spread the peak period, consequently, producing higher traffic volumes in the area for a longer period of time.

The concept of a reduced facility with regards to design was also considered. Consequently, the use of viaducts, retention walls and the possible use of directional type interchanges in several alignments are examples of the implementation of this idea. The concept of a reduced facility with regards to lanes, however, is not desirable because the degree of congestion would be worse with a reduced facility than with the no-build. This is due to the fact that once a new facility is operational, a travel link is established and travel desires are attracted to this link from other local streets and arterials. While this is the intent of the new facility, if the facility does not have the capacity to accommodate the demand, congestion on the facility and other highways in the vicinity of the facility would result.

D. SUMMARY OF IMPACTS

1. General

The Environmental Impact Statement (EIS) has been written based upon studies completed by an Interdisciplinary Team comprised of both citizen and consultant experts.

These studies have been distributed to approximately 100 individuals, and additional copies are available from the Pennsylvania Department of Transportation. The Interdisciplinary Team is comprised of ten (10) citizen representatives, elected by area citizens, and their alternates, one (1) member of the Delaware Valley Citizens Transportation Committee (DVCTC), five (5) Consultant experts, six (6) Governmental Agencies and one (1) Authority. An Advisory Team which consists of ten (10) agencies and entities was also organized during the preparation of this EIS. (See Plates 8 & 9).

Of the seven proposed build alternate alignments, one (1) alignment requires the acquistion of land from Tacony Creek Park and one (1) alignment requires the condemnation of land from Northwood and Simpson Memorial Parks. If either of these alignments are chosen a 4 (f) statement in addition to the EIS will be written to consider all feasible and prudent alternatives to these park alignments. All remaining five (5) alternate alignments avoid park and recreational land. All alternates affect residential, commercial, industrial and manufacturing properties. All but one affect one or both of the two (2) cemeteries in the area. All but two affect the properties of Friends Hospital, a privately owned psychiatric institution. The degree to which these land uses are affected by each alternate varies, and is described in the body of this EIS in detail.

2. Transportation Impacts

The proposed Pulaski Highway is an integral part of the Adopted Regional Transportation Plan for the Delaware Valley Region. It would serve as a link in the planned circumferential freeway system around the core area of the region. The circumferential system would serve to better distribute vehicular traffic between the major radial highway facilities and would provide a bypass route around the Philadelphia Central Business District (CBD). This belt-way system would result in less through traffic in the CBD thus reducing vehicle miles travelled in the core area of the region.

The proposed Pulaski Highway would improve traffic operating conditions in the study area. The travel projections indicate that traffic volumes in the study area will continue to increase because of population, car ownership and employment growth in the Delaware Valley Region. The present street system is fractured due to the locational influences of the Frankford Creek and the merging of four major street grid systems with different orientation. In addition, most of the arterial streets are narrow roadways which were laid out during past centuries and widening is not feasible because of the closeness of residences and commercial buildings to the roadway edges. These conditions place the existing street system in the study area at a particular disadvantage in accommodating the projected increases in traffic volumes. The capacity studies performed have concluded that the existing street system in the study area cannot be upgraded to adequately accommodate the projected traffic volumes. Traffic congestion along the major arterial streets throughout the study area would result with the no-build decision.

The Pulaski Highway would provide increased capacity for the highway system in the study area. This limited access freeway connection between Roosevelt Boulevard and the Delaware Expressway would attract through traffic away from the local arterial streets in the study area. The highway system in the study area would then function more efficently with through travel along the major highway facilities and local traffic along the local arterial streets. The capacity studies performed have concluded that traffic congestion along the local arterial streets would be alleviated by the Pulaski Highway.

The Pulaski Highway would result in a 2 percent increase in vehicle miles travelled in the study area because of the attraction of additional traffic to this facility which would otherwise not pass through the study area. The additional capacity provided by the facility, however, would result in the accommodation of the traffic volumes at a higher level of service. Average daily travel speed in the study area in 1985 would be increased from 20.3 mph to 25.3 mph and average peak hour travel speed would be increased from 12.1 mph to 18.9 mph if the Pulaski Highway is implemented.

Mass transportation ridership in the region and study area has been considered in the travel analyses performed for this study. Mass transportation ridership levels will increase in the future due to regional travel growth and the diversion of highway system trips to the improved mass transit system. The improvements considered in the mass transit system serving the study area are the extension of the Broad Street Subway through the area, improvement of the Frankford Elevated and the center city link of the Penn-Central and Reading commuter railroad systems.

The traffic projections along the Pulaski Highway were developed with consideration of the diversion of trips from the highway system to improved mass transit. The non implementation of this facility, therefore, would not produce a significant increase in transit ridership. The no-build decision would adversely impact the operation of the mass transportation system in the study area. The capacity studies indicate that severe congestion along almost all of the arterial streets in the study area would occur. The congestion would result in serious delays for the surface bus lines and trolley routes in the study area.

The trip origin analyses indicates that the origins of the vehicle trips projected for the Pulaski Highway are scattered throughout the region. There is no feasible way of accommodating these diverse origins on a mass transit facility substitute for the Pulaski Highway, therefore, a mass transit facility is not a viable alternative for the Pulaski Highway.

3. Socio-Economic Impacts

Impacts to the existing residential areas can be expected because of the proposed highway. More specifically as many as three hundred and three (303) or as few as ninety-seven (97) property owners would be relocated. Many of these property owners, however, have already been relocated prior to the initation of the EIS. Neighborhood cemeteries may have to relocate a large number of grave sites and reinter a number of bodies. This may cause a psychological trauma to some living relatives of the deceased. The proposed highway may affect many people living in the area who are dependent on Social Security or pension benefits.

Many of the aforementioned impacts, nevertheless, would be avoided by the no-build decision. The no-build alternative would also affect existing residential areas, because congestion would be increased and safety would not be improved. Many of the impacts of the build alternatives to the existing residential areas, however, are minimized due to the design of the highway alignments to either parallel the Tacony-Frankford Creek, utilize an existing railroad right-of-way, enroach upon cemetery and hospital lands, utilize a vaiduct type design or a directional type interchange at Roosevelt Boulevard.

The proposed highway will improve regional access to the major trucking firms and port facilities presently located near the Delaware River. This may eventually cause unused and some residential land to be converted to industrial use. This would generate more jobs and eventually expand the tax base for the City of Philadelphia offsetting any losses in jobs and tax revenues casued by construction of the highway. With the no-build decision, as indicated in the economic survey, additional trucking firms will move from the area because of the continued restrictions placed upon their operations. This will eventually mean a loss of jobs and tax revenues to the area and city.

4. Air, Noise, and Water Impacts

a. Air Quality

Pollution levels presently exceed the National Ambient Air Quality Standards (NAAQS) for particulates, oxidants, and carbon monoxide within the corridor. These levels, however, will improve because of the State Implementation Plan and the various automotive emission controls that will affect all the alternatives. These effects will ultimately improve the air environment and the air Philadelphians must breathe.

Air quality in the region (or meso area) will be improved because of the facility with regards to carbon monoxide (CO) and hydrocarbons (HC). The facility during operation, however, will result in increased concentrations of pollutants in the micro area (a narrow band approximately 100 feet on either side of the highway) with regards to these same emissions as well as particulates and oxides of nitrogen.

No violations of the National Ambient Air Quality Standards (NAAQS) for one (1) hour and eight (8) hour periods will occur under most probable meteorological conditions. Violation of the standards during these same periods will not occur under worst case meteorological conditions after 1983. Worst case meterological conditions can be expected to occur on several days a year.

b. Noise

Noise levels in the study area are likely to increase in the future regardless of whether the Pulaski Highway is built or not built.

The Pulaski Highway can be designed and constructed with noise abatement devices which will significantly reduce the facility's impact on the noise environment. These abatement strategies generally will reduce noise levels in the immediate vicinity of the facility by 3 to 4 dBA. In general, with abatement strategies implemented, 1995 total noise levels at the receptors analyzed will average from one to three dBA more than the no-build noise levels. Implementation of additional federal and state legislation with respect to automobile and truck noise could further reduce any effect of noise to the general environment.

The most adverse noise impacts will be experienced by receptors immediately adjacent to the Pulaski Highway. The most positive effect will be experienced by residents along existing streets where truck travel is reduced or eliminated by the operation of the Pulaski Highway.

c. Water Quality

Storm water runoff from the Pulaski Highway will be channelled into the receiving waters of the Tacony-Frankford Creek. This will add slight quantities of pollutants such as metal, oil, grease and various nutrients to the stream. These types of pollutants are presently being added to the Creek through storm water runoff from the existing street system, the surrounding neighborhoods and from industrial discharges. The continued addition of these pollutants from all sources will hinder and delay the ecological recovery of the stream. The no-build alternative, consequently, would not considerably reduce long range pollution within the Creek. Construction of the highway in certain areas may add short term sedimentation from erosion into the Creek. Specific Department of Transportation standards, however, will reduce the severity of this problem.

5. Ecological Impacts

If the park alignment is chosen, valuable habitat and open land which is utilized by some wildlife and the surrounding communities would be depleted. This alignment would also devoid the region of important recreational land during an era when recreational land is becoming increasingly important.

6. Historical Impacts

All of the proposed build alternatives affect properties which have been identified as having possible historic and architectural significance. It has been determined by the State Historical and Museum Officer (SHMO) that several of these properties have the potential to receive national recognition. Consequently, eight (8) sites could possibly be eligible for placement on the National Register of Historic Places. No sites within the area are presently on this listing, nor does any property appear on the State Historic Inventory. A report on these sites has been filed with the U.S. Department of the Interior by the FHWA for their specific determination as to site eligibility.

Construction of the Pulaski Highway would affect from one (1) to three (3) of these sites, depending upon the alternate alignment. None of these sites would by physically affected by the no-build alternative, however, secondary impacts may result due to increased traffic.

7. Energy Consumption

The high-travel age group between the years 1970-1990 will account for a larger percentage of the total population. This upward shift in the high-travel age group combined with a general population increase, a continued migration to the auto oriented suburbs, and economic improvement for the lowest income families, points to the fact that there will be significant increases in future highway travel demand.

PennDOT travel data indicates that the Energy Crisis caused only a short term decrease in highway trips, rather than a long term diversion from highway use to mass tranist in the Philadelphia region.

In the future, it can be expected that highway travel in the Delaware Valley Region will continue to increase, because the major factors influencing trip production were not changed by the Energy Crisis. The region as well as the regional vehicle fleet will continue to grow and increase, even if gasoline prices continue to rise. It can also be expected that the primary response of motorists to gasoline price increases will be to purchase more fuel efficient automobiles rather than alter their travel behavoir.

As previously stated, the Pulaski Highway is designed to facilitate circumferential transportation, consequently, it is unlikely that this facility will reduce central Philadelphia transit use. The proposed highway could enhance regional bus transportation, as well as, eliminate the use of ineffecient truck routes within the area. This could ultimately mean reduction in energy consumption within the corridor. The no-build alternative may result in more energy consumption due to longer trips required for surface mass transit as well as auto and truck travel.

8. Impacts on Roosevelt Boulevard

This study has verified the need for improvement to the presently existing at-grade Roosevelt Boulevard. This improvement is necessary with either the build or no-build decision. The Roosevelt Boulevard Expressway is also part of the adopted Regional Transportation Plan, and an Environmental Study for this project will be conducted when the Roosevelt Boulevard is placed on the state program and budget. Improvements to this facility should be placed under additional study, immediately, if the build decision is ultimately reached. This improvement would also entail Federal Highway Administration (FHWA) participation.

E. COMMENTING ENTITIES

This Draft Environmental Impact Statement will be distributed to the following federal, state, and local agencies and organizations for their review and comment.

1. Federal Agencies

Advisory Council on Historic Preservation
Council on Environmental Quality
Delaware River Basin Commission
Department of Agriculture
Department of Commerce
Department of Defense
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Labor
Environmental Protection Agency
Federal Energy Administration
Office of Economic Opportunity

2. State Agencies

Pennsylvania Fish Commission
Pennsylvania Game Commission
Pennsylvania State Planning Board
Pennsylvania Department of Community Affairs
Pennsylvania Department of Agriculture
Pennsylvania Department of Environmental Resources
Economic Develpment Administration
Pennsylvania Historical and Museum Commission

Pennsylvania State Clearinghouse
Pennsylvania Human Relations Commission
Office of State Planning and Development

3. Local Agencies

Delaware Valley Regional Planning Commission
Delaware River Port Authority
City of Philadelphia Streets Department
City of Philadelphia Planning Commission
City of Philadelphia Department of Health - Air Management Services
City of Philadelphia Fairmount Park Commission
City of Philadelphia Redevelopment Authority
Southeastern Pennsylvania Transportation Authority
City of Philadelphia Historical Commission

4. Interdisciplinary Team

Mrs. Clare Clark	Aramingo Civic Association
Mr. Edward Gavin	Frankford Senior Citizens Central
Mr. Maurice Laub	Delaware Valley Citizens' Transportation Committee (DVCTC)
Mr. Stanley Chmielewski	Bridesburg Civic Council
Mr. Domenic Fanticola	Juniata Park Civic Association
Mr. Joseph Kaminski	Frankford Valley Civic Association
Mr. John Dempsey	Richmond Committee for Community Improvement
Mr. Jame Travis	Summerdale Civic Association
Mr. William Baldwin	Northwood Civic Association
Mr. Thaddeus Przybylowski	Bridesburg Civic Association
Mr. William Jasner	Triangle Civic Association
Dr. Joseph Mooney	Economic Consultants (LaSalle College)
Dr. Joseph Kane	Economic Consultants (LaSalle College)
Dr. John Connors	Sociological Consultants (LaSalle College)
Dr. Richard Leonard	Sociological Consultants (LaSalle College)
Dr. Finn Hornum	Sociological Consultants (LaSalle College)
Dr. Jack McCormick	Ecological Consultant, Jack McCormick and Associates
Mr. Clark Boli	Ecological Consultant, Jack McCormick and Associates
Mr. Jordayne Staughton	Air and Noise Consultant, Scott Environmental Technology Inc.
Mr. John Claffey	Regional Transportation Planning Delaware Valley Regional Planning Commission (DVRPC)
Dr. Richard Tyler	Philadelphia Historic Commission
Mrs. Beatrice Kirkbride	Philadelphia Historic Commission
Mr. William Boone	Regional Mass Transportation Southeastern Pennsylvania Transportation Authority (SEPTA)
Mr. Robert Corressel	Regional Mass Transportation Southeastern Pennsylvania Transportation Authority (SEPTA)
Mr. Stephen Bartlett	Community Planning, Philadelphia Planning Commission
Mr. Theodore Thorne	Community Planning, Philadelphia Planning Commission
Mr. James McPhillips	Highway Engineering, Philadelphia Department of Streets

Mr. Matthew Mazza	Highway Engineering, Pennsylvania Department of Transportation (PennDOT)
Mr. John Petro	Environmental Management and Planner, Pennsylvania Department of Transportation (PennDOT)

5. Participating Civic Associations, Community Leaders, and Organizations

Delaware Valley Citizens' Transportation Committee
Aramingo Civic Association
Bridesburg Civic Association
Frankford Valley Civic Association
Frankford Senior Citizens Central
Juniata Park Civic Association
Northwood Civic Association
Richmond Committee for Community Improvement
Summerdale Civic Association
Triangle Civic Association
Civic Council of Bridesburg
Friends Hospital
Upper Northwood Community Council
Parkview Hospital
Transportation Action Group
United Northeast Civic Association
St. Joachim Church
Maple Lane Civic Association
Poquessing Valley Watershed Association
Harrowgate Park Civic Association
Upper Holmesburg Homeowners Association
Lawncrest Community Association
Northeast Transportation Action Council
Oakland Cemetery
Wissinoming Civic Association
Condemned Property Owners
Frankford Businessmen & Taxpayers Association
Clean Air Council
Sears, Roebuck & Company

6. Elected Officials

U.S. Senator Richard S. Schweiker
U.S. Senator Hugh Scott
U.S. Representative William J. Green
U.S. Representative Joshua Eilberg
State Senator Joseph Smith
State Senator Charles F. Dougherty
State Representative Joseph Sullivan
State Representative Alvin Katz
State Representative Fortunato N. Perri
State Representative James McIntyre
Mayor Frank Rizzo
Councilman Joseph Zazyczny
Councilman Harry Jannotti

7. News Media

Philadelphia Inquirer
Philadelphia Daily News
Philadelphia Bulletin
Juniata News
Frankford News
Frankford News Gleaner
KYW-TV
WCAU-Radio
WCAU-TV
WFIL-Radio
WPVI-TV
KYW-Radio

SECTION I

DESCRIPTION OF THE PROPOSED ACTION

A. DESCRIPTION AND STATUS OF PROJECT

1. Location, Type of Facility and Length

The Pulaski Highway, as presently proposed, is intended to serve as a link in the planned intermediate loop freeway system surrounding the core areas of the City of Philadelphia. It is planned to serve the dual purpose of linking a number of main feeder routes from areas outside of the core and serving as a section of the planned beltway system around the central portion of the Philadelphia metropolitan area. (See Plate 4. Project No 19).

The project is proposed as a 2.4 mile long multi-lane freeway facility connecting the Roosevelt Boulevard (U.S. Route 1 and the Delaware Expressway-Interstate Route 95) in the Northeast section of the City of Philadelphia. The study area for this proposed highway facility is indicated on Plates 1, 2 and 3.

2. Need for the Project

This project is required to accomodate the travel demands between the Northwest Philadelphia area and Interstate Route 95. The need for this project was first indicated by the Philadelphia-Camden Area Traffic Survey of 1947. This need was further identified and confirmed through the Penn-Jersey Transportation Study begun in 1959 and through more recent analyses prepared by the Delaware Valley Regional Planning Commission.

This project is also required to complete the highway beltway around the core areas of the City of Philadelphia. The project is a part of the overall regional transportation plan for the Delaware Valley Region which consists of an integrated system of highways and mass transportation facilities. It is intended to serve as a link in the highway beltway around the core areas of the City which will provide alternative routes for through traffic to bypass the core areas.

3. Previous Studies and Approvals

The Pulaski Highway was previously known as the Tacony Creek Freeway. Initial engineering studies for this project were completed by the consulting engineering firm of Gannett, Fleming, Corddry and Carpenter for the City of Philadlephia in 1958. This engineering study was initiated by the City because the traffic data obtained through the Philadelphia-Camden Area Traffic Survey of 1947 indicated that there was a considerable demand for a modern highway connecting the heavily populated areas in the Northwest sections of the City with the proposed Delaware Expressway. This initial study recommended the adoption of the Tacony Creek Freeway in the corridor formed by the Tacony Creek (See Plate 12) and that financial assistance be obtained from the state and national levels for its construction.

Following this study, the project was placed on the Pennsylvania Department of Highway's (now PennDOT) Capital Improvement Program, the project was presented at Public Hearings conducted by the Philadelphia City Council's Committee on Streets and Services. In April of 1965, the Council of the City of Philadelphia approved an ordinance to place the Tacony Creek Freeway on the City Plan pending final route selection.

In April of 1965 the Pennsylvania Department of Highways engaged the firms of Modjeski and Masters and Urban Engineers Inc. to prepare preliminary and final designs for the Tacony Expressway. Modjeski and Masters was engaged to design approximately 1.2 miles of the highway between the Delaware Expressway and Bristol Street (Section C) and Urban Engineers was engaged to design the remaining 3.8 miles between Bristol Street and the Tookany Creek Parkway at the border line of the City of Philadelphia and Montgomery County (Section B).

In April of 1966 the City of Philadelphia engaged Urban Engineers Inc. to evaluate the feasibility of an alternative route for Section B of the Tacony Expressway (between Bristol Street and the Tookany Creek Parkway) which had been suggested by the City Planning Commission. The result of this study was the adoption of a modified alignment for Section B which remained in the Tacony Creek corridor but preserved the major portion of the Juniata Golf Course (See Plate 13). This modified alignment was approved by the City Planning Commission, the Fairmount Park Commission, the City Streets Department and the Pennsylvania Department of Highways.

The Federal Highway Administration approved the adoption of the modified alignment of Section B of the Tacony Expressway as the recommended alignment for presentation of the project at Public Hearings. The preliminary designs were then completed by the firms of Modjeski and Masters and Urban Engineers Inc. and presented at a Public Hearing conducted by the Pennsylvania Department of Highways on February 27, 1968, at Northeast Catholic High School in the study area of the project.

Based on testimony recieved at this Public Hearing and the results of a special alternative test of the Regional Highway Network (Cheltenham Bypass Test), the portion of Section B of the Tacony Creek Freeway which extended between Roosevelt Boulevard and Tookany Creek Parkway was eliminated from further consideration. Several changes were also made in the design plans for Section C and remaining portion of Section B as a result of the Public Hearing testimony.

Following the adoption of these section limits and design changes the Federal Highway Administration granted formal line, grade and typical section approval for the project on August 15, 1968 between the Delaware Expressway and the Roosevelt Boulevard. The plans for Section C and the remaining portion of Section B of the project then continued into the final design stage.

4. Intervening Requirements

The plans for the Pulaski Highway were developed through the Tacony Creek Corridor and Section B of the project passed through lands of Tacony Creek Park. The passage of the Federal Aid Highway Act of 1968 which required a study of all feasible and prudent alternatives to highway projects requiring parklands be considered, resulted in the restudy of Section B of the Pulaski Highway.

In addition, the National Environmental Policy Act of 1969 required the preparation of an Envrionmental Impact Statement for Section B of this project. The alignments presented herein are the results of the studies of alternative alignments which were initated in 1971.

The design for Section C, however, was not affected by these Acts since no parklands were located along the approved alignment between the Delaware Expressway and Leiper Street (opposite Bristol Street in the modified plan adopted in 1966). The design plans for Section C continued to be developed and approved. Three of the four sets of right-of-way plans for Section C were signed by the Governor of Pennsylvania in March of 1972 and property acquistion was initiated.

It was expected that a Design Location Study Public Hearing on Section B of the Pulaski Highway (Leiper Street to Roosevelt Boulevard) could be held by late 1973. A preliminary draft EIS on this section was prepared during the summer of 1973. In July of 1973, however, the Federal Highway Administration reached an out of court settlement of a suit initiated by the National Wildlife Federation. As a result of that settlement the Federal Highway Administration agreed to reassess the environmental effects of selected highway projects. Following their reassessment, the Federal Highway Administration directed PennDOT to include the entire length of the Pulaski Highway between the Roosevelt Boulevard and the Delaware Expressway in the Environmental Impact Statement that was being prepared for Section B at that time. This direction also resulted in the delay in the signing of the final set of right-of-way plans for Section C and the halt of property acquisition in that section until the Environmental Impact Study is completed.

In addition to this directive to extend the limits of the Environmental Impact Study, the PennDOT Action Plan was formally adopted in September, 1973. As a result of the adoption of the Action Plan, the current Environmental Impact Study which was initiated in March, 1974 is utilizing the Interdisciplinary Team approach to determine the social, economic, and environmental effects of the proposed Pulaski Highway.

At the present time the proposed Pulaski Highway has recieved location approval for its entire length between the Delaware Expressway (Interstate Route 95) and the Roosevelt Boulevard (U.S. Route 1) and design approval for Section C between the Delaware Expressway and Leiper Street. These approvals were granted by the Federal Highway Administration (FHWA) on August 15, 1968 and confirmed by the FHWA on May 28, 1975. The FHWA letter of May 28, 1975 also confirmed the established section limits for the Environmental Impact Statement to be the Delaware Expressway and the Roosevelt Boulevard.

5. Section 4 (f) Statement Requirements

As previously mentioned, the original plan for the Pulaski Highway was to construct the project along the Tacony Creek Corridor and through the Tacony Creek Park. The Federal-Aid Highway Act of 1968, Section 4 (f), required the study of all feasible and prudent alternatives to the use of public parklands for highway projects. In accordance with this law the Pennsylvania Department of Transportation began a study of alternative highway alignments for the Pulaski Highway which avoided parklands. The previous studies conducted in 1966 by Urban Engineers for alignments along

Adams Avenue as suggested by the City cf Philadelphia Planning Commission were used as a guide in developing alignments which avoided parklands.

At the present time only two of the seven alternate alignments studied in detail require the use of parklands. Alternate D which was developed to correspond to the original plan through the Tacony Creek Park would require approximately 28 Acres of lands from the Tacony Creek Park. Alternate E along the Reading Railroad right-of-way through the Northwood neighborhood would require approximately 0.45 Acres of public recreational lands from Simpson Memorial Park and approximately 0.91 Acres of parklands from Northwood Park. If either of these two Alternates is chosen for construction following the evaluation of this Envrionmental Impact Statement and testimony received at the Public Hearing, a Section 4 (f) Statement will be prepared in addition to this Envrionmental Impact Statement.

6. Present Studies

As stated in the Comment and Co-ordination Section an Interdisciplinary Team headed by the Environmental Manager of PennDOT's District 6 was formulated in March, 1974 to prepare the Environmental Impact Statement for the Pulaski Highway between the Delaware Expressway and the Roosevelt Boulevard. Consultants have been hired by PennDOT in the fields of sociology, ecology, economics and air and noise pollution to prepare studies of the effects of the proposed Pulaski Highway. In addition to these consultants, various agencies in the Delaware Valley serve on this team. These consultants and agencies have been requested to submit evaluations of the effects of the proposed Pulaski Highway in their fields of expertise. Ten civic association leaders were elected to serve on this team by an organized group of all of the civic associations in the area of the project and another was appointed by the Delaware Valley Citizen Transportation Committee. They provide citizen participation in this environmental study process. Also, various additional agencies have been requested to serve on an Advisory Group to this Interdisciplinary Team.

The structure of the Interdisciplinary Team and Advisory Group are indicated on Plates 8 and 9. PennDOT serves on the Interdisciplinary Team mainly in the role of the Highway Engineer, however, additional responsibilities are included in the roles of Noise Expert and Geologist.

The Interdisciplinary Team members prepared base reports detailing the expected impacts of the proposed highway facility and submitted them to the Environmental Manager in the late Autumn of 1974 and early 1975. The following reports were used as a basis in the preparation of this Draft Environmental Impact Statement and are available for review by contacting the District Engineer or the Environmental Manager at the Pennsylvania Department of Transportation's District 6 Office, 200 Radnor-Chester Road, St. Davids, Pa. 19087.

<u>Basis Reports for the Draft Environmental Impact Statement, L.R. 1078</u>

Economic Impact Study, Dr. Joseph Mooney & Dr. Joseph Kane, August, 1974.

(Traffic)Analysis of the Proposed Pulaski Expressway Alternatives, DVRPC October, 1974.

Biological and Physical Assessment for the Proposed Pulaski Highway, Jack McCormick and Associates, October, 1974.

Air Quality Study (Volumes 1 and 2) Scott Environmental Technology Inc., October, 1974.

Environmental Noise Study, PennDOT, October, 1974.

Draft Noise Study, Scott Environmental Technology Inc., December, 1974.

A Social-Cultural Impact Study, Dr. John Connors, Dr. Richard Leonard and Mr. Finn Hornum, October, 1974.

Historical Report, E. T. Gavin, December, 1974.

City of Philadelphia Department of Streets Report, October, 1974.

City of Philadelphia Planning Commission Report, December, 1974.

City of Philadelphia Historic Commission Report, September, 1974.

Northwood Civic Association Historic Report, J. Travis, October, 1974.

Frankford Senior Citizens Central Economic and Historic Reports, E.T. Gavin, December, 1974.

Aramingo Civic Association, Historic Report, C. Clark, December, 1974.

PennDOT Highway Engineering Report (Volumes I, II and III), December-March, 1974-75.

7. Related Studies

a. Previous Transportation Studies for Northeast Philadelphia

Numerous studies and reports for transportation projects have been undertaken by the various area gevernmental bodies over the years for the Northeast section of Philadelphia. A listing of these studies and reports is herein provided, and they are available for review by contacting the District Engineer or the Environmental Manager at the Pennsylvania Department of Transportation's District 6 Office during working hours.

(1) City of Philadelphia Studies

(a) Northeast Freeway, Gannett, Flemming, Corddry and Carpenter. 1957

(b) Tacony Creek Expressway, Gannett, Flemming, Corddry and Carpenter. 1958

(c) Northeast Freeway, Urban Engineers Inc. 1960

(d) Tacony Creek Expressway, Urban Engineers Inc. 1966

(e) Preliminary Location Surveys for Northeast Subway Extension. 1948

(f) Northeast Subway Extension, Louis T. Klauder and Associates. 1960

(g) Northeast Subway Extension along Roosevelt Boulevard. 1961

(h) Broad Street Subway Extensions, Turnpike Engineers Inc. 1964

(i) Northeast Subway Extension Design Plans, Turnpike Engineers Inc. 1965

(j) Philadelphia Comprehensive Plans. 1965

(2) Delaware River Port Authority Studies

(a) Delaware River Crossings, Mojeski and Masters 1955

(b) Delaware River Crossing Needs, Simpson and Curtin. 1962

(c) Delair Bridge Crossing, Modjeski & Masters 1963

(d) Delair Bridge Crossing, Modjeski & Masters 1966

(e) Phila-Pennsauken Bridge Report, Michael Baker Inc. 1969

(3) Delaware Valley Regional Planning Commission Studies

(a) 1985 Regional Transportation Plan 1969

(b) Traffic Analysis Report - Pulaski Highway 1973

(c) Air Pollution Report - Pulaski Highway 1973

(d) Activating the Reading Short Line 1972

(e) Analysis of Delaware River Bridge Crossings 1972

(f) Penn Jersey Transportation Studies 1964

(4) Civic Group Studies

(a) Review of Northeast Rapid Transit System, Anthony Tomazinis 1964

(b) Transportation Planning for the Greater Northeast, Albert Derr 1970

(c) Noise and the Northeast Freeway, H. W. Pratt 1967

(5) PennDOT Studies

(a) Tacony Expressway, Urban Engineers 1968

(b) Delair Bridge Interchange, Modjeski and Masters 1969

(c) Northeast Freeway, Urban Engineers 1966

(d) Tacony Creek and Northeast Toll Roads, Wilbur Smith Associates 1967

(e) Effect of Pulaski Highway on Tacony Creek Park, G. E. Patton 1971

(f) Parklands Submission for Pulaski Highway 1971

(g) Unofficial Draft Environmental Impact Statement- Pulaski Highway 1971

(h) Investigation of Alternate Alignments 1971

(i) Pulaski Highway - Corridor Location Study 1971

(j) Pulaski Highway - Unofficial Draft Environmental Statement 1971

(k) Pulaski Highway - Noise Pollution Study 1973

(l) Pulaski Highway - Design Location Study 1973

(m) Pulaski Highway - Water Quality Investigation 1973

(n) Pulaski Highway - Air Quality Study 1973

(o) Pulaski Highway - Unofficial Draft Environmental Impact Statement 1973

b. Legislative Investigations

The Pulaski Highway was the subject of a special study of the Senate of the Commonwealth of Pennsylvania. A special Senate sub-committee was chaired by Senator Joseph Smith to inquire into the Betsy Ross Bridge and its access routes (See Plate 3). The Senate sub-committee completed its study in February, 1974 and recommended the construction of the Pulaski Highway without further delay.

The progress of the Pulaski Highway was also the subject of a special study by the House of Representatives of the Commonwealth of Pennsylvania. A special House sub-committee was chaired by Representative Alvin Katz to investigate the delay in completing access roads and access ramps to the new Betsy Ross Bridge. The House sub-committee published a report in December, 1974 and recommended that the Pulaski Highway not be constructed, and that the sub-committee be reinstituted to investigate the delays in constructing the access routes in the area.

Both of these studies based their conclusions on the results of testimony received from citizens and officials of PennDOT and various other organizations. While their recommendations are opposing, it is important to note that both investigations reported that the major concern of the citizens and businessmen in the project area was that a decision to build or to eliminate the Pulaski Highway be definitely made and the uncertainty that has existed for more than a decade be eliminated.

8. Anticipated Completion Date

The Public Hearing for this project is expected in 1976 whereby comments on the alternate designs and this Draft EIS will be taken. Following a possible approval of a recommended alignment, final design could proceed, probably requiring at least two years to complete. If a proposed build project alignment is chosen, right-of-way acquisition and clearing could begin, allowing actual construction to begin in 1979. Under this schedule, the facility could be open for traffic in 1981. This schedule assumes no unusual delays in the review, approval, and funding processes.

B. TRANSPORTATION DATA

1. The Regional Transportation Plan

Extensive traffic projection analyses for proposed Pulaski Highway have been prepared by the Delaware Valley Regional Planning Commission (DVRPC). The DVRPC was formed in July of 1965 by the Governors and Legislatures of the State of New Jersey and the Commonwealth of Pennsylvania to prepare Comprehensive Plans for the physical development of the Delaware Valley Region. It consists of a Board and an Executive Committee, which are comprised of elected and appointed officials of the governments of the nine counties and two states in the Delaware Valley Region, and a staff which prepares the technical studies.

The DVRPC continued the regional transportation study begun by the Penn-Jersey Transportation Study in 1959. A region-wide transportation study was conducted and massive amounts of data concerning transportation facilities, travel patterns, land use, population, economics and governmental regulations were collected. The region was divided into 521 transportation analysis zones as shown on Plate 14 and travel data and trip forecasts were devised on a zonal basis. The DVRPC then devised a series of Regional Transportation Plans for the year 1985 which included freeway networks, rail commuter networks, and subway-elevated and rapid transit networks. The DVRPC then tested seven alternative combinations of these networks (See Plates 15, 15A thru D) and evaluated the acceptability of each of these combinations according to criteria based on system performance, total cost, and travel costs.

These tests and evaluations resulted in the determination of the optimum combination of a freeway network, a rail commuter network, and a subway-elevated and rapid transit network to serve the transportation needs of the region in the year 1985. Test Plan 3 was the only one which was found acceptable by all testing criteria and thus became the recommended plan.

This recommended 1985 Regional Transportation Plan was part of the 1985 Regional Comprehensive Plan presented to the public at Public Hearings held in October and November of 1969, and subsequently adopted by the Board of the DVRPC on December 17, 1969. Plates 4, 5, and 6 indicate the various transportation networks which, when combined, comprise the multi-modal 1985 Adopted Regional Transportation Plan for the Delaware Valley Region.

The 1985 Regional Transportation Plan is an integral part of the DVRPC 1985 Adopted Comprehensive Plan for the physical development of the region. This Adopted Comprehensive Plan also includes 1985 Plans for Land Use, Open Space, Housing, Water Supply and Water Pollution Control. All of these 1985 Adopted Regional Plans were prepared in coordination with one another. The 1985 Regional Land Use Plan was used as the basis for zonal trip productions and attractions for the 1985 Regional Transportation Plan.

The 1985 Adopted Regional Transportation Plan for the Delaware Valley Region includes the Pulaski Highway as a link in the intermediate freeway loop around the central core of the metropolitan area. The Pulaski Highway is shown as project #19 on Plate 4.

2. <u>Projection Processes Utilized</u>

The entire process used by the DVRPC to project travel in the Delaware Valley Region for the year 1985 is divided into five major steps as follows:

Step 1 Projection of socio/economic and land use activities (land use plan.)
Step 2 Projection of future trips (trip generation)
Step 3 Projection of mode of travel (transit or highway)
Step 4 Projection of travel patterns
Step 5 Projection of traffic loads on facilities (trip assignment)

Step 1 utilizes the Activities Allocation Model to determine the amount of employment, population and number of households in each sub area of the region. Step 2 utilizes the results of Step 1 to compute the total number of person trips by their trip purpose. Step 3 utilizes transit accessibility and frequency of service, car ownership and job and residential densities to produce estimates of transit usage for each trip purpose. The transit trips are then subtracted from the computed total person trips to obtain auto person trips. Step 4 utilizes mathematical models to distribute origins and destinations of trips for both highway and transit trips. Step 5 utilizes mathematical techniques to accumulate trips on each individual highway and transit facility.

A more complete description of these processes utilized by the DVRPC in projecting and assigning future travel is contained in the report prepared by the DVRPC for the Pulaski Highway Interdisciplinary Team.

3. <u>Traffic Projections for the Pulaski Highway Project</u>

a. <u>General</u>

The travel projection analyses utilized for the current studies and designs for the Pulaski Highway Project were completed by the DVRPC and indicated in their report "Traffic Analyses for Alternate Alignments of the Pulaski Highway" prepared in June, 1973.

b. Concepts

The DVRPC has prepared extensive traffic projections analyses for the proposed Pulaski Highway over a period of several years. The DVRPC investigated various concepts, alignments and schemes for this highway facility from a traffic volume aspect. Concepts studied included:

(1) A No-Build Alternate

(2) The connection of the Pulaski Highway to the proposed Northeast Freeway (DVRPC Adopted Plan)

(3) The connection of the Pulaski Highway to an extension north of Roosevelt Boulevard to the vicinity of Oxford Avenue and Levick Street (Oxford Spur)

(4) The termination of the Pulaski Highway at Roosevelt Boulevard (Current Proposal)

(5) The connection of the Pulaski Highway to an improved Roosevelt Boulevard* between 9th Street and the Pulaski Highway (DVRPC Adopted Plan) (*grade separated center lanes)

c. Networks

The DVRPC projected and assigned 1985 traffic for a No-Build Alternate and two basic Build Alternate alignments of the Pulaski Highway - one through the Tacony Creek Park as previously designed and one along the route of Adams Avenue as previously suggested by the City Planning Commission.

Combinations of the concepts and alternate alignments resulted in traffic projections and assignements for five Pulaski Highway traffic analyses networks:

Network A - The No-Build Network (See Table 1 for a listing of expressways included)

Network B - The Build Alternate with the alignment through the Tacony Creek Park, with the extension north of Roosevelt Boulevard to Oxford and Levick (Oxford Spur) and with the improvement of Roosevelt Boulevard from 9th Street to the Pulaski Highway.

TABLE 1
EXPRESSWAYS INCLUDED IN THE PULASKI HIGHWAY NO-BUILD NETWORK

FACILITY	NO. ON PLATE 4
1. All Existing Expressways	
2. The Delaware Expressway (I-95)	6
3. The Mid-County Expressway (I-476)	4
4. The Cobbs Creek Expressway (I-695)	5
5. The Vine Street Expressway (I-76)	3
6. New Jersey I-76	8
7. Burlington-Bristol Bridge Approach to I-95	28
8. Burlington-Mt. Holly Expressway	42

Network C - The Build Alternate with the alignment through the Tacony Creek Park, terminating at Roosevelt Boulevard, with the improvement of Roosevelt Boulevard from 9th Street to the Pulaski Highway.

Network D - The Build Alternate with the alignment along Adams Avenue, with the extension north of Roosevelt Boulevard to Oxford and Levick (Oxford Spur) and without the improvement of Roosevelt Boulevard.

Network E - The Build Alternate with the alignment along Adams Avenue, terminating at Roosevelt Boulevard and without the improvement of Roosevelt Boulevard.

Traffic projections and assignments for the year 1985 were prepared for each of these five networks for the proposed Pulaski Highway and for the surrounding arterial streets and expressways in the study area as shown on Plates 16 to 20.

The regional highway network used as a base highway network for the analyses of the Build Alternate was the 1985 Adopted Freeway Plan as shown on Plate 4 with the following modifications:

(1) deletion of the Northeast Freeway for both basic alignment

(2) deletion of the improvement to Roosevelt Boulevard for the Adams Avenue basic alignment.

The regional mass transit network used as a base transit network for the analyses of both the Build and No-Build Alternates was the 1985 Adopted Railroad Plan and the 1985 Adopted Subway-Elevated and Rapid Transit Plan as indicated on Plates 5 and 6. A major planned facility included in this base transit network which extends from the Philadelphia CBD through the corridor served by the proposed Pulaski Highway is the Northeast Extension of the Broad Street Subway to Rhawn Street. This planned subway facility was considered in operation in the preparation of 1985 traffic assignments for the proposed Pulaski Highway.

The current designs for the Pulaski Highway are based on the traffic data for Build Networks C and E. These two networks indicate the Pulaski Highway terminating at Roosevelt Boulevard as presently proposed. Network

C indicates the Pulaski Highway passing through the Tacony Creek Park and interchanging with Roosevelt Boulevard at "F" Street. This network corresponds to Build Alternate "D" only. Network E indicates the Pulaski Highway parallel to the present alignment of Adams Avenue and interchanging with Roosevelt Boulevard at Adams Avenue. This network corresponds to Build Alternates A-1, A-2, B, C, E, and F, all of which interchange with Roosevelt Boulevard in the vicinity of Adams and Summerdale Avenues.

Networks B and D were used solely to determine the traffic effects of extending the Pulaski Highway north of Roosevelt Boulevard to the Oxford Avenue and Levick Street area. These networks were not used for any traffic analyses or design purpose and were deleted from further consideration.

The DVRPC converted the 1985 network assignments along the proposed Pulaski Highway to 1980 and 1995 average daily traffic (ADT) assignments. These are intended to indicate traffic volumes on the proposed highway when it is first opened to traffic (1980) and fifteen years afterwards (1995). The 1980 and 1995 ADT traffic assignments were then applied to each of the Build Alternate alignments currently being investigated in detail as shown on Plates 22 through 29. The 1985 ADT traffic assignments for the arterial streets and expressways included in the No-Build Alternative are shown on Plate 30. The assignments indicate that the traffic demand along the proposed Pulaski Highway would be in excess of 87,000 vehicles per day in 1980 and in excess of approximately 100,000 vehicles per day in 1995. For comparison purposes, existing traffic volumes (1969-1972) on the arterial streets in the study area are shown on Plate 16.

d. Supplemental Analyses

In addition to preparing traffic projections and assignments for the Pulaski Highway and the arterial streets and expressways in the local study area, the DVRPC prepared various supplemental traffic analyses. These analyses included:

(1) Roosevelt Boulevard Traffic Demand Analysis - an assessment of the 1985 traffic demands on Roosevelt Boulevard between the present terminus of the Roosevelt Expressway at 9th Street and the proposed Pulaski Highway. Current daily traffic volumes were supplied from existing counts and projected 1985 assigned traffic volumes for both Network A (No-Build Network) and Network C (Build Network with the park alignment) were determined. The existing traffic volumes along this section of Roosevelt Boulevard and nearby arterial streets are indicated on Plates 31. The projected 1985 daily traffic volumes for these same facilities are indicated on Plate 32 for the No-Build Network and on Plate 33 for Network C.

(2) Screenline Analysis - an analysis of the assigned 1985 traffic volumes crossing hypothetical lines oriented across the two major travel corridors in the study area. This analysis indicates the travel assignments to the separate arterials and expressways and the total arterial and expressway assignments. The analysis also indicates the changes that would occur in arterial and expressway travel for each of the networks. The screenlines chosen are shown on Plate 34 and the results of this analysis are indicated in Tables 2 and 3.

(3) Volume to Capacity Anslysis - an analysis of the 1985 assigned demand volumes to the roadway link capacity of the expressways and between intersections on the major arterial streets. The volume to capacity ratios were computed for each network to provide an indication of where congested traffic conditions would occur in the study area. The results of this analysis are indicated in Table 4. The values shown in Table 4 can be used as an indication of where capacity of the roadways may be insufficient, however, these are only relative values and are not based on specific roadway and signalization constraints at the particular sites indicated.

TABLE 2

EAST-WEST SCREENLINE "A"

BETWEEN RISING SUN AVENUE AND DELAWARE EXPRESSWAY

Facility	Existing Traffic ADT (Year)	1985 ADT (Alternate Networks)				
		Network A	Network B	Network C	Network D	Network E
Rising Sun Avenue	15,500 (1970)	22,700	20,400	21,200	19,400	19,400
Tabor Avenue	15,300 (1971)	25,700	22,900	27,400	22,900	24,400
Northeast Freeway	--	--	38,000	--	33,400	--
Summerdale Avenue	13,100 (1972)	16,600	16,200	17,600	16,200	19,100
Roosevelt Boulevard	91,000 (1972)	106,600	89,200	106,600	107,400	121,200
Castor Avenue	18,300 (1968)	21,700	16,100	21,800	15,600	16,000
Oxford Avenue	9,800 (1968)	12,500	11,600	12,200	11,600	12,200
Frankford Avenue	13,400 (1971)	15,700	16,500	16,500	17,100	17,100
Torresdale Avenue	9,600 (1971)	15,000	15,800	14,700	14,400	14,700
Tacony State Road	14,600 (1970)	24,700	26,900	23,600	22,100	24,400
Aramingo Avenue	16,400 (1969)	28,300	27,800	28,300	24,400	26,200
Delaware Expressway	75,800 (1971)	162,000	151,000	161,800	148,600	155,200
TOTAL	292,800	451,500	452,400	451,700	453,100	451,900
Arterial Volume	217,000	289,500	263,400	289,900	271,100	296,700
Expressway Volume	75,800	162,000	189,000	161,800	182,000	155,200

TABLE 3

NORTH-SOUTH SCREENLINE "B"

BETWEEN LEVICK STREET AND ALLEGHENY AVENUE

Facility	Existing Traffic ADT (Year)	1985 ADT (Alternate Networks)				
		Network A	Network B	Network C	Network D	Network E
Allegheny Avenue	15,800 (1969)	24,300	19,400	19,400	23,700	23,700
Tioga Street	8,800 (1969)	15,200	10,700	10,700	14,300	14,300
Erie Avenue	15,600 (1970)	21,700	17,300	17,300	20,600	20,600
Hunting Park Ave.	13,100 (1968)	23,600	17,900	17,900	22,500	22,500
Cayuga Street	6,700 (1972)	10,400	9,900	9,900	12,400	12,400
Wyoming Avenue	9,700 (1968)	19,300	17,500	17,500	19,100	19,100
Pulaski Highway	--	--	55,000	63,400	--	--
Roosevelt Boulevard	109,500 (1972)	133,600	123,700	127,400	149,500	154,300
Martins Mill Road	4,600 (1972)	12,500	7,400	6,800	7,400	6,800
Levick Street	14,200 (1968)	22,700	20,800	20,200	23,800	20,200
TOTAL	198,000	283,300	299,600	310,500	293,300	293,900
Arterial Volume	198,000	283,300	244,600	247,100	293,300	293,900
Expressway Volume	--	--	55,000	63,400	--	--

TABLE 4
COMPARISON OF VOLUME TO CAPACITY
RATIOS FOR SELECTED ARTERIALS

FACILITY	ROUTE SECTION	DAILY CAPACITY	EXISTING TRAFFIC		DO NOTHING NETWK. NETWORK A		PULASKI TERMINATED AT ROOSEVELT BLVD. NETWORK C		NETWORK E	
			VOL.	V/C	VOL.	V/C	VOL.	V/C	VOL.	V/C RATIO
Roosevelt Blvd.	Whitaker Avenue - Adams Avenue	184.2 Exp.** 108.0	Not Avail.	-	126.1	1.17	128.9	0.70	146.9	1.36
" "	Adams Avenue - Summerdale Ave.	184.2 Exp.** 108.0	109,500 (1972)	1.01	133.6	1.24	127.4	0.69	154.3	1.43
" "	Ramona Avenue - Godfrey Avenue	184.2 Exp.** 108.0	91,000 (1972)	0.84	106.6	0.99	106.6	0.58	121.2	1.12
Adams Avenue	Rising Sun Ave.- Tabor Road	36.0	11,700 (1968)	0.32	29.7	0.82	25.4	0.71	24.6	0.68
" "	Tabor Road - Roosevelt Blvd.	36.0	20,400 (1968)	0.57	39.7	1.10	38.6	1.07	35.3	0.98
Rising Sun Ave.	Levick Street - Adams Avenue	20.0	Not Avail.	-	22.7	1.14	21.2	1.00	19.4	0.97
" "	Adams Avenue - Tabor Road	20.0	Not Avail.	-	24.0	1.20	15.1	0.76	15.1	0.76
Tabor Road	Rising Sun Ave.- Adams Avenue	20.0	8,500 (1968)	0.42	23.9	1.20	17.3	0.86	15.8	0.79
Tabor Avenue	Adams Avenue - Levick Street	20.0	15,300 (1971)	0.76	25.7	1.28	27.4	1.37	24.4	1.22
Summerdale	Roosevelt Blvd.- Pratt Street	20.0	13,100 (1972)	0.66	16.6	0.83	17.6	0.58	19.1	0.96
Summerdale	Pratt Street - Oxford Avenue	20.0	13,100 (1972)	0.66	18.1	0.90	19.2	0.96	23.8	1.19
Castor Avenue	Adams Avenue - Godfrey Avenue	20.0	18,300 (1968)	0.92	21.7	1.05	21.8	1.09	18.0	0.90
" "	Cayuga Street - Wyoming Avenue	20.0	17,800 (1968)	0.89	13.7	0.65	21.9	1.10	25.4	1.27
Oxford Avenue	Levick Street - Cottman Ave.	20.0	14,400 (1968)	0.72	19.8	0.99	19.4	0.97	19.6	0.98
" "	Devereaux Street- Langdon Avenue	20.0	14,900 (1968)	0.74	21.6	1.08	14.0	0.70	15.2	0.76
Frankford Ave.	Pratt Street - Arrott Street	20.0	13,400 (1971)	0.67	15.7	0.78	16.5	0.82	17.1	0.86
Wyoming Ave.	"C" Street - Whitaker Ave.	24.0	13,300 (1968)	0.55	16.4	0.68	16.1	0.67	16.7	0.70
Erie Avenue	"G" Street - Whitaker Ave.	36.0	Not Avail.	-	18.9	0.52	15.6	0.43	17.9	0.50
Wingohocking St.	Castor Avenue - Pulaski Ramp	20.0	8,000 (1972)	0.40	9.6	0.48	13.8	0.69	22.7	1.14

** Roosevelt Boulevard is included as an at-grade facility in Networks D and E; it is included as a limited access facility in Networks B and C.

TABLE 4 (cont.)

COMPARISON OF VOLUME TO CAPACITY
RATIOS FOR SELECTED ARTERIALS

Facility	Route Section	Daily Capacity	Pulaski Terminated at Roosevelt Blvd.			
			Network C		Network E	
			Vol.	V/C	Vol.	V/C
Pulaski Highway	Oxford-Levick Sts. to Roosevelt Blvd. (or Pulaski Hwy.)	90,800	--	--	--	--
"	Roosevelt Blvd. to Pulaski Hwy.	136,200	63,400	0.47	--	--
"	Pulaski Hwy. (or Roosevelt Blvd.) to Castor Ave. (or Wingohocking St.)	181,700	63,400 90,300	0.35 0.50	77,200	0.42
"	Wingohocking St. to Aramingo Ave.	181,700	96,400	0.53	95,000	0.52
"	Aramingo Ave. to Delaware Exp.	181,700	69,500	0.38	68,100	0.37
Philadelphia - Pennsauken Bridge	Delaware Exp. to Richmond St.	181,700	75,900	0.42	75,900	0.42
Philadelphia - Pennsauken Bridge	Richmond St. to Delaware River	181,700	81,500	0.45	81,500	0.45
Delaware Expressway	North of Betsy Ross Bridge	181,700	211,100	1.16	204,900	1.13
Delaware Expressway	South of Betsy Ross Bridge	181,700	187,500	1.03	195,100	1.07

TABLE 4 (cont.)

COMPARISON OF VOLUME TO CAPACITY
RATIOS FOR THE PULASKI HIGHWAY (1995)

Route Section (From - To)	Daily Basic Capacity	Pulaski Terminated at Roosevelt Blvd.			
		Network C		Network E	
		Vol.	V/C	Vol.	V/C
Oxford-Levick Sts. to Roosevelt Blvd. (or Pulaski Hwy.)	90,800	-	-	-	-
Roosevelt Blvd. to Pulaski Hwy.	136,200	73,500	0.54	-	-
Pulaski Highway (or Roosevelt Blvd.) to Castor Avenue (or Wingohocking St.)	181,700	104,700	0.58	89,600	0.49
Wingohocking St. to Aramingo Avenue	181,700	111,800	0.62	110,200	0.61
Aramingo Avenue to Delaware Exp.	181,700	80,600	0.44	79,000	0.43
Delaware Exp. to Richmond Street	181,700	88,100	0.48	88,100	0.48
Richmond Street to Philadelphia - Pennsauken Bridge	181,700	94,600	0.52	94,600	0.52

(4) Selected Link Analysis - an analysis of the location of the origins of the trips assigned to the Pulaski Highway. The results of this analysis are indicated in Table 5.

(5) Delaware Expressway Interchange Analysis - an analysis of the traffic volumes interchanging with local arterials along the Delaware Expressway with and without the proposed Pulaski Highway. This analysis indicates the amount of trips assigned to the Pulaski Highway which would otherwise travel over other local arterials to reach the Delaware Expressway and Betsy Ross Bridge. The results of this analysis are indicated in Table 6 and Plate 35.

(6) Richmond Street Ramps Analysis - an analysis of the impact of closing these ramps leading to the Betsy Ross Bridge. This analysis indicates the redistribution of traffic to other approach routes to the bridge if these ramps are closed. The service area for the Richmond Street Ramps are indicated on Plate 36 for Network A (No-Build Network), and Plate 37 for Network C (Build Network with the park alignment). Projected 1985 daily traffic volumes along the highway facilities in the study area with the Richmond Street Ramps deleted are indicated on Plate 38 for Network A and on Plate 39 for Network C.

(7) Local Access Analysis - an analysis of the traffic impact of eliminating the local access interchange planned at Aramingo Avenue and at Castor-Wingohocking. This analysis indicates the redistribution of traffic to local arterial streets and the remaining interchanges at Roosevelt Boulevard and the Delaware Expressway if the planned local interchanges are eliminated. Projected 1985 daily traffic volumes along the highway facilities in the study area with and without the planned local inerchanges are indicated in the report prepared by the DVRPC which in included in the Appendix. The analysis is discussed in Section IV.

Table 5

Origin of trips on the Pulaski Highway

Area of Trip Origins	% of Total
Northeast Philadelphia	17%
Northwest Philadelphia	26%
North Philadelphia, Philadelphia CBD and Southwest Philadelphia	17%
Bucks County	11%
Montgomery County	8%
Delaware & Chester Counties	3%
External Trips (Including New Jersey)	18%
Total	100%

Table 6

Traffic Volumes at I-95 Interchanges under the No Build Alternative and Project Alternative

	1985 Traffic	
	Network A	Network C
Academy Road	28,100	21,300
Cottman Avenue	35,800	30,200
Castor Avenue	15,300	12,500
Alleghany Avenue	25,400	20,200

4. Projected Ridership on Mass Transit Facilities

An estimate of transit ridership in the Delaware Valley Region in the year 1985 was prepared by the DVRPC. The DVRPC prepared estimates of transit usage under the following transportation system assumptions:

a. Policies favoring transit with a Maximum Transit Network and Basic (Minimum) Highway Network combination (Test Plan 5 See Plate 15B)

b. Policies favoring highways with a Basic Transit Network and Maximum Highway Network combination (Test Plan 6A See Plate 15C)

The 1985 daily transit ridership estimates for these two opposite assumptions are shown in the table below.

a. 1960 Transit Ridership	1,283,400
b. 1985 Basic Transit Network (Test Plan 6A)	1,802,800
c. 1985 Maximum Transit Network (Test Plan 5)	1,978,800

The facilities included in the Basic and Maximum Transit Networks are shown on Plate 15C. Both were tested in conjunction with a railroad commuter line network as shown on Plate 15D.

The additional transit facilities in the Pulaski Highway Study Area which were included in the Maximum Transit Network are; the extension of the Broad Street Subway between Rhawn Street and Grant Avenue, the extension of the Frankford El to Rhawn Street, and the Belt Line Subway, a loop subway which follows a circumferential route from the 69th Street Terminal through Overbrook, East Falls, Germantown, Olney and Frankford to the vicinity of Torresdale Avenue and Bridge Street.

The Maximum Transit Network was expected to cost almost twice as much as the Basic Transit Network. The 1985 overall regional ridership on the Maximum Transit Network, however, was expected to increase by only 9.7% over the Basic Transit Network as indicated here:

	1985 Daily Ridership	1968 Cost
Basic (Minimum) Transit Network Test Plan 6A	1,802,800	$ 772,800,000
Maximum Transit Network Test Plan 5	1,978,800	$1,489,300,000

The DVRPC test of opposite transit policies indicated that 1985 transit ridership would be increased by policies and facilities favoring transit. An analysis of transit trip growth by sector indicates that the majority of this increase would occur in outlying areas. In addition, the projections developed for each sector indicate that already densely developed urban sectors would show little increase in transit trips over the 1960 level. These analyses are contained in the Technical Supplement to Plan Report No. 5 prepared by the DVRPC. Selected tables from that report which indicated transit trip growth by sector are contained on the following pages and the sectors considered are shown on Plate 40.

The DVRPC transit ridership projections shown in these tables did not include the effects of restrained highway speeds on modal choice, however, these effects were the subject of thorough studies by the DVRPC. In 1969 the DVRPC resimulated district level travel projections for 1985 to determine how many auto drivers would be discouraged by congestion on highways and switch to mass transit. The resimulation included revised modal split projections, redistribution of the automobile and transit trips, revised sub-modal split projections and reassignment of automobile and transit trips to the 1985 Adopted Transportation Plan for the Delaware Valley Region. This resimilation was based on the Intermediate Freeway Network and the Basic Transit Network.

The revised 1985 transit ridership on the 1985 Adopted Transit Network was projected to be 1,978,800 daily trips, an increase of 9.7% over the 1985 daily transit ridership of 1,802,800 which was projected using unrestrained highway speeds. The revised 1985 daily highway trips on the Adopted Freeway Network were less than 2% lower than those projected using unrestrained highway speeds. Total person trips generated for the region remained the same at approximatley 14.4 million.

The analyses indicated that the effects of restrained highway speeds on total regional highway trips is very small resulting in only a 1.7% reduction. The transit trips increase to and from the Philadelphia CBD amounted to a 16% increase over those projected with unrestrained highway speeds. The increase, however, came primarily from districts located increasingly distant from the CBD.

The conclusions derived from these restrained speed analyses was that the change in highway trips was not enough to indicate that automobile drivers who would be discouraged by congestion and decide to use mass transit were sufficient in number to either reduce a single planned expressway facility or add a new transit facility to the 1985 Adopted Transportation Plan for the Delaware Valley Region. Revised trip tables are included in the DVRPC report "The Effects of Restrained Highway Speeds on the 1985 Travel Patterns and Modal Choice."

Ridership projections for each mode of travel(railroad, subway-elevated and surface routes) are indicated in the tables on the following pages. Ridership projections for each of the rail mass transit facilities included in the 1985 Adopted Regional Transit Plan are indicated in Plates 41 through 45. The projections indicated with the basic transit network in Table 14 and with the original assignment on Plates 41 through 45 were utilized in the preparation of the projected traffic volumes for the proposed Pulaski Highway.

It is important to note that the basic transit network became the 1985 Adopted Regional Subway Elevated and Rapid Transit Plan and that this Adopted Regional Plan include the Northeast Extension of the Broad Street Subway

TABLE 7

BASIC TRANSIT NETWORK FACILITIES

FACILITY	NO. ON PLATE 6
All Existing Facilities	
Northeast Extension of Broad Street Subway	28
South Philadelphia Extension of Broad Street Subway*	29
Lindenwold High Speed Line*	30
Airport High Speed Line	31

* construction already completed

TABLE 8

MAXIMUM TRANSIT NETWORK FACILITIES

Ceaderbrook Extension of Broad Street Subway

Broomall Extension of Market-Frankford Elevated

Extension of Frankford Elevated to Rhawn Street

King of Prussia Spur - Norristown High Speed Line

Extension of Lindenwold Line to Woodland Avenue

Moorestown-Mount Holly Line

Willingboro-Burlington Spur

Extension of Broad Street Subway to Grant Avenue

Belt Line Subway

Extension of Lindenwold Line to Airport

Woodbury-Glassboro Line

Extension of Reading Norristown Line

TABLE 9

ESTIMATED 1985 TRANSIT TRIP ORIGINS BY SECTOR

Sector	Base 1960 Transit Trips (Thousands)	Total Person Trips, Growth Factor	1985 Transit Trips (Thousands) Basic Transit Trips Plan 6a	Basic Transit Growth Factor	Maximum Transit Trips Plan 5	Maximum Transit Growth Factor	Percent of Person Trips Using Transit Base 1960	Basic 6a	Maximum 5
1	231	2.13	324	1.40	360	1.56	57	38	42
2	223	1.58	242	1.08	251	1.13	38	26	27
3	99	1.73	108	1.09	115	1.15	32	20	22
4	183	1.83	240	1.31	264	1.44	30	22	24
5	171	1.55	228	1.34	246	1.44	23	20	22
6	112	1.56	153	1.37	169	1.52	16	14	16
7	9	2.29	28	3.02	29	3.17	2	3	3
8	39	1.80	78	2.01	84	2.18	5	5	6
9	105	1.69	170	1.62	185	1.76	7	7	8
10	6	1.71	17	2.71	17	2.79	2	4	4
11	30	2.06	88	2.95	110	3.69	4	5	6
12	15	2.20	36	2.45	47	3.19	4	4	6
15	42	1.41	61	1.46	70	1.67	16	17	19
16	19	1.39	31	1.65	33	1.75	6	8	8
Total	1,283	1.78	1,803	1.40	1,979	1.54	16	13	14

Note: Trips may not add due to rounding.

TABLE 10

ESTIMATED 1985 TRANSIT TRIP ORIGINS FOR SELECTED AREAS

Area	Base 1960 Transit Trips (Thousands)	1985 Transit Trips (Thousands) Basic Transit Trips Plan 6a	Basic Transit Growth Factor	Maximum Transit Trips Plan 5	Maximum Transit Growth Factor	Percent of Person Trips Using Transit Base 1960	Basic 6a	Maximum 5
Philadelphia CBD	231	324	1.40	360	1.56	57	38	42
Camden City	42	61	1.46	70	1.67	16	17	19
Trenton City	19	31	1.65	33	1.75	7	8	8
Philadelphia City	1,019	1,295	1.27	1,404	1.38	31	23	25
Pennsylvania Counties	1,172	1,570	1.34	1,702	1.45	19	15	16
New Jersey Counties	112	233	2.09	277	2.48	6	6	7
Cordon Area	1,283	1,803	1.40	1,979	1.54	16	13	14

TABLE 11

ESTIMATED 1985 TRANSIT TRIP ORIGINS FOR SELECTED DISTRICTS

Planning District Number	Approximate Center of District	Base 1960 Transit Trips (Thousands)	1985 Transit Trips (Thousands) Basic Transit Trips Plan 6a	Basic Transit Growth Factor	Maximum Transit Trips Plan 5	Maximum Transit Growth Factor	Percent of Person Trips Using Transit Base 1960	Basic 6a	Maximum 5
101	15th and Market Sts. Philadelphia (CBD)	50	70	1.39	76	1.51	61	47	51
500	Broadway and Market Sts. Camden (CBD)	10	15	1.46	16	1.61	28	31	34
781	Broad and Cooper Sts. Woodbury, N. J.	2	5	1.98	8	3.21	4	5	7
282	Frankford Ave. and Bridge Sts., Philadelphia, Pa.	25	33	1.29	36	1.44	22	22	25
754	Moorestown, Pk. and Chester Avenue, Moorestown, N. J.	1	6	5.11	8	7.08	3	5	7
274	Ogontz Ave. and Washington Lane, Philadelphia, Pa.	13	19	1.46	22	1.67	14	15	17

TABLE 12

1985 TRANSIT TRIP PROJECTIONS AND GROWTH FACTORS BY TRIP PURPOSE—BY SECTOR

Internal-Internal Trip Origins (Thousands)

Test Plan 5

MAXIMUM NETWORK

1985

Sector	1960 Total Trips	Home to Work Trips	Home to Work GF	Home to Non-Work Trips	Home to Non-Work GF	Work to Home Trips	Work to Home GF	Non-Work to Home Trips	Non-Work to Home GF	Non-Home to Non-Home Trips	Non-Home to Non-Home GF	Total Trips	Total GF
1	231.2	9.2	1.73	8.6	1.82	184.0	1.48	104.3	1.70	53.8	1.50	359.9	1.56
2	222.8	70.3	1.11	52.0	1.03	60.4	1.12	45.3	1.09	23.0	1.72	251.0	1.13
3	99.4	35.8	1.12	27.5	1.03	24.6	1.28	17.3	1.03	9.4	2.01	114.6	1.15
4	182.6	67.0	1.22	68.3	1.43	49.5	1.56	55.3	1.55	23.6	1.91	263.7	1.44
5	170.8	76.4	1.44	55.6	1.27	46.6	1.65	44.5	1.24	22.5	2.37	245.6	1.44
6	112.2	50.7	1.35	37.9	1.35	31.9	1.56	32.0	1.54	16.7	3.02	169.2	1.52
Philadelphia	1,019.1	309.6	1.26	249.9	1.24	397.1	1.43	298.7	1.41	148.8	1.84	1,404.1	1.38
7	9.1	12.3	2.84	7.8	3.46	2.8	3.42	3.8	3.15	2.4	4.25	29.0	3.17
8	38.6	24.8	1.86	20.9	2.47	13.2	1.81	15.7	2.39	9.7	3.27	84.3	2.18
9	104.9	60.7	1.69	51.2	1.97	27.1	1.77	32.8	1.50	12.7	2.27	184.6	1.76
10	6.1	6.5	3.15	5.2	2.59	2.3	2.02	2.7	3.93	0.5	1.84	17.1	2.79
11	29.8	35.8	2.70	27.5	3.42	10.5	2.91	15.3	4.09	20.6	18.93	109.7	3.69
12	14.7	15.6	2.44	11.7	2.61	3.9	3.22	5.3	2.61	10.3	18.21	46.8	3.16
15	42.1	16.5	1.59	12.8	1.48	18.7	1.62	14.3	1.74	8.0	2.37	70.2	1.67
16	18.9	6.4	1.54	6.5	1.75	8.7	1.91	9.1	1.74	2.4	1.81	32.9	1.75
Cordon Area	1,283.4	488.2	1.45	393.4	1.48	484.2	1.50	397.6	1.52	215.4	2.23	1,978.8	1.54

Trips may not add due to rounding.

TABLE 13

1985 TRANSIT TRIP PROJECTIONS AND GROWTH FACTORS
BY TRIP PURPOSE-BY SECTOR
INTERNAL-INTERNAL TRIP ORIGINS
(THOUSANDS)
TEST PLAN 6a
BASIC NETWORK

Sector	Home to Work Trips	Home to Work GF	Home to Non-Work Trips	Home to Non-Work GF	Work to Home Trips	Work to Home GF	Non-Work to Home Trips	Non-Work to Home GF	Non-Home to Non-Home Trips	Non-Home to Non-Home GF	Total Trips	Total GF
1	7.5	1.41	7.1	1.50	167.0	1.35	90.9	1.47	52.2	1.46	323.9	1.40
2	65.6	1.04	50.8	1.01	58.9	1.09	43.8	1.05	22.5	1.69	241.6	1.06
3	34.3	1.07	25.7	0.96	22.3	1.16	17.0	1.01	8.9	1.90	108.1	[illegible]
4	61.5	1.12	53.5	1.12	49.1	1.55	52.5	1.47	23.1	1.88	239.7	1.41
5	70.8	1.33	54.1	1.23	39.6	1.40	42.8	1.19	21.0	[illegible]	228.3	1.34
6	44.8	1.20	35.7	1.27	29.0	1.42	29.8	1.43	14.0	2.54	153.3	1.37
Philadelphia	284.6	1.16	226.9	1.09	365.8	1.32	275.9	1.30	141.8	1.75	1,295.0	1.27
7	11.6	2.68	7.7	3.44	2.6	3.23	3.7	3.04	2.1	4.67	27.6	3.02
8	22.2	1.66	20.2	2.38	12.3	1.69	14.5	2.21	8.6	2.91	77.8	2.01
9	55.8	1.55	50.3	1.93	23.7	1.54	30.0	1.37	9.9	1.77	169.6	1.62
10	6.1	2.95	5.2	2.59	2.3	2.02	2.6	3.86	0.5	1.80	16.6	2.71
11	30.5	2.30	24.0	2.99	8.5	2.36	12.2	3.27	12.4	11.36	87.6	2.95
12	13.5	2.11	10.7	2.38	3.2	2.66	4.3	2.10	4.4	7.72	36.0	2.45
15	14.5	1.39	11.7	1.36	16.7	1.45	12.4	1.51	6.1	[illegible]	61.3	1.36
16	5.7	1.39	6.5	1.73	8.4	1.85	8.4	1.62	2.2	1.70	31.2	1.65
Cordon Area	444.3	1.32	363.1	1.35	443.5	1.37	364.0	1.39	187.9	[illegible]	1,802.8	1.40

Trips may not add due to rounding.

TABLE 14

1985 TRANSIT TRIP PROJECTIONS AND GROWTH FACTORS (THOUSANDS) BY SUB-MODE-BY SECTOR TEST PLAN 6a (BASIC NETWORK)

	1960				1985							
					Railroad		Sub-El		Surface		Total	
Sector	Rail-road	Sub El	Surf	Total	Trips	GF	Trips	GF	Trips	GF	Trips	GF
1	30.1	94.5	106.5	231.2	56.3	1.87	142.2	1.50	125.4	1.18	323.9	1.40
2	3.6	71.2	148.0	222.8	3.9	1.08	85.7	1.20	152.0	1.03	241.6	1.08
3	.6	25.9	73.0	99.4	.5	.79	41.2	1.59	66 4	.91	108.1	1.09
4	6.3	58.8	117.5	182.6	7.0	1.11	85.1	1.45	147.6	1.26	239.7	1.31
5	8.0	55.6	107.3	170.8	12.3	1.54	91.8	1.65	124.3	1.16	228.3	1.34
6	1.9	43.9	66.4	112.2	2.5	1.28	80.5	1.84	70.3	1.06	153.4	1.37
Philadelphia Total	50.5	349.9	618.8	1,019.1	82.4	1.63	526.5	1.51	686.0	1.11	1,295.0	1.27
7	2.6	2.4	4.2	9.1	6.6	2.55	7.2	3.06	13.8	3.29	27.6	3.0[illegible]
8	11.5	7.0	20.2	38.6	20.8	1.82	13.1	1.87	43.8	2.18	77.8	2.01
9	18.2	22 9	63.8	104.9	30.1	1.66	43.5	1.90	96.0	1.50	169.6	1.62
Other Pennsylvania Total	32.3	32.2	88.2	152.7	57.6	1.79	63.8	1.98	153.6	1.74	275.0	1.80
10	.2	—	5.9	6.1	.2	.91	.9	*	15.5	2.65	16.6	2.71
11	.8	2.3	26.7	29.8	.9	1.11	24.9	*	61.8	2.32	87.6	2.95
12	.3	1.2	13.2	14.7	.2	.84	6.8	*	29.0	2.20	36.0	2.45
15	.4	4.8	37.0	42.1	.4	.89	13.2	2.76	47.8	1.29	61.3	1.46
16	.6	—	18.2	18.9	.4	.68	1.2	*	29.6	1.62	31.2	1.65
New Jersey Total	2.4	8.3	100.9	111.6	2.2	.91	46.9	*	183.7	1.82	232.8	2.09
Grand Total	85.2	390.4	809.8	1,283.4	142.2	1.67	637.2	163.2	1,023.3	1.27	1,802.8	1.40

* Growth Factor in excess of 5.00.
Totals may not add due to rounding.

TABLE 15

1985 TRANSIT TRIP PROJECTIONS AND GROWTH FACTORS (THOUSANDS) BY SUB-MODE-BY SECTOR TEST PLAN 5 (MAXIMUM TRANSIT NETWORK)

	Railroad		Sub-El		Surface		Total	
Sector	Trips	GF	Trips	GF	Trips	GF	Trips	GF
1	55.8	1.85	180.2	1.91	124.0	1.16	359.9	1.56
2	3.9	1.09	96.6	1.36	150.5	1.02	251.0	1.13
3	.5	.81	46.0	1.78	68.2	.93	114.6	1.15
4	6.9	1.10	114.9	1.95	141.9	1.21	263.7	1.44
5	11.8	1.49	132.6	2.39	101.2	.94	245.6	1.44
6	2.7	1.38	106.2	2.42	60.3	.91	169.2	1.51
Philadelphia Total	81.6	1.62	676.5	1.93	646.0	1.04	1,404.1	1.38
7	6.2	2.39	10.2	4.30	12.6	3.02	29.0	3.17
8	20.8	1.81	25.4	3.63	38.1	1.89	84.3	2.18
9	30.2	1.66	64.1	2.80	90.2	1.41	184.6	1.76
Other Pennsylvania Total	57.2	1.77	99.7	3.09	141.0	1.60	297.9	1.95
10	.2	.92	1.4	*	15.5	2.65	17.1	2.79
11	.9	1.12	47.5	*	61.2	2.30	109.7	3.69
12	.3	.87	23.9	*	22.6	1.72	46.8	3.19
15	.4	.94	23.3	4.86	46.6	1.26	70.2	1.67
16	.4	.69	1.6	*	30.9	1.70	32.9	1.75
New Jersey Total	2.2	.92	97.7	*	176.9	1.75	276.8	1.48
Grand Total	141.1	1.66	873.8	223.8	963.9	1.19	1,978.8	1.54

* Growth Factor is excess of 5.00.
Totals may not add due to rounding.

through the Pulaski Highway study area. The highway traffic projections prepared for the Pulaski Highway were based on a multi-modal transportation system which include this Broad Street Subway extension in operation and therfore definitely did consider the diversion of trips, oriented between the CBD and the northeast section of the city, from the highways onto greatly improved mass transit.

5. Suitability of the Projections

The DVRPC traffic projections for the Pulaski Highway have been criticized by some individuals who contend that the volumes projected are inaccurate because they are based on data collected in 1960 and because the 1985 Adopted Regional Transportation Plan includes several highway facilities which may not be implemented.

While it is true that the data collection was conducted in 1960, the travel projections are not based on factored growth of this data, but rather on 1985 zonal trip productions and attractions. The 1985 zonal trip productions and attractions are based on projected land uses and employment within each zone in the year 1985. Zonal land use and employment for the year 1985 are based on the 1985 Adopted Regional Land Use Plan. In essence, the projection of trips is based on the future land use plan in conjunction with population and car ownership projections and not on the growth factoring of 1960 trips. These projections have been continually updated by the DVRPC.

It is also true that the Adopted Regional Transportation Plan includes some highway facilities that may not be implemented by 1985. The facilities in this status which would influence traffic projections on the Pulaski Highway were either deleted from the highway networks used by the DVRPC to obtain the current traffic projections for the Pulaski Highway, or were found to have no significant influence on Pulaski Highway volumes. The Northeast Freeway, for example, was deleted from all five of the networks described previously so that the influence of the non-implementation of that project on the traffic projections could be considered. In addition, the extension of the Roosevelt Expressway was specifically deleted from Networks D and E in order to determine the effects of building and not building this facility on traffic volumes projected for the Pulaski Highway. The elimination of other proposed expressways which are unlikely to be implemented such as the Crosstown Expressway and the Lansdowne Expressway would have no significant effect on projected traffic volumes along the proposed Pulaski Highway.

The result of the elimination of expressways from the Adopted Regional Transportation Plan will be the concentrations of future trips on the local street systems instead of on the planned expressways. The elimination of some of the planned expressways in the Delaware Valley Region will not result in the significant reduction of future highway trips. The region will continue to grow and the population will continue to increase without these facilities. People will still go to work, students will still go to school, shoppers will continue to travel to commercial districts and business trips will continue to be made by automobile even if several planned expressways are not built. The elimination of planned expressways in the region will result in the diversion of some of the projected highway trips to mass transit facilities, however, the vast majority of the projected highway trips would continue to be made on the local arterial streets.

These effects were documented by the DVRPC test of opposite transportation policies as discussed previously. The studies conducted by the DVRPC have concluded that the difference in projected 1985 daily transit ridership between the combinations of the Maximum Highway Network with the Basic (Minimum) Transit Network and the Basic (Minimum) Highway Network with the Maximum Transit Network is only 176, 000 trips in the entire

Delaware Valley Region. Also, their analyses have concluded that the difference in projected 1985 daily auto driver trips between these same two combinations amounted to only 127,400 trips out of a total of 8,362,000 auto driver trips for the entire region. This insignificant difference in auto driver trips between the Minimum and Maximum Highway Networks (approximately 1.5%), clearly indicates that the vast majority of the projected highway trips will continue to be made on the highway system even without the implementation of several of the planned expressways which are included in the 1985 Adopted Regional Transportation Plan (Intermediate Highway Network)

The suitability of the travel projections to accurately determine the need for the Pulaski Highway and for use in the location and design of the highway has been reviewed by the Pennsylvania Department of Transportation's Deputy Secretary for Planning. His findings, as stated in a letter dated August 30, 1974 and included as page 142 of the Appendix to this report, are as follows:

a. The models used are not deficient when used on a broad regional basis as was done in the Pulaski Highway analysis.

b. The traffic assignment process is most accurate on high volume major facilities such as the Pulaski Highway.

c. The traffic estimates developed by the DVRPC are as good as can be expected from the assignment process.

d. The range of volumes that corresponds to a desired level of service is wide enough to permit a reasonable amount of error in forecasting future traffic without affecting design characteristics.

e. The base data, including employment and related work trip data, is accurate enough to make decisions concerning the location and design of the Pulaski Highway.

f. The traffic studies assumed transit improvements identified in the Adopted Regional Transportation Plan, including the extension of the Broad Street Subway.

g. In answer to questions concerning the effect that the uncertain status of other transportation proposals could have on the Pulaski study, it should be noted that the uncertain status of the Northeast Freeway is the reason why so many Pulaski alternatives have been studied.

The DVRPC planning process is a continuous planning process which is evaluated, udpdated, and certified by various Federal Agencies on a regular basis.

A comparison has been made between the population projections for 1970 that were made by the DVRPC in the 60's and the 1970 population counted in the 1970 census. The comparison indicates that the regional population projections which DVRPC uses as a base for it's trip production process have been very accurate as indicated below:

DVRPC projected 1970 population	5,252,000
Census count of 1970 population	5,126,361
population difference	125,639
% error	2.4%

In addition, the DVRPC has incorporated base data obtained from the 1970 census into the traffic analyses performed for the Pulaski Highway.

6. Travel Trends

The most important factors influencing regional travel are population, population density, car ownership, households, employment, income, transit accessibility, fares and travel time. The trends in these important factors for the Delaware Valley Region and the City of Philadelphia are indicated in Table 16.

Comparison between 1960 data and 1985 DVRPC projections which show the expected trends in travel characteristics for the Region, the City of Philadelphia and the Northeast section of the City are indicated on Table 17.

The 1985 travel projections indicate that person trips are expected to significantly increase over the 1960 base data for the Region as a whole, for the City of Philadelphia and for the Northeast Philadelphia Sector. The projections also indicate that, while the total number of person trips made by mass transit will increase, the percentage of total person trips made by

TABLE 16

FACTOR	DELAWARE VALLEY REGION **	CITY OF PHILADELPHIA
Population 1960	4,609,289	2,002,512
Population 1970	5,126,361	1,949,996
Population 1970 *	5,252,000	N.A.
Population 1985 *	6,454,000	2,023,906
Residential Land 1960	237,209 Acres	26,334 Acres
Residential Land 1985 *	387,965 Acres	29,052 Acres
Residential Density 1960	6.2	26.0
Residential Density 1985*	5.1	22.9
Car Ownership 1960	1,243,656	399,962
Car Ownership 1970	1,797,208	494,371
Car Ownership 1985 *	2,019,500	613,100
Households 1960	1,525,398	698,306
Households 1970	1,755,093	717,738
Households 1970 *	1,625,200	N.A.
Households 1985 *	1,960,291	664,250
Total Labor Force 1960	1,757,745	777,655
Total Labor Force 1970	1,987,709	741,907
Total Labor Force 1970 *	2,221,900	N.A.
Total Labor Force 1985 *	2,666,200	N.A.
Median Income 1960	$ 5,421	$ 4,789
Median Income 1970	$ 8,786	$ 7,206
Median Income 1985 *	$ 10,166	N.A.
Transit Fares 1960	N.A.	20¢, Free transfers
Transit Fares 1970	N.A.	35¢, 5¢ transfers
Transit Fares 1985 *	N.A.	25¢, 4¢ transfers

* Projected by DVRPC

** Includes City of Philadelphia

Sources of Data (1) 1960 Census, (2) 1970 Census, (3) 1985 Regional Projections for the Delaware Valley Plan Report #1 (DVRPC), (4) Penn Jersey Transportation Study.

TABLE 17

FACTOR	DELAWARE VALLEY REGION **	CITY OF PHILADELPHIA	NORTHEAST PHILADELPHIA ***
Population 1960	4,609,289	2,002,512	378,047
Population 1985 *	6,454,000	2,023,906	432,061
Households 1960	1,525,398	698,306	114,578
Households 1985 *	1,960,294	664,250	125,474
Car Ownership 1960	1,243,656	399,962	109,400
Car ownership 1985 *	2,019,500	613,100	161,700
Person Trips	8,072,100	3,341,100	695,100
Person Trips 1985 *	14,367,600	5,646,400	1,084,400
Auto Driver Trips 1960	4,508,800	1,571,000	383,300
Auto Driver Trips 1985 * 1	8,234,800	2,873,800	610,900
Transit Fares 1960 2	25¢, free transfer	25¢, free transfer	25¢, free transfer
Transit Fares 1985* 2	25¢, 4¢ transfer	25¢, 4¢ transfer	25¢, 4¢ transfer
Transit Trips 1960	1,283,000	1,019,000	112,000
Transit Trips 1985*	1,803,000	1,295,000	153,000
% Person Trips by Transit 1960	16%	30.3%	16%
% Person Trips by Transit 1985 *	13%	22.9%	14%

* Projected by DVRPC
** Includes City of Philadelphia
*** Sector 6

1. Auto Driver Trips shown are for Minimum Highway Network; Maximum Highway Network figures: Region 8,362,200; City 2,951,600; Northeast 622,700
2. DVRPC High Policy Fares are shown. Low Policy Fares are 20¢, free transfers. Existing 1975 fares are 35¢, 5¢ transfers. Railroad Fares were 30¢ within the city limits in 1960 with a 10¢ increment per zone. DVRPC Low Policy Fares for 1985 were the same as in 1960. High Policy Fares were 45¢ with a 15¢ increment per zone.

Sources of Data (1) 1985 Regional Transportation Plan Technical Supplement Report No. 5 (2) Penn Jersey Transportation Study (3) 1960 Census (4) 1970 Census mass transit will decline.

Additional trends were recognized by the DVRPC through a comparison of the 1960 and 1970 population characteristics. These trends were cited in the report "A comparison of 1960 and 1970 Population Characteristics for the Region and Counties of the Delaware Valley" published by DVRPC in January, 1973. This publication cites the following trends regarding travel characteristics:

a. There was a decline in the use of rail transit as a means of transportation to work.

b. There was an increase in the use of the auto for work trips: 55% in 1960; 68% in 1970.

c. There was an increase in the area residents working outside the region: 1970 increased 76% over 1960.

d. The counties around Philadelphia gained workers while the City lost workers.

e. Personal income was uniformly higher than in 1960.

While recent market studies have indicated that on a nationwide basis transit travel will significantly increase as a percentage of the transportation market, it should be remembered that this is due mostly to the surge of new rapid transit systems being constructed in cities throughout the country where no such facilities currently exist e.g. Washington, D.C., San Francisco (Bart) and Atlanta. The riderships on these and other new rapid transit lines will have the major effects on increases in the national transportation market percentages.

The nationwide trend will not be the case in the Philadelphia area. This region already has several subway facilities serving the downtown area e.g. Market-Frankford Subway Elevated Line, Broad Street Subway, Lindenwold High Speed Line, and light Rail Lines from Norristown, Media and Sharon Hill (See Plate 6). In addition to these facilities, the Penn

Central and Reading Railroads currently operate twelve railraod commuter lines serving the Philadelphia CBD (See Plate 5). Also, the Southeastern Pennsylvania Transportation Authority (SEPTA) operates a very extensive system of surface bus lines and light rail lines which are interconnected with the subway-elevated and commuter railroad facilities. At the present time it is possible to utilize the existing mass transportation facilities to reach, within a short walking distance, every shopping and employment district and every residential neighborhood in the City of Philadelphia and the closely situated surrounding cities, townships and boroughs.

The travel projections for the Delaware Valley Region used for the Pulaski Highway traffic analyses have already accounted for future increases in the number of daily riders on the existing and proposed mass transit lines including surface bus and light rail lines. The future travel projections have also included new riders on the following new and planned rapid transit lines in the region (See Plates 5 and 6):

a. Extensions of the Broad Street Subway to South Philadelphia and Northeast Philadelphia.

b. Extension of the modern Lindenwold High Speed Line to Glassboro, Burlington and Mt. Holly.

c. The Subway Surface Line to Eastwick and the Airport.

d. The Center City Commuter Railroad Connection.

The travel analyses performed by the DVRPC have concluded that with the existing mass transit facilities and the above listed proposed major improvements, mass transit ridership in the Philadelphia area will increase in absolute numbers in the future. Mass transit ridership as a percentage of total travel, however, will decline from 16% of regional travel in 1960 to 13% of regional travel in 1985. Similar trends for transit travel within the City of Philadelphia indicate a decline from 30.3% in 1960 to 22.9% in 1985.

For the Northeast Section of the City where the Pulaski Highway would be constructed, the trend in transit travel would show a decline from 16% in 1960 to 14% in 1985.

While these trends indicate decreased shares of this area's travel market for transit travel, it should be noted that in absolute numbers transit ridership will increase significantly over the 1960 levels (See Table 17). Even with these declining percentages the transit ridership share of the total travel market in the City of Philadelphia in 1985 will be almost triple the 8.3% share forecasted on a nationwide basis in 1990 by Frost and Sullivan.

A recent study by the Highway Statistics Division of the U.S. Department of Transportation considered future travel trends in view of the energy crisis. The study concluded that the high-travel age group was 30-44 years. People in this age group drive approximately 13% to 18% more than the average for all groups. In 1970 this age group accounted for 17% of the total population, however, by 1990 this age group will account for 23% of the total population. The study concluded that because of this upward shift in the high travel age group combined with general population increases, the continued migration to the auto oriented suburbs and economic improvements for the lowest income families, there would be significant increases in future highway travel demand. The study noted that there is an energy crisis but there is no shortage of energy resources.

The travel data which is continuously monitored by PennDOT continuous traffic recording stations to determine the effects of the Energy Crisis indicated that the Energy Crisis did not cause a long-term major decrease in highway trips but rather a short-term decrease and a short-term diversion of highway trips to mass transit facilities.

In the future, it can be expected that highway travel in the Delaware Valley Region will continue to increase, because the major factors influencing trip production were not changed by the Energy Crisis. The region will continue to grow and the population will continue to increase even if gasoline prices continue to increase. A recent study prepared for the U.S. Senate Appropriations Committee by the congressional Office of Technology Assessment has concluded that "the impact of a fifty percent increase in the price of gasoline on transit ridership is relatively slight, causing less than a 10 percent increase. This is because the primary response of motorists to gasoline price increase is to purchase more fuel efficient automobiles rather than alter their travel behavior". This study's conclusion is also supported by the PennDOT travel data monitored since the beginning of the Energy Crisis. The travel data indicates that only when gasoline was not readily available, in February and March of 1974, was there a significant increase in transit ridership and decrease in highway traffic. Auto travel was significantly reduced during the height of the Energy Crisis in February, 1974. Since that time, however, auto travel has continually increased, and is approaching levels reached before the Energy Crisis. The effect that the Energy Crisis has had on automobile travel is indicated on Plate 46.

Mass transit ridership in the Philadelphia area in February, 1974 increased by 15% compared to February, 1973 ridership levels. By July, 1974, however, mass transit ridership fell back to lesser levels of increase. The May 1974 transit ridership level was only 8% more than the May 1973 level and the corresponding increases for other months were: July-2%, August-4%, September-5%, October-4%, November-4%, and December-5%. SEPTA reported an overall 1974 increase of only 5.8% in total yearly ridership over the 1973 levels.

In 1975, transit ridership levels indicated declines in transit usage when compared to 1974 levels. The January, 1975 level showed a 7% decrease when compared to the January, 1974 levels. The corresponding decreases for other months were: February-2% and March-33%. The large decrease for March was influenced by the strike of the Transport Workers Union.

The lack of clear energy programs in the Delaware Velley precludes any rigorous adjustment of travel projections at this time. However, it is not likely that energy policies will result in a major decrease in peak hour circumferential highway traffic sufficient to warrant the deletion of the Pulaski Highway.

7. Expressway Capacity

The capacity of an expressway facility is determined by the physical characteristics of the facility and the composition of the traffic utilizing the facility.

Physical characteristics influencing capacity are lane width, lateral clearances, shoulders, auxiliary lanes, surface condition, alignment and grades. Traffic composition characteristics influencing capacity are percentage of trucks and buses, lane distributions, variations in traffic flow and interruptions.

With uninterrupted traffic flow and optimum conditions concerning the physical characteristics mentioned, an expressway can accommodate an average of 2,000 passenger cars per hour (pcph) in each lane at approximately 35 miles per hour. This passenger car capacity must be adjusted to consider the influences of trucks, buses, and flow variations during the peak hour.

Trucks act to reduce the capacity of a freeway in terms of total vehicles carried per hour. In effect, each truck displaces several passenger cars in the traffic flow. On multi-lane highways through level terrain it has been found that the average dual-tired vehicle is equivalent to two passenger cars.

Buses in the traffic stream effect the capacity in a similar manner but to a lesser degree than trucks. On level terrain, intercity buses maintain or slightly exceed the average speed of passenger cars. Because bus volumes on expressways are typically too small to affect traffic flow significantly, it is seldom feasible to consider buses separately in capacity analyses. They are included in the truck counts and analyzed as if each bus were a truck.

Vehicle volumes during the peak hour on multi-lane expressways are typically distributed across the lanes as follows: Lane 1 (right lane) - 1700 pcph, Lane 2 - 2100 pcph, Lane 3 - 2200 pcph, Lane 4 (left lane) - 2400 pcph. These lane distributions are accounted for in the use of the average of 2000 pcph across all lanes. For eight lane expressways the average across all lanes is 2100 pcph.*

The peaking characteristics of traffic flow within the rush hour is accounted for in the application of an adjustment factor. This adjustment factor is the "peak hour factor" which is a ratio of the volume occuring during the peak hour to the maximum 5 minute rate of flow during a given time period within the peak hour. The highest 5 minute peak rate of flow on urban expressways is usually 1.05 to 1.15 times the peak hourly rate of flow.

* Source: Highway Capacity Manual HRB Special Report 87.

The capacity of one lane of an urban expressway on level terrain can thus be expressed by the application of the following formula:

Capacity per lane = 2000 pcph x Truck Adjustment Factor

x Peak Hour Factor

where:

2000 pcph = average passenger cars per hour
Truck Adjustment Factor = 100÷ (100- % T + (E_t x %T))
% T = percentage of trucks in the traffic
E_t = the number of cars one truck is equivalent to

Peak Hour Factor - explained above

For a typical urban expressway on level terrain carrying 6% trucks the capacity per lane can be determined as:

Capacity = 2000 pcph x 0.94 x 0.95 = 1786 pcph

8. Level of Service

Level of Service is a term which denotes any one of an infinite number of differing combinations of operating conditions that may occur on a given roadway when it is accommodating various traffic volumes. It is a qualitative measure of the effects of a number of factors which include speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort, convenience and operating costs.From a driver's viewpoint, low volumes on a given roadway provide a higher Level of Service than high volumes. Thus, the Level of Service for any particular roadway varies inversely as a function of volume.

Selected specific Levels of Service are defined in terms of particular limiting values of travel speed and volume to capacity ratio (V/C). These levels are designated A through F, from best to worst and cover the entire range of traffic operations that may occur.

The Levels of Service for expressways are defined here and indicated on Plates 47 and 47A.

Level of Service "A" describes a condition of free flow with low volumes and high speeds. Traffic density is low with speeds determined by driver desires, speed limits and roadway conditions. There is little or no restriction in maneuverability due to the presence of other vehicles and drivers can maintain their desired speeds with little or no delay.

Level of Service "B" is in the zone of stable flow with operation speeds beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed and lane of operation.

Level of Service "C" is still in the zone of stable flow, but speeds and maneuverability are more closely controlled by higher volumes. Most drivers are restricted in their freedom to select their own speed, change lanes or pass. A relatively satisfactory operating speed is still obtained.

Level of Service "D" approaches unstable flow with tolerable operating speeds being maintained though considerably affected by changes in operating conditions. Fluctuations in volume and temporary restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom to maneuver, and comfort and convenience are low. These conditions can be tolerated for short periods of time.

Level of Service "E" cannot be described by speed alone but represents operations at even lower operating speeds than Level "D" with volumes at or near capacity of the roadway. At capacity, speeds are typically in the neigborhood of 30 mph. Flow is unstable and there may be stoppages of momentary duration. Level of Service "E" is typically considered the capacity conditions.

Level of Service "F" describes forced flow operation at low speeds where volumes are less than capacity due to the slow movement of vehicles. These conditions usually result from queues of vehicles backing up from restrictions. Speeds are reduced substantially and stoppage may occur for short or long periods of time because of congestion.

For expressways the following speeds and volume to capacity limits are defined in the Highway Capacity Manual for each level of service.

Level of Service	Speed	V/C
A	≥60 mph*	≤ 0.43
B	≥55 mph	≤0.63
C	≥50 mph	≤ 0.79
D	≥40 mph	≤ 0.86
E	≥30-35 mph	≤ 1.00
F	<30 mph	Not meaningful

9. Determination of Number of Lanes

The type of highway facility required is determined by the projected traffic volumes. The projected 1995 daily traffic volumes for the Pulaski Highway which were determined by the Delaware Valley Regional Planning Commission range from 79,000 vehicles to 110,200 vehicles on the non-park alternates. The highway facility proposed must be capable of accommodating the rush hour traffic volumes which correspond to these projected daily traffic volumes at an acceptable Level of Service.

PennDOT criteria defines the minimum acceptable Level of Service for highways surrounded by urban land uses as Level of Service D (See above discussion).

The DVRPC analyses for the Pulaski Highway indicate that approximately ten percent of the projected daily traffic will travel over the highway during the rush hour and that sixty percent of the rush hour traffic will travel in the direction of the peak flow. Applying these percentages to the projected daily traffic volumes leads to the determination that the rush hour demand volume will be 6,600 vehicles per hour in the peak direction of travel. The proposed highway facility must accommodate the 6,600 vehicles per hour in one direction at Level of Service D to be acceptable.

* If the V/C ratio is low enough, Level A operating conditions can be obtained at the Federally imposed 55 mph speed limit.

The service volume for Level of Service D for a two lane highway with uninterrupted flow conditions is approximatley 1700 vehicles per hour for both directions. This preliminary comparision indicates that the proposed highway must be a multi-lane facility which can provide for uninterrupted traffic flow - a freeway.

The service volume for Level of Service D for a four lane freeway is approximately 3,400 vehicles per hour in one direction. For a six lane freeway this service volume increases to approximatley 5,100 vehicles per hour in one direction and for an eight lane freeway the service volume increases to approximately 6, 800 vehicles per hour in one direction. This preliminary comparison indicates that an eight lane freeway will be required to accommodate the rush hour demand volume of 6,600 vehicles per hour in one direction at an acceptable Level of Service.

C ACCESS CONTROL AND RIGHT OF WAY WIDTH

1. Access Control

The analyses of the projected traffic volumes for the proposed Pulaski Highway have indicated that uninterrupted flow conditions must be provided to accommodate the 110,000 vehicles per day which would use this facility in 1995 at the minimum acceptable Level of Service. Uninterrupted flow conditions can only be provided by highway facilities which have no at-grade intersections with crossroads or driveways to adjacent properties along their route. These highway facilities, with access limited to interchange ramps only are termed freeways. The Pulaski Highway would be a limited access highway (freeway) with interchanges at major crossroads.

2. Right of Way Width

PennDOT design criteria which apply to the designs for Urban Freeways are indicated in Table 18. These criteria were utilized in the preparation of the designs for the Build Alternatives for the Pulaski Highway.

TABLE 18

DESIGN CRITERIA

Type of Highway	Limited-Access with Interchanges
Functional Classification	Principal Urban Expressway
Design Speed	
Desirable	70 mph
Minimum	50 mph
Horizontal Curvature	
Desirable	1° 30'
Maximum	7° 00'
Grade	
Maximum	4%
Minimum	0.5%
Number of Lanes	8 divided
Lane Width	12 feet
Shoulders	10 feet wide, paved, each side of roadway
Median	23 feet wide, paved
Maximum Superelevation	0.06 foot per foot
Horizontal Clearances	Maximum 30 feet; minimum 14 feet from edge of traveling lane to face of pier or abutment
Vertical Clearance	
Over and Under Highways	14'-6"
Under Railroads	14'-6"
Slopes	As indicated on typical section (See Plates 48, 49 and 50)

The typical sections shown on Plate 48 indicate the location of the roadways,shoulders and median areas along the Pulaski Highway in sections where the Pulaski Highway would be constructed with open slopes to the existing ground surface. Where the highway would be constructed above the existing ground level on an embankment (fill) the side slopes indicated on the left side of the typical sections would apply. Where the highway would be constructed below the existing ground level (cut) the side slopes indicated on the right side of the typical sections would apply.

The typical sections shown on Plate 49 indicate the location of the roadways, shoulders and median areas along the Pulaski Highway in areas where the highway would be constructed in a depressed section with retaining walls.

The typical sections shown on Plate 50 indicate the location of the roadways, shoulders and median areas along the Pulaski Highway in areas where the highway would be constructed as an elevated bridge (viaduct).

These typical sections apply to various parts of the Pulaski Highway depending upon the land use of the surrounding area. The highway is generally elevated on a bridge section (viaduct) as it passes over the Frankford Creek and Penn-Central railroad tracks through the industrial areas between I-95 and Torresdale Avenue. It continues on an elevated bridge over the Frankford Creek in order to pass over the Frankford Elevated at Kensington Avenue.

Once over the El, the highway begins to descend, however, it ramains on viaduct until it crosses over Wingohocking Street because of its location over the creek and the relocation of Adams Avenue under the viaduct.

After crossing over Wingohocking Street the viaduct section ends for most alternates and a short section of embankment construction and then open cut construction occurs in an area surrounded by industrial land uses.

Following this short open slope section, the highway enters a depressed section contained within retaining walls due to its location in areas surrounded by predominantly residential land uses. It continues in a depressed retaining wall section, until its interchange at the Roosevelt Boulevard.

Right-of-way widths vary for each alternate depending upon the area traversed and the type of section considered. Right-of-way limits are indicated on the plan sheets (See Plates 80-171). The typical sections shown on Plates 48, 49, and 50 indicate the widths and locations of the roadways and shoulder areas.

The plans and profiles of each alternate alignment indicate where and how the Pulaski Highway crosses streets, streams, and other topographic features.

D. DEFICIENCIES IN THE EXISTING FACILITIES

1. Traffic Increases on the Existing Street Network

The 1985 average daily traffic (ADT) volumes on the arterial streets in the Pulaski Highway study area would be increased significantly over the existing ADT volumes if no additional highway facilities are constructed (No-Build Network). This significant traffic increase is illustrated by comparing the 1985 ADT volumes for the No-Build Network with the existing ADT volumes (See Table 4) for each of the arterial streets indicated.

The existing arterial street system in the study area consits of many old and narrow streets. Many of these arterials were established in the 1700's and 1800's such as Frankford Avenue (Kings Highway) and Adams Avenue. This street system is greatly fractured because of the locational influences of the Tacony-Frankford Creek and the meshing of four major street grid systems each of which has a different orientation of its axes. These conditions place the existing street system at an extreme disadvantage in its ability to accommodate the future significant increases in daily traffic volumes. Specific locations where traffic congestion along the existing street system would occur in 1985, if no improvements are made, are detailed in the following sections.

2. Arterial Street Capacity and Levels of Service

The capacity of an arterial street is determined by the physical and operational characteristics of the street, the composition and flow characteristics of the traffic utilizing the street and traffic control measures. Points of traffic interruption such as intersections provide logical breaks for street section analyses, hence, intersection approach capacity is generally used as the primary measure of urban arterial street capacity. After the intersection is investigated the overall street is then considered for overall capacity using overall travel speed and capacity restraints at the most critical point.

Generally, the physical characteristic most directly influencing capacity is intersection approach width. The operational characteristics influencing capacity are One-Way or Two-Way Operation, parking conditions, metropolitan area population, and location within the metropolitan area. Four specific land use areas within metropolitan areas are considered: a. the Central Business District, b. Fringe areas, c. Outlying Business Districts and d. Residential areas. Each area has distinct traffic operation characteristics.

The traffic composition characteristics influencing capacity are volumes of trucks and through buses and volumes of local transit buses. Local transit buses have entirely different effects than through buses which are considered as trucks. The degree to which bus stops influence capacity depends on bus stop locations, number of buses and time required to accomplish boarding of passengers.

The traffic flow characteristics influencing capacity are volumes of turning vehicles, degree of utilization of the intersection approaches and variations in rates of flow. The degree of utilization of the intersection approach is measured by the "Load Factor". This factor is a ratio of the number of signal phases that are fully utilized to the total number of signal phases available for the approach during a particular time period. The variations in flow rates is measured by the "Peak Hour Factor". This factor is a ratio of the number of vehicles approaching the intersection during one hour to four times the number approaching during the highest 15 consecutive minutes.

The traffic control measures influencing capacity are traffic signals and the marking of roadway lanes. Important elements of traffic signalization are time to complete one cycle, the ratio of green time to total cycle time and the clearance (yellow) times for each cycle.

Intersection capacities have been subjected to much research and a graphical method which takes into account all of the above factors influencing capacity has been developed. This graphical method was developed under the sponsorship of the U.S. Department of Transportation, Bureau of Public Roads by Jack E. Leisch, Chief Highway Engineer of DeLeuw, Cather and Company in 1967. The method is based on the computational procedures established in the Highway Capacity Manual, Special Report 87 of the Highway Research Board - a division of engineering and industrial research of the National Academy of Sciences. This graphical method of intersection analyses was used to perform the arterial street capacity analysis for this study.

As previously indicated, Level of Service is a term which denotes any one of an infinite number of differing combinations of operating conditions that may occur on a given roadway when it is accommodating various traffic volumes. The Level of Service for any particular roadway varies inversely as a function of volume and selected specific Levels of Service are defined in terms of particular limiting values of travel speed and volume to capacity ratio (V/C). These levels are designated A through F, from best to worst, and cover the entire range of traffic operations that may occur. The Levels of Service for urban arterial streets are defined here:

Level of Service "A" describes a condition of free flow with speeds controlled chiefly by speed limits and signal progressions. This level also assumes no backlog at intersections, free mid-block operation and no interruptions due to double parking, driveways and parking areas. On arterial streets this corresponds to operation at about 30 mph.

Level of Service "B" describes conditions where average travel speeds start dropping due to intersection delays and intervehicular conflicts but remain at 25 mph or more. Delay is not unreasonable and most intersections will operate with little or no backlog.

Level of Service "C" describes conditions of stable flow where average travel speeds have dropped to 20 mph. The frequency and duration of backlogs at signals reaches the limit considered reasonably acceptable by most drivers.

Level of Service "D" describes conditions that begin to tax the capabilities of the street system and average travel speeds drop to approximately 15 mph. Delays at critical locations may become extensive with vehicles occasionally waiting two or more signal cycles to pass through critical intersections. Demand flow variations are attenuated with signals in effect storing excess demand. These conditions are tolerable for short periods of time or at occasional bottlenecks but create unacceptable delays when they exist for a considerable portion of the peak hour along an entire section of street.

Level of Service "E" describes capacity conditions with average travel speeds at 15 mph and continuous backup on the approaches to most intersections. Traffic flow is determined by the maximum discharge rates at the intersections.

Level of Service "F" describes conditions where flow interruptions are regularly induced at traffic signals throughout the length of the arterial. The signals meter the traffic into each section of the arterial. This storage gradually increases and forced flow is reached when the street sections cannot accommodate the vehicles discharged at the signals due to vehicular backups extending back through the street from the next signal ahead. The result is lowered volumes and decreased Level of Service and long delays. The peak hour demand under these conditions is usually extended over more than one hour resulting in a longer peak demand period.

For urban arterials the following average travel speeds and volume to capacity limits are defined for each Level of Service as shown in the table below.

Level of Service	Speed	V/C
A	≥30	≤ 0.60
B	≥25	≤ 0.70
C	≥20	≤ 0.80
D	≥15	≤ 0.90
E	=15	≤ 1.00
F	<15	Not meaningful

3. Capacity Analyses of the Existing Highway Network

a. Local Arterial Streets

Capacity analyses at various intersections of the arterial streets in the study area were performed using the existing operational characteristics and the projected 1985 No-Build Network daily traffic volumes. The results of these analyses are indicated below:

Intersection	1985 No-Build Network Level of Service (No Improvements)
1. Whitaker and Wyoming	F*
2. Whitaker and Hunting Park	D
3. Whitaker and Erie	C
4. Adams and Ramona	F*
5. Adams and Castor	F*
6. Adams and Orthodox	C
7. Adams and Wingohocking	B
8. Castor and Pratt	A
9. Castor and Orthodox	F*
10. Castor and Wingohocking	F*
11. Castor and Hunting Park	F*
12. Castor and Erie	E*
13. Castor and Kensington	E*
14. Castor and Richmond	F*
15. Orthodox and Frankford	F*
16. Summerdale and Godfrey	A
17. Summerdale and Oxford	F*

* intersection failure

Intersection	1985 No-Build Network Level of Service (No Improvements)
18. Arrott and Adams	B
19. Arrott and Castor	C
20. & 21. Frankford and Margaret and Oxford	F*
22. Oxford and Pratt	F*
23. G and Wyoming	F*
24. G and Hunting Park	F*
25. G and Erie	F*
26. Wyoming and C	F*
27. Wyoming and Ramona	F*
28. Wyoming and Castor	D
29. Castor and Aramingo	D
30. Orthodox and Aramingo	B
31. Bridge and Harbison	D
32. Orthodox and Richmond	C
33. Orthodox and Torresdale	C
34. Torresdale and Bridge	F*
35. Torresdale and Robbins	C
36. Torresdale and Levick	A
37. Harbison and Robbins	A
38. Harbison and Levick	A
39. Rising Sun and Tabor	F*
40. Rising Sun and Adams	F*
41. Adams and Tabor	F*
42. Rising Sun and Levick	F*
43. Oxford and Levick	F*
44. Summerdale and Levick	F*
45. Devereaux and Summerdale	A

* intersection failure

The intersection capacity analyses indicate that severe traffic congestion would occur in the study area along the following arterial streets: Wyoming Avenue, Whitaker Avenue, C Street, Hunting Park Avenue, Adams Avenue, Erie Avenue, Castor Avenue, Summerdale Avenue, Frankford Avenue, Torresdale Avenue, Oxford Avenue, Rising Sun Avenue, Tabor Road, Levick Street, G Street, Bridge Street, Richmond Street, Orthodox Street, Margaret Street and Ramona Avenue. These arterial streets would not be capable of accommodating the projected 1985 daily traffic volumes under the No-Build Network.

b. Roosevelt Boulevard

Additional intersection capacity analyses were performed along Roosevelt Boulevard using projected 1985 daily traffic volumes for the No-Build Network and the existing operational characteristics along this twelve lane major highway. The results of these analyses are indicated below:

Intersection	1985 No-Build Network Level of Service (No improvements)
9th Street	F*
5th Street	F*
Mascher Street	F*
Rising Sun Avenue	F*
C Street	F*
Whitaker Avenue (South)	F*
Whitaker Avenue (North)	F*
Adams Avenue	F*
Summerdale Avenue	F*
Pratt Street	D

* intersection failure

These intersection capacity analyses indicate that the Roosevelt Boulevard will operate under jammed traffic conditions (Level of Service F) in 1985 with the No-Build Network.

Even if the Pulaski Highway is not constructed, daily traffic volumes along the Roosevelt Boulevard will increase significantly over present volumes (See Plates 31 and 32). Jammed traffic flow conditions would result along this major highway (U.S. 1) as indicated in the table above. Either additional travel lanes must be added to the existing twelve lanes along this major highway, or the center lanes must be converted into grade separated express lanes, to accommodate the projected 1985 traffic volumes under the No-Build Network.

c. Local Arterial Street Improvements Required

The locations where congestion would occur along the arterial street system are indicated on the previous page. The improvements to the arterial streets in the study area which would be necessary to obtain stable flow conditions with the No-Build Alternate are indicated below:

Intersection	1985 No-Build Network Level of Service (No Improvements)	(With Improvements)
1. Whitaker and Wyoming	F*	D
2. Whitaker and Hunting Park	D	N
3. Whitaker and Erie	C	N
4. Adams and Ramona	F*	D[1]
5. Adams and Castor	F*	D[1]
6. Adams and Orthodox	C	N
7. Adams and Wingohocking	B	N
8. Castor and Pratt	A	N
9. Castor and Orthodox	F*	C
10. Castor and Wingohocking	F*	C
11. Castor and Hunting Park	F*	D
12. Castor and Erie	E*	D
13. Castor and Kensington	E*	C
14. Castor and Richmond	F*	E*
15. Orthodox and Frankford	F*	D
16. Summerdale and Godfrey	A	N
17. Simmerdale and Oxford	F*	D[1]
18. Arrott and Adams	B	N
19. Arrott and Castor	C	N
20. & 21. Frankford and Margaret and Oxford	F*	E*
22. Oxford and Pratt	A	N
23. G and Wyoming	F*	C[1]
24. G and Hunting Park	F*	D
25. G and Erie	F*	D
26. Wyoming and C	F*	D
27. Wyoming and Ramona	F*	E[1]*
28. Wyoming and Castor	D	N
29. Castor and Aramingo	D	N
30. Orthodox and Aramingo	B	N
31. Bridge and Harbison	D	N
32. Orthodox and Richmond	C	N
33. Orthodox and Torresdale	C	N
34. Torresdale and Bridge	F*	D
35. Torresdale and Robbins	C	N
36. Torresdale and Levick	A	N
37. Harbison and Robbins	A	N
38. Harbison and Levick	A	N
39. Rising Sun and Tabor	F*	F[1]*
40. Rising Sun and Adams	F*	E[1]*
41. Adams and Tabor	F*	E[1]*
42. Rising Sun and Levick	F*	F[1]*
43. Oxford and Levick	F*	D[1]*
44. Summerdale and Levick	F*	E[1]*
45. Devereaux and Summerdale	A	N

* intersection failure
1 street widening required
N improvements not required

(1) Adams Avenue - The capacity analyses along Adams Avenue indicate that removal of parking along this street between Roosevelt Boulevard and Rising Sun Avenue would be required. Even with this removal of parking, severe congestion would remain along this section of Adams Avenue. Widening this section of Adams Avenue is not feasible.

Between Roosevelt Boulevard and Castor Avenue the widening of Adams Avenue by 20 feet would be required to produce stable flow conditions. This widening would require the condemnation of three homes along this section of Adams Avenue.

(2) Castor Avenue - The capacity analyses along Castor Avenue indicate that widening would not be required along this arterial street. The congestion at Orthodox Street could be alleviated by removal of parking along that street.

The congestion between Wingohocking Street and Kensington Avenue would require the removal of parking along this section of Castor Avenue and on Hunting Park Avenue and Erie Avenue. This removal of parking along residential sections of Castor Avenue would create parking problems for residents in the Juniata Park neighborhood.

At Richmond Street removal of parking on Castor Avenue and Richmond Street would be necessary. Even with this removal of parking, congestion would remain. Widening of Castor Avenue or Richmond Street is not feasible because of the abutting properties.

(3) Rising Sun Avenue - The capacity analyses along Rising Sun Avenue indicate that removal of parking in the vicinity of Levick Street would be necessary. Even with this removal and a widening of Levick Street, congestion would remain at this location.

Between Roosevelt Boulevard and Adams Avenue a major widening and removal of parking would be necessary. This widening is not feasible because the commercial properties are close to the exiting roadway and even if accomplished severe congestion along Rising Sun Avenue would remain.

(4) Tabor Road - The capacity analyses indicate that a major widening of Tabor Road would be necessary between Rising Sun Avenue and Levick Street. Even with this widening and improvements to Rising Sun, Adams and Levick, severe congestion would remain. This widening would require much of the small front lawn areas of the homes along Tabor Road.

(5) Levick Street - The capacity analyses along Levick Street indicate that removal of parking and major widening would be necessary between Martin's Mill Road and Roosevelt Boulevard. Even with these major improvements congestion would remain at Summerdale Avenue. The widening would require many homes along Levick Street and is not feasible.

Between Roosevelt Boulevard and the Tacony Palmyra Bridge no improvements to Levick Street or its one-way twin, Robbins Avenue, would be necessary.

(6) Summerdale Avenue - The capacity analyses indicate that removal of parking along Summerdale Avenue between Oxford Avenue and Levick Street would be necessary. Even with this removal of parking severe congestion along Summerdale Avenue would remain at Roosevelt Boulevard and at Levick Street. The removal of parking would create parking problems for the residents in this area.

(7) Oxford Avenue - The capacity analyses along Oxford Avenue indicate that widening of Oxford Avenue between Summerdale Avenue and Roosevelt Boulevard is necessary.

Between Roosevelt Boulevard and Frankford Avenue congestion would occur only at the Frankford-Margaret-Oxford intersection. At this intersection removal of parking along Oxford Avenue is necessary, however, congestion would remain. It is not feasible to widen the streets at this intersection, therefore congestion would remain at that location under the No-Build Alternate.

(8) Wyoming Avenue - The capacity analyses along Wyoming Avenue indicate that removal of parking would be necessary along Wyoming Avenue be-

tween C Street and Whitaker Avenue. This removal would cause parking problems in this residential area.

Between Whitaker Avenue and Ramona Avenue a widening of Wyoming Avenue by 10 feet would be necessary. This widening would require lands from the Tacony Creek Park. Even with this widening, congestion would remain along Wyoming Avenue at Ramona Avenue.

(9) Whitaker Avenue - The intersection capacity analyses indicate that removal of parking would be necessary between Roosevelt Boulevard and Wyoming Avenue.

This removal or parking would cause parking problems in this residential area.

(10) Hunting Park Avenue - The capacity analyses along Hunting Park Avenue indicate that removal of parking along this street in the vicinity of Castor Avenue would be necessary. This removal of parking would cause parking problems in this residential area.

(11) C Street - The capacity analyses along C Street indicates that removal of parking would be necessary at Roosevelt Boulevard. This removal of parking would cause parking problems in this residential area.

(12) Erie Avenue - The capacity analyses along Erie Avenue indicate that removal of parking at Castor Avenue would be necessary. This removal of parking along Erie Avenue should not cause any noticeable problems in this area.

(13) G Street - The capacity analyses indicate that removal of parking along G Street between Wyoming Avenue and Erie Avenue would be necessary. This removal would cause parking problems in the residential area near Wyoming Avenue.

(14) Orthodox Street - The capacity analyses along Orthodox Street indicate that removal of parking at Castor Avenue and Frankford Avenue would be necessary. These removals would cause parking problems in the residen-

tial section of Castor Avenue and would lessen parking supply in the commercial area at Frankford Avenue.

(15) Margaret Street - The capacity analyses along Margaret Street indicates that congestion would occur at Frankford Avenue. At this location congestion would remain because street widening is not feasible.

(16) Frankford Avenue - The capacity analyses indicate that removal of parking along Frankford Avenue would be necessary between Oxford Avenue and Kensington Avenue. Even with this improvement congestion would remain at the Oxford-Margaret intersection. This removal of parking would be bitterly opposed by the merchants along Frankford Avenue and is not feasible.

(17) Bridge Street - The capacity analyses along Bridge Street indicated that removal of parking would be necessary in the vicinity of Torresdale Avenue. This removal would lessen the parking supply in this commercial area.

(18) Torresdale Avenue - The capacity analyses along Torresdale Avenue indicate that removal of parking would be necessary in the vicinity of Bridge Street. This removal would also lessen the parking supply in this commercial area.

(19) Richmond Street - The capacity analyses along Richmond Street indicate that the removal of parking would be necessary in the vicinity of Castor Avenue. This removal of parking would create parking problems for the residents along this section of Richmond Street and the congestion would remain. Additional areas where congestion might occur are in the vicinity of Allegheny Avenue and Le Fever Street. These intersections were not analyzed because the projections were not available.

The widening of Richmond Street is not feasible because of the many homes and businesses presently located right at the sidewalk areas along this street.

(20) Roosevelt Boulevard - The capacity analyses along Roosevelt Boulevard indicate that additional Boulevard traffic lanes would be necessary through the study area.

Between C Street and Adams Avenue one additional Boulevard traffic lane in each direction would be necessary. In addition, the removal of parking along C Street and the widening of the Adams-Whitaker approach would be necessary.

At Summerdale Avenue two additional Boulevard traffic lanes in each direction would be necessary. In addition, the widening of the Adams Avenue approach would be required. Grade separation of this intersection would appear to be the more reasonable solution to the congestion problem than adding four lanes to the twelve lane Roosevelt Boulevard.

Between 9th Street and C Street, one additional Boulevard traffic lane in each direction would be necessary, however, this improvement would not eliminate congestion along this section of the Boulevard.

The required improvements to the arterial streets under the No-Build Alternate are summarized in the table below:

STREET (SECTION)	IMPROVEMENT	RESULTS
1) Adams Avenue	Remove parking	Congestion
(Blvd.-Rising Sun)**	Widen 20'	Stable Flow
2) Castor Avenue		
(Wingohocking-Kensington)	Remove parking	Stable Flow
(Richmond Street)	Remove parking	Congestion
3) Rising Sun Avenue		
(Blvd.-Adams)	Widen 24"*	Congestion
(Adams-Levick)**	Remove parking	Congestion
4) Tabor Road		
(Rising Sun-Adams	Widen 12'	Congestion
(Adams-Levick)	Widen 20'	Congestion
5) Levick Street		
(Martin's Mill-Summerdale	Widen 20'	Stable Flow
(Summerdale-Blvd)	Widen 20'	Congestion
6) Summerdale Avenue		
(Oxford-Levick)	Remove parking	Congestion

* indicates improvements that were studied but are not feasible
** indicates location where street widening is not feasible

STREET (SECTION)	IMPROVEMENTS	RESULTS
7) Oxford Avenue		
(Summerdale-Blvd)	Widen 10'	Stable Flow
(at Frankford)**	Remove parking	Congestion
8) Wyoming Avenue		
(C-Whitaker)	Remove parking	Stable Flow
(Whitaker-Ramona)	Widen 10"	Congestion
9) Whitaker Avenue		
(Blvd-Wyoming)	Remove parking	Stable Flow
10) Hunting Park		
(at Castor)	Remove parking	Stable Flow
11) "C" Street		
(at Boulevard)	Remove parking	Stable Flow
12) Erie Avenue		
(at Castor)	Remove parking	Stable Flow
13) G Street		
(Wyoming-Erie)	Remove parking	Stable Flow
14) Orthodox Street		
(at Castor)	Remove parking	Stable Flow
(at Frankford)	Remove parking	Stable Flow
15) Margaret Street		
(at Frankford)**	No improvement	Congestion
16) Frankford Avenue		
(Kensington-Orthodox)**	Remove parking*	Stable Flow
(Orthodox-Oxford)**	Remove parking*	Congestion
17) Bridge Street		
(at Torresdale)	Remove parking	Stable Flow
18) Torresdale Avenue		
(at Bridge)	Remove parking	Stable Flow
19) Richmond Street		
(at Castor)**	Remove parking	Congestion
20) Roosevelt Boulevard		
(9th-C)	Add two traffic lanes	Congestion
(C-Adams)	Add two traffic lanes	Stable Flow
(at Summerdale)	Add four traffic lanes (or grade separate)	Stable Flow

* indicates improvements that were studied but are not feasible
** indicates location where street widening is not feasible

The capacity analyses of the arterial street system indicate that even with the removal of parking along Adams Avenue, Castor Avenue, Rising Sun Avenue, Levick Street, Summerdale Avenue, Oxford Avenue, Wyoming Avenue, Whitaker Avenue, Hunting Park Avenue, G Street, Erie Avenue, Orthodox Street, Frankford Avenue, Bridge Street, Torresdale Avenue and Richmond Street and major widening of Roosevelt Boulevard, Adams Avenue, Tabor Road, Levick Street, Oxford Avenue and Wyoming Avenue the arterial highway network would still remain congested with the No-Build Alternate.

Because some of the improvement studied are not feasible, such as widening Rising Sun Avenue by 24' and removing parking along Frankford Avenue, more congestion than indicated in these discussions would remain with the No-Build Alternate.

d. Delaware Expressway

Expressway capacity analyses were performed for sections of the Delaware Expressway, Interstate Route 95, in the study area. Projected 1985 daily traffic volumes for the No-Build Network and the existing operational characteristics along this eight lane freeway were used.

The capacity for each lane of the Delaware Expressway is determined by the following formula:

$$\text{Capacity} = 2100 \text{ pcph} \times \frac{100}{(100-\%T + (Et\times\%T))} \times \frac{1.00}{1.05}$$

where:

2100 pcph - average passenger cars per hour (for an eight lane urban expressway that is highly utilized 2100 pcph is applicable)*

$\frac{100}{(\ )}$ = truck adjustment

% T = percent of trucks

Et = number of cars that 1 truck is equivalent to

$\frac{1.00}{1.05}$ = peak hour factor

The capacity of each lane of the Delaware Expressway with a vehicle mix

* Highway Research Board Special Report 87 - Highway Capacity Manual

containing 6% trucks can thus be computed as

Capacity = 2100 x 0.94 x 0.95 = 1875 pcph

The demand volumes assigned to the Delaware Expressway in 1985 for the No-Build Network indicate that this facility will be highly utilized with volumes in the study area ranging from 162,00 ADT to 228,900 ADT.

The capacity of a highway is usually determined for peak hour operating conditions. The demand volumes must be expressed in vehicles per hour during the peak hour for analysis. The ADT volumes (Average Daily Traffic) can be converted to peak hour volumes (DHV) through multiplication by the percentage of daily traffic that occurs during the peak hours.

The Delaware Expressway is considered as a major travel facility in the Delaware Valley Region, very similar to the Schuylkill Expressway (I-76). Peak hour volume percentages and directional distributions on this facility are considered the same as those on the Schuylkill Expressway, which exhibits a peak hour traffic flow of 8% of the daily flow and a directional distribution of 55% during the peak hour. The DHV for the sections of the Delaware Expressway in the study area were calculated by the application of these percentages and are listed below.

In addition, the peak hour capacity of the Delaware Expressway for four lanes in one direction (7500 vph) and the demand DHV volume to capacity ratios were computed and indicated below.

DELAWARE EXPRESSWAY CAPACITY ANALYSES
NO BUILD NETWORK

SECTION	1985 ADT	1985 DHV	CAPACITY	DHV/CAPACITY
Academy-Cottman	184,400	8114	7500	1.08
Cottman-Bridge	188,300	8285	7500	1.10
Bridge-Aramingo	162,000	7128	7500	0.95
Aramingo-Betsy Ross Bridge	198,500	8734	5360	1.63
Betsy Ross Bridge-Castor	198,500	8734	5360	1.63
Castor-Allegheny	217,400	9566	7500	1.28

A review of the demand volume to capacity ratio along the Delaware Expressway indicates that operation will occur in the level of service F range (severe congestion) with the No-Build Network in 1985.

e. The Effects of the Richmond Street Ramps

If the Richmond Street Ramps to the Betsy Ross Bridge are not opened to traffic, changes in the No-Build Network projected 1985 daily traffic volumes would occur along the following highway facilities (See Plates 38 and 39).

Richmond Street - significant traffic reductions would result because the ramps connect directly to this street. Richmond Street would operate under stable flow conditions with the ramps closed.

Aramingo Avenue - minor traffic increases would result (@ 800 ADT)

Torresdale Avenue - minor traffic increases would result (@ 500 ADT)

Frankford Avenue - minor traffic increases would result (@ 400 ADT)

Orthodox Street - minor traffic reductions would result (@ 300 ADT)

Arrott Street - minor traffic decreases would result (@ 300 ADT)

Adams Avenue - minor traffic decreases would result between Orthodox and the Roosevelt Boulevard (@ 600 ADT)

Pratt Street - minor traffic decreases would result (@ 200 ADT)

Roosevelt Boulevard - traffic increases would result along the Roosevelt Boulevard. These increases would amount to 1200 ADT between Rising Sun Avenue and Summerdale Avenue, 1800 ADT between Summerdale Avenue and Pratt Street and 2000 ADT north of Pratt Street. This is due to the redistribution of some of the trips which would have used the Richmond Street Ramps and Betsy Ross Bridge to the Tacony Palmyra Bridge.

Delaware Expressway - significant traffic increases would result because some of the traffic which would have used the Richmond Street Ramps would then reach the Betsy Ross Bridge via the Delaware Expressway. Traffic increases along the Delaware Expressway would amount to 5700 ADT north of the Bridge and 4400 ADT south of the bridge.

Betsy Ross Bridge - significant traffic decreases would result because of reduced access to the bridge. The reduction would amount to 4700 trips per day.

Traffic volume projections along the other arterial streets not specifically mentioned above would not be changed by the closing of the Richmond Street Ramps.

Except for Richmond Street, which is directly connected to the ramps, no reduction in the traffic congestion which would occur with the No-Build Network along the arterial streets in the study area in 1985 can be expected due to the closing of the Richmond Street Ramps. The overall effects of closing these ramps, with the No-Build Network, would be to increase traffic congestion along the Roosevelt Boulevard and the Delaware Expressway. Only minor traffic reductions would result along a few of the arterial streets in the study area. Arrott Street, Adams Avenue, Orthodox Street and Pratt Street would experience these traffic reductions,however, the reductions would not be large enough to change the results of the intersection capacity analyses performed along these streets for the No-Build Network. Traffic congestion would remain along the arterial streets with the No-Build Network as previously discussed.

4. Truck Travel on the Existing Street Network

There is a significant amount of truck travel in the study area due to the location of important port facilities and major trucking centers in Richmond, and the location of large industrial centers at various sites within the study area. These port, trucking and industrial centers are indicated on Plate 51.

Because of the locations of residential districts between the Roosevelt Boulevard (U.S. 1) major travel corridor and the port, trucking and industrial centers, and the narrowness of the streets, restrictions to truck traffic have been posted on many of the arterial streets in the study area.

At the present time truck travel between the Boulevard and the trucking terminal center is along Adams Avenue to Castor Avenue , then along Castor Avenue to the terminal areas. Truck restrictions have recently been posted along Orthodox Street and Arrott Street, resulting in Castor Avenue remaining as the only direct street with no truck restrictions between the truck terminals and industrial areas along I-95 and the Roosevelt Boulevard - Adams Avenue area. Truck volumes along Castor Avenue can be expected to increase significantly in the near future due to the re-routing of trucks which previously traveled along Orthodox Street and Arrott Street.

Truck travel between Roosevelt Boulevard and the Tacony-Palmyra Bridge is also regulated. A special truck route has been designated along Harbison Avenue and Tacony Street as outlined on Plate 52. This restricted routing results in additional travel distances for trucks across the Wissinoming neighborhood and is an indirect and inefficient routing for truck travel from the Northwest section of the City. The travel restrictions between the Boulevard and the Tacony-Palymra Bridge also result in trucks utilizing Castor Avenue and Torresdale Avenue to Tacony Street and Tacony Street to the bridge.

With the No-Build conditions these inefficient truck routings and travel restrictions will remain and will continue to cause additional travel distances and costs for the trucking industry in the study area. Many trucking firms have already relocated out of the city (43 in the last 10 years). It is likely that some of the remaining firms will relocate to other areas because of the restrictions placed on truck movement in the study area.

E. DESCRIPTION OF THE SURROUNDING AREA, ITS FACILITIES AND SERVICES

1. The Area and Its People

a. General

Large metropolitan communities are a synthetic combination of an urban continum representing almost every possible type of sub-community. Historical cities like Philadelphia grew as they periodically redefined their boundaries to include neighboring communities. One hears frequently that Philadelphia is a collection of neighborhoods, and so it is because these neigborhoods were autonomous communities in their own right one hundred years ago. For a variety of reasons these sub-communities became part of the metropolis itself, but in doing so they retained many of the primary characteristics of communal living.

This section is an attempt to point out the chief characteristics of the area through which a proposed highway would be routed. The census information analyzed reveals both the area's current social structures, as well as, reveals some indication of the effects of social change in the area. In most cases the micro and macro area were compared to the city itself, and to the metropolitan area.

The impact area is a mixture of homes, businesses, factories, cemeteries, institutions and parks, mixed together in the lower part of the area in nineteenth century style. It is honeycombed with railroad lines and terminals; trucks and truck terminals are a fact of life; the Frankford "el" yards lie at its northeastern end. The "el" on Frankford and Kensington Avenues forms a major social boundary, the Frankford Creek is a similar dividing line and also serves as the southern boundary for Northeast Philadelphia. Roosevelt Boulevard near the western end of the study area and Interstate 95 near its eastern end are significant social realities defining neighborhood boundaries.

Homes in the area date from the mid-nineteenth century and earlier to those built after World War II, the newer homes generally, but not exclusively, being found near the Boulevard. Variety in nationality, age, and income level is a striking fact about the study area; neighborhood names such as Richmond, West Frankford, Northwood, Bridesburg, Harrowgate and Juniata Park evoke different images in the minds of those familiar with the area (See Social Description of the Neighborhoods discussed next).

Some sections of the area are predominantly Roman Catholic and Catholic parishes are important social institutions. In other areas Catholic and Protestants are more evenly mixed. Some of the churches in the area take an active part in recreation and in neighborhood improvement efforts. Jews in the area are found mainly along the Boulevard although there has evidently been an outmigration of Jewish families from the southwestern part of the study area in recent years.

b. Population (See Plate 53)

The population of the micro area in 1970 was 59,824 and that of the macro area was 128,906. From 1960 to 1970 the population of the micro area fell slightly faster than did that of the City of Philadelphia, 3.0% compared to 2.7%; the population of the macro area dropped by 6.9%. This thinning of population in the older sections of American cities is a common phenomenon (See Table 19).

In the micro area, the decrease in population occurred despite a small rise (1.5%) in the number of households. In the macro area the decline in the number of households (0.7%) could account for only a small part of the 6.9% population decrease. Over the ten year period mean household size went from 3.13 to 2.99 in the micro area and from 3.15 to 2.96 in the macro area. This drop in household size closely paralleled the drop for the city and for the SMSA.

The population of the impact area was considerably older than that of the city proper and of the SMSA; 13.5% of the people in the micro area and 13.4% in the macro area were 65 years old or over in 1970 compared to 11.7% in the city and 9.7% in the SMSA. Inspection of the ratios in Table 20 shows that from 1960 to 1970 the proportion of the population 65 and over rose faster in the study area than in the city or in the SMSA. In general the heavier concentrations of people 65 and over are found in certain sections of Northwood, Frankford, Frankford Valley and in Feltonville (See Table 20).

Residents of the impact area were also likely to be in the middle age years, 45 to 64, than were inhabitants of Philadelphia proper and of SMSA. The proportion of persons 20 to 44 years old was lower in the impact area (micro area 28.0% and macro area 27.4%) than in the city (30.7%) and in the SMSA (31.3%). This data might indicate that when they marry, the young people

TABLE 19

TOTAL POPULATION CHANGES IN STUDY AREA 1960-1970

CENSUS TRACT NUMBER		POPULATION SIZE		PERCENT CHANGE
1970	1960	1970	1960	1960-1970
185	0045D	183	354	- 48.3
189	0045E	1452	1368	+ 6.1
190	0033B	7854	8165	- 3.8
289	0042G	9744	9804	- 0.6
290	0042F	6298	6246	+ 0.8
291	0035F	4827	5249	- 8.0
292	0035G	4482	4626	- 3.1
293	0023F	3791	4051	- 6.4
294	0023I	4402	4903	- 10.2
295	0023J	1282	1418	- 9.6
301	0023E	5907	5940	- 0.6
303	0035E	9003	8915	+ 1.0
304	0035D	599	654	- 8.4
Total Micro Area		59824	61693	- 3.0
82	0045J	614	1170	- 47.5
183	0045C	4963	5794	- 14.3
184	0045A	2792	3035	- 8.0
186	0045I	6075	6670	- 8.9
187	0045H	2162	2412	- 10.4
188	0045G	8474	9428	- 10.1
191	0033C	7976	8593	- 7.2
192	0033H	8638	9042	- 4.5
296	0023K	1355	2787	- 51.4
297	0023A	638	999	- 36.1
298	0023B	5582	5793	- 3.6
299	0023H	5008	5580	- 10.3
300	0023G	7614	8391	- 9.3
302	0023D	7191	6938	+ 3.6
Total Macro Area		128906	138325	- 6.8
Total City		1948609	2002512	- 2.7
Total SMSA		4817914	4342897	+ 10.9

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

TABLE 20

AGE OF POPULATION 1970 and 1960

PERCENT AND RATIO TO PERCENT IN SMSA

CENSUS TRACT	65 and Over 1970 PERCENT	INDEX*	1960 PERCENT	INDEX*	45 to 64 1970 PERCENT	INDEX*	1960 PERCENT	INDEX*
185	9.3		6.5	71	37.2	168	20.1	94
189	11.8	122	10.2	112	27.3	124	26.8	125
190	12.6	130	8.2	90	25.3	114	27.2	127
289	12.9	133	10.7	118	25.4	115	29.0	136
290	15.2	157	11.0	121	28.4	129	29.0	136
291	13.0	134	8.7	96	25.6	116	20.9	98
292	13.7	141	13.6	149	23.6	107	29.0	136
293	14.5	149	12.8	141	24.8	112	25.0	117
294	11.8	122	11.1	122	23.9	108	22.9	107
295	14.5	149	15.0	165	32.1	145	21.8	102
301	21.8	225	18.4	202	26.1	118	30.6	143
303	9.6	99	5.7	63	20.9	95	20.9	98
304	10.7	110	11.2	123	23.5	106	22.9	107
Total Micro	13.5	139	10.7	118	25.0	113	26.0	121
182	11.4	118	6.8	75	29.0	131	29.1	136
183	11.7	121	10.3	113	30.6	138	22.8	107
184	10.5	108	11.3	124	25.8	117	24.3	114
186	12.4	128	11.8	130	32.9	149	21.9	102
187	12.7	131	11.9	131	26.7	121	23.0	107
188	13.9	143	11.9	131	25.5	115	25.8	121
191	12.3	127	6.5	71	32.9	149	25.3	118
192	11.8	122	11.6	126	24.5	111	24.4	114
296	14.5	149	13.2	145	31.3	142	23.7	111
297	11.4	118	12.1	133	23.5	106	24.6	115
298	11.4	118	7.0	77	28.2	128	22.7	106
299	12.3	127	10.9	120	24.1	109	22.7	106
300	16.5	170	15.0	165	24.9	113	25.5	119
302	17.8	184	16.7	184	25.4	115	28.6	134
Total Macro	13.4	138	11.1	122	26.3	119	25.3	118
City	11.7	121	10.4	114	23.1	105	23.6	110
SMSA	9.7		9.1		22.1		21.4	

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

* Index related to SMSA base value; $\frac{\text{Census tract \% value}}{\text{SMSA \% value}}$ X100 Index

are more likely to move out of the area than are young people in other parts of the city and metropolis.

One in ten of the people in the micro area in 1970 were foreign born. Nearly one in four were born in this country to one or two foreign born parents. Thus, one in three residents in this immediate impact area of the highway are, in census terms, "of foreign stock " (See Table 21 which includes persons foreign born and those born of one or more foreign parents). While the available census data does not cover this, a high proportion of these residents of foreign stock were almost surely in middle and old age. The proportion of the inhabitants of the study area who were of foreign stock was well above the proportion for the city and for the SMSA.

In the micro area the greatest number of persons of foreign stock were Italian (3485), next were Russians (3033), and then Poles (2546). The Italians were most heavily concentrated in the Deni and East Frankford sections. Persons of Russian stock in the micro area were most numerous in Feltonville. It is assumed that a good many of those of Russian stock are Jewish. Those of Polish stock in the micro area were most heavily concentrated in Frankford Valley where they were 38% of the population. Outside the micro area there were concentrations of Polish residents of foreign stock in Bridesburg, in Richmond and in Frankford Valley. National identification is strengthened through membership in nationality churches, e.g., the Polish National Catholic Church in Frankford Valley and in national parishes such as Mater Dolorosa in Deni, and through organizations such as the Sons of Italy and the Polish American String Band.

The proportions of people in the micro area who were foreign born and of foreign stock fell markedly from 1960 and 1970. Ratios based on the proportion in the SMSA show that the decline in the proportion of foreign stock in the micro and macro areas was only slightly greater than the decline for the SMSA and was parallel to the decline in the city.

TABLE 21

POPULATION OF FOREIGN STOCK 1970-1960

PERCENT AND RATIO TO PERCENT IN SMSA

	FOREIGN STOCK			
	1970		1960	
Census Tract	Percent	INDEX *	Percent	INDEX *
185	23.6	114	32.5	129
189	25.7	124	30.2	120
190	23.5	114	34.4	137
289	37.2	180	54.8	218
290	43.2	209	46.9	187
291	36.9	178	42.4	169
292	31.3	151	53.1	212
293	40.5	196	37.9	151
294	32.9	159	32.4	129
295	48.0	232	33.8	242
301	29.1	141	33.8	135
303	26.5	128	29.0	116
304	32.7	158	31.3	125
Total Micro Area	32.9	159	40.7	162
182	26.1	126	30.4	121
183	42.6	206	50.1	200
184	30.9	149	35.2	140
186	46.2	223	52.4	209
187	31.9	154	42.0	167
188	21.9	106	32.0	127
191	34.7	168	36.4	145
192	34.7	113	28.4	113
296	57.0	275	54.4	217
297	38.1	184	31.2	124
298	29.2	141	30.3	121
299	27.0	130	33.9	135
300	18.3	88	22.1	88
302	27.7	134	32.3	129
Total Macro Area	31.3	151	37.6	150
City	23.1	112	29.1	116
SMSA	20.7	100	25.1	100

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

* Index related to SMSA base value; $\frac{\text{Census tract \% value}}{\text{SMSA \% value}}$ X100=Index

In 1960 only 73 persons of Puerto Rican birth or parentage were found in the micro area and another 32 were found in the remainder of the macro area. This number had risen to 307 for the micro area and 89 for the remainder of the macro area by 1970. Census Tract 294 in Frankford, the East Frankford area, contained the largest number of people of Puerto Rican origin or parentage, 134 of them. The next largest number was in the Feltonville area at the southwestern end of the impact area.

The impact area was overwhelmingly white in 1970. One percent of the residents of the micro area and 3% of those in the macro area were black This compares to 33.6% for the city and 17% for the SMSA. Eleven of the 27 census tracts in the study area had no black inhabitants and 10 more tracts has less than 1% black population. Black residents in the study area were heavily concentrated in central Frankford in a rather highly segregated section. It was reported that the black population of the study area had been augmented in recent years by families from a historic black community farther up in the Northeast, Tacony which had been disrupted by the building of I-95. (See Table 22).

From 1960 to 1970 the number of blacks in the micro area grew from 0.8% to 1.3% of the area population. The bulk of this increase came in Tract 294 where the black population in the micro area had been heavily concentrated in 1960. In the part of the macro area which lies outside the micro area, black population growth between 1960 and 1970 was concentrated in three tracts in central Frankford.

When racial composition of schools was examined (See Table 23) for an indication of any change in the area since 1970, a rise in the proportion of blacks in Frankford High School from 8% in 1969-70 school year to 12% in 1973-74 was seen, and in the Creighton Elementary School (west of the Boulevard at the southern end of the impact area) the rise was from 12% to 16%. But the proportion of blacks in other schools such as Smedley School

TABLE 22

TOTAL BLACK POPULATION IN STUDY AREA 1960-1970

CENSUS TRACT NUMBERS-1970	1970 POPULATION	1970 PERCENTAGE	1960 POPULATION	1960 PERCENTAGE
185	1	.5	0	--
189	0	--	0	--
190	0	--	0	--
289	1	--	1	--
290	1	--	3	--
291	32	.7	6	.1
292	4	.1	2	--
293	0	--	18	.4
294	723	16.4	432	8.8
295	1	.1	2	.1
301	22	.4	7	.1
303	9	.1	0	--
304	0	--	0	--
Total Micro Area	794		471	
182	19	3.1	23	1.9
183	1	--	1	--
184	0	--	0	--
186	10	.2	11	.2
187	47	2.2	63	2.6
188	2	--	0	--
191	1	--	1	--
192	0	--	3	--
296	6	.4	0	--
297	2	.3	1	.1
298	97	1.7	0	--
299	752	15.0	232	4.1
300	1754	23.0	1624	19.3
302	12	.2	0	--
Total Macro Area	3497		2430	
Total City	653791	33.6	529240	26.4

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

TABLE 23

SCHOOLS AND RACIAL PERCENTAGE

	Enrollment 1969-70		Enrollment 1973-74	
Senior High Schools	No.	%NW	No.	%NW
Frankford	2340	8	2690	12
James Martin (Trade)	1520	*	1450	80
Northeast Catholic (Boys only)	2825	*	2592	*
Junior High Schools				
Warren Harding	1520	33	1450	27
John B. Stetson	2235	34	2415	32
Elementary Schools				
A. Public				
Barton	860	16	940	3
Bridesburg	370	1	350	2
Creighton	750	12	755	16
Edmunds	930	1	955	1
Hopkinson	920	10	900	13
Marshall	440	11	355	3
Olney	630	0	640	4
Sheridan	900	1	655	1
Smedley	700	46	665	49
Stearne	530	49	455	45
Sullivan	690	10	615	2
Webster	850	2	705	1
B. Parochial (Catholic)				
St. Adalbert	743	*	557	*
All Saints	395	*	345	*
St. Ambrose	1986	*	1363	*
Ascension	1428	*	1291	*
St. Bartholomew	1741	*	1497	*
St. George	269	*	254	*
Holy Innocents	1599	*	1348	*
St. Joachim	750	*	605	*
St. Joan of Arc	893	*	702	*
St. John Cantius	610	*	550	*
St. Martin of Tours	2792	*	2351	*
Mater Dolorosa	459	*	415	*
Nativity	1247	*	1083	*

* Figures not available

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

in East Frankford and Edmunds School in Northwood remained about the same, and the proportion of blacks in other schools such as Harding Junior High and Marshall School declined appreciably. This inconclusive pattern of racial change in the public shools can be understood in part in the light of the drop in enrollement in Catholic Schools whose pupils are predominantly white during this time (See Table 23).

There were 294 persons of other races, neither white nor black, in the micro area in 1970, and 479 persons of other races in the macro area. In 1960 there had been 90 persons of other races in the micro area and 168 in the macro area.

c. Family Structure

A first measure of the strength of families in an area, though a negative or inverted measure, is the proportion of households headed by primary individuals rather than by heads of families. A primary individual according to the census Bureau is a household head who lives alone or with non-family members only.

The proportion of households headed by primary individuals for the impact area in comparison to the city and SMSA for both 1960 and 1970 is:

	1970		1960	
	Percent	Index*	Percent	Index*
Micro Area	22.3	114	14.4	97
Macro Area	22.3	114	14.2	96
City	25.8	132	19.5	132
SMSA	19.6	100	14.8	100

In 1960 the study area had a lower proportion of primary individuals, non-family households, than the city of Philadelphia and a lower proportion than the SMSA. Obviously, in all these areas there was a substantial rise in individuals living outside a family group and this use was greater in the study area than it was in the city and the SMSA. Within the macro area the proportion of primary individuals was higher in Tracts 301 (42.6%) and

*(See explanation in Table 21)

304 (31.0%), both of which are near the Boulevard. There was a particularly rapid rise in these non-family households in several tracts, notably Tract 190 (Juniata Park), Tract 293 (Deni), and Tract 291 (Feltonville). The rapid growth in households of primary individuals in the area may be due to aging and widowhood, to increasing family disruption through divorce and to other factors.

Excluding the non-family households and concentrating on the families in the social impact area, one finds that 82.4% of these families in 1970 had both a husband and wife present, 13.5% were headed by a women and the remainder had an "other male head". This proportion of "husband -wife" families was slightly lower than that for the SMSA (83.6%) but higher than that for the city (76.4%). The highest proportion of husband-wife families were found toward the southern and western ends of the macro area. The lowest proportion of such families were found in East Frankford, and Richmond. Households with female heads were most common in the micro area in Tract 293, Deni, (18.3% of all households) and in Tract 299, East Frankford (22.2%) which lies in the macro area.

Because the census definition of a family includes such households as two sisters living together, not all families with female heads have children in them. Census data does make it possible to determine what fraction of the children in an area are living with both parents. In 1970, 84.4% of the persons under 18 years old in the micro area (83.0% in the macro area) were living with both parents. This proportion was far higher than the proportion of children living with both parents in the City of Philadelphia (70.3%) and also higher for this proportion for the SMSA (80.6%). Tract 294 in East Frankford had the lowest proportion of children living with both parents (73.8%) in the micro area and the highest proportion was in Tract 292 (89.5%) around Friends Hospital.

An index developed by Shevky and Bell to measure and compare degrees of familism in urban areas was utilized to provide a summary measure of familism for the tracts of the study area in comparison with one another, the city and the SMSA. Shevky and Bell constructed their familism index by combining separate scores for fertility of women in the labor force and single family dwellings.

The Skevky-Bell index designed to measure familism in sub-areas of a city is shown in the Social-Cultural Impact Study, a basis report to this EIS. Only three tracts have familism scores below that of the city, and four have scores which are over 100 points above the city score. Familism, measured in this way is lowest in Tract 301 which includes part of Northwood and highest in Tract 182 along the river in Richmond.

d. Residential Stability

Residential stability is an obvious ingredient in developing and maintaining communities; it is present in the social impact area to a remarkable extent. In 1970, 70.4% of the people in the macro area were living in the same house they occupied in 1965; for the city this figure was 61.2% and for the SMSA, 60.2%. Within the study area the highest proportion of families who had not moved during the past five years were found in Richmond's Tract 182, Bridesburg's Tract 183, and the western part of Juniata in Tract 191. The least stable tracts were in East Frankford, and in the tract near Friends Hospital which contains part of Northwood. The 1970 census showed a marked increase over 1960 in residential stability in the micro area -- 70.1% in the same house as five years earlier in 1970 comparied to 63.3% in 1960. The increase in stability for the macro area was less (70.4% from 66.3%) and there was an increase in residential stability during the decade for the city and the SMSA. (See Table 24)

Among those people living in the impact area in 1970 who were living at a different address in 1965, three-fourths had lived in the city in 1965.

TABLE 24

RESIDENTIAL STABILITY, 1970-1960

Proportion of Inhabitants Living At

Same Address as Five Years Earlier

Census Tract	1970 Number	1970 Percentage	1960 Number	1960 Percent
185	108	67.0	209	64.9
189	897	71.7	763	60.9
190	5304	73.7	4498	60.6
289	6428	72.1	6168	64.1
290	4344	73.7	3897	67.3
291	3386	75.7	2871	61.6
292	2404	58.4	3138	72.6
293	2311	66.3	2354	64.1
294	2708	66.6	2501	56.4
295	797	65.4	1057	80.1
301	3399	61.0	3416	60.4
303	6127	74.4	4767	62.0
304	432	74.3	291	46.9
Total Micro Area	38645	70.1	35960	63.3
Ratio to SMSA		116		114
182	439	80.8	793	74.8
183	3750	80.2	3991	74.9
184	1940	75.0	2097	75.8
186	4541	79.8	4640	75.1
187	1373	66.9	1547	70.4
188	5492	70.0	5761	66.5
191	6228	82.5	5045	65.5
192	5619	71.2	5909	71.0
296	909	72.4	1700	65.9
297	355	63.5	637	68.2
298	3716	71.8	3627	69.2
299	2626	58.3	3147	62.1
300	4182	59.6	4821	61.7
302	4157	62.0	4599	71.2
Total Macro Area	83972	70.4	84274	66.3
INDEX*		117		119
Total City	1096910	61.2	1062442	57.7
INDEX*		102		104
Total SMSA	2660944	60.2	2183796	55.5

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

* Index related to SMSA base value; $\frac{\text{Census tract \% value}}{\text{SMSA \% value}} \times 100 = \text{Index}$

In some cases they moved to another address in the same neighborhood. In some other cases they moved from one neighborhood to another within the study area. Many of the people interviewed in this study had spent most of all their lives in their present neighborhood and had relatives living nearby. Others had been born and raised in Fletonville and had moved to Northwood. Some, of course, had moved in from other parts of the city, the SMSA, or the world at large. In talking to the community leaders about themselves and their neighborhoods, one usually got a sense of rooted-edness, of territoriality.

e. Home Ownership

The study area in 1970 showed a high degree of home ownership; 69.5% of the dwellings in the micro area and 74.1% of those in the macro area were owner-occupied, compare to 57% in the city and 65% in the SMSA (See Table 25).

Within the impact area there are great differences between census tracts in the proportion of housing that is owner occupied. Ninety-one percent of the dwellings in Tract 91 (the southern section of Juniata Park) and 88% of the dwellings in Tract 183 in Bridesburg were owner occupied. The tracts with the lowest rate of home ownerships were in Frankford near the creek, in lower Northwood and in Summerdale.

The rate of home ownership declined in the Philadelphia SMSA from 1960 to 1970, going from 66.4% to 64.7% and the rate fell for the city and the social impact area as well. Table 25 presents the findings on vacancies for the study area. Its vacancy rate is considerably lower than the rate for the SMSA. Only 2.5% of the housing in the macro area was vacant in 1970. Several tracts showed high vacancy rates, i.e. rates of 5% or more. On the other hand, several tracts had remarkable low vacancy rates. From 1960 to 1970 the vacancy rate for the SMSA fell substantially (from 5.0% to 3.5%) but the vacancy rate in the macro area went from 2.7% to 2.8%. While the macro area had a not-

TABLE 25

HOME OWNERSHIP AND VACANT DWELLINGS

IN THE IMPACT AREA 1970 and 1960

Census Tract	Owner Occupied Percent 1970	Owner Occupied Percent 1960	Owner Occupied Index* 1970	Owner Occupied Index* 1960	Percent Dwelling Units Vacant 1970	Percent Dwelling Units Vacant 1960
185	83.3	82.4	129	124	4.1	5.2
189	77.8	77.0	120	116	3.1	4.8
190	74.1	71.8	115	108	1.2	3.2
289	83.2	83.2	128	125	1.3	1.7
290	76.1	75.7	118	114	1.5	1.7
291	66.4	68.1	103	103	0.6	1.0
292	80.3	79.3	124	119	2.4	1.4
293	55.0	59.6	85	90	5.1	4.2
294	55.4	55.8	86	84	6.0	6.2
295	77.6	79.4	120	120	5.1	4.0
301	44.7	47.4	69	71	4.6	3.5
303	77.2	78.2	119	118	1.2	2.0
304	51.3	55.2	79	83	6.2	3.5
Total Micro Area	69.5	70.1	107	106	2.5	2.8
182	72.3	77.9	112	117	5.2	2.6
183	87.9	89.2	136	134	1.7	2.1
184	75.5	79.8	117	120	6.1	4.0
186	84.8	87.1	131	131	3.3	1.9
187	72.8	73.1	122	110	3.0	5.0
188	72.8	72.6	113	109	4.0	4.3
191	90.6	92.3	140	139	1.0	1.5
192	77.1	79.3	119	119	2.8	2.2
296	71.6	71.4	111	108	3.6	4.6
297	72.0	73.9	111	111	3.2	2.8
298	81.9	84.7	127	128	1.2	1.8
299	68.3	69.6	106	105	3.2	2.7
300	56.2	58.6	87	88	4.9	3.0
302	73.6	78.0	114	117	2.0	1.8
Total Macro Area	73.1	74.3	113	112	2.8	2.7
City	56.9	58.7	88	88	4.6	5.1
SMSA	64.7	66.4			3.5	5.0

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

* Index related to SMSA base value; $\frac{\text{Census tract \% value}}{\text{SMSA \% value}} \times 100 = \text{Index}$

able lower vacancy rate in 1970 than did the SMSA and the city, the differences had narrowed considerably.

Overcrowded housing (more than 1.01 persons per room) was present in the social impact area in the same proportion (5.5%) that it was found in the SMSA. Overcrowding in the micro and macro areas increased appreciably from 1960 to 1970 while it was decreasing in the city and in the SMSA. Thus the substantial advantage the study area had over the city and the SMSA in the area of overcrowding in 1960 had largely or entirely disappeared by the 1970 census.

f. Social-Economic Standing

The social and economic standing of an area is likely to be judged by the jobs its inhabitants hold, by their family incomes, their level of education, their ethnic or racial background, and the quality of the housing. The Shevky-Bell index of social-economic status makes use of census data on occupation, income and education to compare the standing of sub-areas within the city. This index and the three separate elements of income, occupation and education are used here to analyze and present the economic and status position of the study area and its parts.

Average family income in the micro area was $10,987 (arithmetic mean) in 1970 and in the macro area it was $10,514. This was higher than the average for the city ($10,431) but lower than that for the SMSA ($12,223).* There were marked differences among the census tracts in the social impact area.

Using the ratio of the median income of the census tract to the median of the SMSA for both 1970 and 1960, one finds that 22 tracts lost ground in relation to the SMSA, that is, had a lower ratio in 1970 than in 1960, four gained relative to the SMSA, and one remained the same (See Table 26).

* Since a median income for the micro and macro area could not be computed, the arithmetic mean is used in this initial comparison with the city and the SMSA. From here on the median is used as it is a better figure for the purpose of this study.

TABLE 26

MEDIAN INCOME AND RATIO TO MEDIAN

FOR SMSA 1970 and 1960

Census Tract	1970 Median	1970 Index*	1960 Median	1960 Index*
185	$10000	93	$5870	91
189	10645	99	6048	94
190	9973	92	6587	102
289	9583	89	6288	98
290	10865	101	6528	101
291	9761	95	6075	94
292	10980	102	7440	116
293	8748	81	5317	83
294	8747	81	5333	91
295	8758	81	5826	91
301	10648	99	7290	113
303	9687	90	6321	98
304	11500	107	5957	93
182	9300	86	5909	92
183	9839	91	6248	97
184	9570	89	5814	90
186	9151	85	6090	95
187	9361	87	5995	93
188	9489	88	6141	95
191	10597	98	6591	102
192	9305	86	5933	92
296	8403	78	6028	94
297	8214	76	6000	93
298	9357	87	6181	96
299	8401	78	5724	89
300	8429	78	5613	87
302	10585	98	7341	114
Median City	9366		5782	
Median SMSA	10783		6433	

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

* Index related to SMSA base value; $\frac{\text{Census tract X value}}{\text{Median SMSA value}}$ X 100 = Indeex

Census data in 1970 reported that 6.0% of the families in both the micro and macro areas were below the poverty level, a percentage below that of the city (11.2%) and the SMSA (7.3%). Three percent of the families in the impact area were on welfare compared to 11.2% for the city and 7.2% for the SMSA. Families in the study area were much more likely than families in the SMSA or in the City of Philadelphia to be receiving Social Security income. Twenty-seven percent of the families in the micro area and 26% in the macro area received such income while 21% in the SMSA and 23% in the city received it. This income includes retirements, survivors and disability payments under Social Security.

Census tract data confirm the observation made by most of the community leaders relative to the description of the area as a locale for the working class with large numbers of the workers assigned to middle-range jobs. For the purpose of the Environmental Impact Statement the work categories were combined into the characteristic three dimensional status profile of high, medium and low. The first category combines professionals, proprietors, managers and officials. The second category combines skilled, foreman, clerical and sales workers. The final category embraces the semi-skilled, unskilled and service worker groups. Table 27 presents the occupational distribution by percentage for 1970 of the macro and micro areas. This table uses the traditional occupational categories. It shows that the macro area is below the city and the SMSA in categories representing professional, managerial, labores, and private household workers. It has a higher percentage of sales workers than the city but below that of the SMSA. In the service worker category it is below the percentage for the city, but slightly above the figure for the SMSA. The remaining three categories of clerical, craftsmen and operatives are all higher than either the percentage for the city or the SMSA. Actually, two-thirds (66.1%) of all workers in the macro area are located in these three categories. This compares to 55.5% for the city and 52.7% for the SMSA.

TABLE 27

OCCUPATIONAL DISTRIBUTION FOR 1970

Occupational Category	Micro Area	Macro Area	City	SMSA
Professional, Technical and Kindred	9.2	7.9	12.7	15.7
Managers and Administrators	5.2	4.5	5.6	7.8
Sales Workers	7.0	6.0	6.5	7.6
Clerical and Kindred	25.4	25.3	22.7	20.7
Craftsmen, Foreman and Kindred	15.9	16.1	12.4	13.9
Operatives and Transport Workers	22.0	24.7	20.4	18.1
Laborers, Farm Workers	4.1	4.1	5.0	4.5
Services Workers	10.9	11.0	12.9	10.5
Private Household Workers	.3	.4	1.8	1.2
Total Percent	100.0	100.0	100.0	100.0
Total Number	23910	51905	763520	1878497

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

Table 28 combines the nine occupational categories into the three dimensions of high, medium and low status types of occupations. It shows that the percentage of high status jobs is well below the rate for the city and the SMSA. Almost fifty percent (47.4%) of the workers in the macro area are in the middle-status occupational category. This compares to 41.1% for the city and 42.1% for the SMSA. This third category of lower status occupations is downward for all groups at about the same rate of change. The macro percentage figure is almost identical in 1970 with the city (40.1% for the former to 40.0% for the latter). The SMSA is well below this percentage with 34.4%.

The evidence of socio-economic status insofar as this is indicated by type of occupation supports the general impression of most respondents. This is working class area with about one-half of the jobs in the middle-status range. Lower-status jobs are average with the rest of the city. Upper-status jobs are 6.2% below the level of the city with this differential passed on almost entirely to the higher percentage of middle-status jobs in the macro area.

Not one tract in the social impact area had a median number of years of school completed by its adult inhabitants higher than the median for the SMSA. In one tract, 301 Northwood, the median was the same as that of the SMSA (12.0 years). Only four tracts in the study area had a median years of education completed higher than the median for the city (10.9). The rather high proportion of the population in the areas who are 65 years old and over, foreign born, and manual workers help to explain the relatively low educational level (See Table 29).

Chart 10 in the Social Cultural Impact Study shows the ranking of the census tracts within the social impact area according to the Shevky-Bell index of Social-Economic Status. This measure, used widely in the analysis of sub-areas with cities, is based on measures of both occupation and

TABLE 28

OCCUPATIONAL DISTRIBUTION BY PERCENTAGE, 1970-1960

Census Tract	Professionals, Properietors, Managers and Officials		Skilled, Foremen, Clerical, Sales		Semi-Skilled Unskilled, Service	
	1970	1960	1970	1960	1970	1960
185	6.2	6.2	33.8	27.3	60.0	66.4
189	17.8	17.6	42.4	39.0	40.0	43.4
190	11.7	11.4	49.8	49.6	38.5	40.0
289	11.2	15.4	50.7	50.2	38.1	34.2
290	18.3	19.1	50.0	53.6	31.7	27.1
291	16.6	19.7	47.5	51.2	35.9	29.0
292	18.7	29.6	50.3	49.5	30.9	20.9
293	8.4	9.4	40.3	40.6	51.3	49.9
294	5.7	8.9	39.0	36.7	55.3	54.4
295	2.7	8.7	40.0	33.4	57.3	57.9
301	23.0	28.1	52.9	49.5	24.2	22.3
303	17.1	15.5	50.6	52.9	32.3	31.7
304	13.4	16.0	41.4	66.4	45.2	17.6
Total Micro Area	14.5	17.0	48.4	48.6	37.1	34.3
182	5.9	11.3	36.0	31.3	58.1	57.3
183	12.4	10.0	41.5	41.9	46.0	47.9
184	11.5	9.0	43.7	46.8	44.9	44.1
186	9.5	10.0	39.1	34.9	51.4	54.5
187	7.2	5.1	40.2	35.3	52.6	58.8
188	8.1	10.6	47.4	45.5	44.6	43.9
191	12.8	9.7	52.9	47.5	34.3	42.7
192	9.3	10.8	49.6	50.1	41.0	39.1
296	12.5	11.1	32.1	36.9	55.5	51.6
297	2.0	12.1	53.5	38.4	44.5	49.5
298	9.2	12.2	49.9	49.5	40.8	38.3
299	7.0	8.8	45.2	42.2	47.9	49.0
300	10.5	11.2	45.4	43.8	44.1	45.0
302	18.5	23.7	52.0	53.3	29.5	23.0
Total Macro Area	12.5	11.6	47.4	44.8	40.1	43.5
City	18.3	16.6	41.7	40.8	40.0	52.5
SMSA	23.5	21.2	42.1	41.4	34.4	37.4

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

TABLE 29

MEDIAN SCHOOL YEARS COMPLETED 1970-1960

Census Tract	1970 Years Completed	1970 Index*	1960 Years Completed	1960 Index*
185	9.9	82	8.8	84
189	10.1	84	8.9	85
190	10.5	88	9.4	90
289	10.5	88	9.5	90
290	10.9	81	9.9	94
291	10.2	85	10.8	103
292	11.8	98	11.4	109
293	8.9	74	8.6	88
294	8.9	74	8.6	88
295	8.9	74	8.1	77
301	12.0	100	10.7	102
303	11.1	92	10.4	99
304	10.3	86	10.8	103
182	8.9	74	8.9	85
183	9.3	77	8.6	88
184	9.4	78	8.7	83
186	9.1	76	8.5	81
187	9.0	75	8.4	80
188	9.5	79	8.8	84
191	10.4	87	9.7	92
192	10.2	85	8.9	85
296	8.5	71	8.3	79
297	8.7	73	8.7	83
298	10.4	87	9.8	93
299	9.5	79	8.9	85
300	10.0	83	9.0	86
302	11.2	93	10.8	103
City	10.9	91	9.6	91
SMSA	12.0		10.5	

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

* Index related to SMSA base median; $\frac{\text{Census tract median}}{\text{SMSA median}} \times 100 = \text{Index}$

education. A high score on the index indicates low socio-economic status. Only four census tracts, those in the West Frankford, Northwood and Summerdale areas, showed higher socio-economic status than the mean for the city, nine of the 27 census tracts were 150 points or more away from the city average in the direction indicating lower socio-economic status.

A slender majority of workers in the micro and macro areas use private automobiles to get to work while a third use mass transit (See Table 30). See Plate 54 for public transportation facilities in the study area. Over 10% walked or were gainfully employed at home. Mass transit was used most by workers in Tract 301 (Northwood) and in Tract 300, which is located at the end of the Frankford El. In 1970 in 9 of the 27 census tracts, one-sixth or more workers walked to work, a pattern that might be expected in the areas where housing and industry are interspersed.

The shift away from mass transit from 1960 to 1970 occurred in the social impact area at about the same pace as it did in the city but much less than it did in the SMSA. The drop in the use of public transportation was particularly large in Tracts 291 near the Boulevard, 182 in Richmond and 299 in East Frankford.

g. Summary

In summary many of the social indicators may simply verify what knowledge people already know. The area of study generally shows a decreasing population, a population that is considerably older than it would be for the city proper. There is a high proportion of foreign stock, while the few black people who live in the area are found on a very few census tracts. There are strong family ties which are related to the areas residential stability, high home ownership and low vacancy rate.

TABLE 30

MEANS OF TRANSPORTATION TO WORK (in Percentages)

Census Tract	1970 Private Auto	1970 Public Transit	1970 Walk	1970 Work at Home	1960 Private Auto	1960 Public Transit	1960 Walk	1960 Work at Home
185	64	29	0	0	40	44	6	0
189	39	30	27	4	41	30	17	10
190	55	35	8	1	49	36	11	1
289	60	33	4	3	54	38	4	3
290	56	38	3	1	49	39	4	1
291	63	27	8	2	52	37	6	1
292	62	28	7	2	53	36	6	4
293	49	32	17	1	35	40	17	2
294	44	37	17	1	33	35	22	4
295	39	32	20	7	43	33	14	8
301	44	41	13	2	40	45	9	1
303	54	34	9	2	53	36	7	2
304	63	22	15	0	44	32	14	6
Micro	54	34	9	2	47	38	9	2
Ratios	80	166	112	72	87	144	103	50
182	48	24	20	9	31	34	15	9
183	51	32	12	3	39	39	14	5
184	51	30	17	2	33	28	32	3
186	47	31	18	3	37	33	19	3
187	57	29	12	2	38	35	22	2
188	48	35	15	2	38	37	15	4
191	61	30	8	0	57	33	8	1
192	50	32	15	2	43	34	14	3
296	35	28	33	4	36	36	18	7
297	50	21	27	0	19	29	41	2
298	55	36	6	2	48	33	10	2
299	50	30	15	3	41	41	12	3
300	41	44	13	2	38	40	11	3
302	59	32	6	2	45	41	4	3
Macro	52	33	11	2	44	37	11	3
Index*	77	163	135	86	81	140	134	58
City	50	37	10	2	39	41	9	3
Index*	74	181	116	82	72	157	110	68
SMSA	67	20	8	2	54	26	9	5

Percentages do not add to 100 since a small miscellaneous category was omitted.

SOURCE: THE SOCIAL-CULTURAL IMPACT STUDY

* Index related to SMSA base value; $\frac{\text{Census tract \% value}}{\text{SMSA \% value}} \times 100 = \text{Index}$

In describing the types of employment, levels of income, and education it becomes clear that it is a certain kind of working-class area. The poverty level is low while income is slightly above the average for the city. Reinforcing the aging and fixed income factor, one should also note the high percentage on Social Security. In six census tracts over 30% of all families were dependent on some phase of the Social Security System.

Finally, to support some of the conclusions of Transportation Planners, more people in this area are driving to work. In 1960 44% of the work force used private automobiles. In 1970 the figure was up to 52%.

2. Neighborhood Descriptions (See Plate 55)

A prime source of knowledge about the study area has been gained by interviews with leaders in the neighborhood and with city-wide officials in a position to know what was planned for the area and what was happening in it. While there was, no doubt, an optimistic bias in some interviews, the information gained has been a valuable resource in understanding the neighborhoods, human services and trends in the area. For several of the major neighborhoods from the river to the area just above the Boulevard, brief descriptions based mainly on the answers of the interviewees are presented.

a. Bridesburg (See Plate 56)

Bridesburg is an extremely ethnic area. The majority of its residents are of Polish background with small numbers of other ethnic groups including Italians and Wasps. The community borders the Delaware River, the Frankford Creek, and a variety of railroad lines add further isolation from the bordering communities of Richmond to the south and Frankford Valley to the west. Strictly speaking it does not lie in the immediate area of study, for I-95 is already open and constitutes a western border of the community. The Betsy Ross Bridge is completed and its western terminus is in Bridesburg.

The combined population in 1970 was 7,755 people, a drop of 1,074 persons since the 1960 census. It would be worth reiterating that it is working-class area with many of its residents employed in the nearby industries like Allied Chemical, Rohm and Haas, and the Frankford Arsenal. All Saints and St. John Cantius are the major churches for its chiefly Catholic residents.

It is at the same time a community where everyone does not think alike. This is witnessed in the splintering of the Bridesburg Civic Association into another more action-oriented group named the Bridesburg Civic Council. Some of the residents view this as a split between a group that is business-oriented and pro-highway versus a group that is people-oriented. The Councilman who represents Bridesburg, as well as Richmond, is a leading proponent for the construction of the Pulaski Highway.

b. Richmond (See Plate 56 and 57)

Richmond is a rather extended area that runs from the Delaware River west to Trenton Street, and from Frankford Creek south almost to Lehigh Avenue. That section of Richmond south of Allegheny Avenue is known as Port Richmond. It is a major port facility. The web of railroad yards at the river front slightly north of Lehigh reveal a measure of the amount of traffic that still moves through the docks of this area. The Port Richmond Civic Association is a group that separated from the older association, the Richmond Committee for Community Improvement, not because of conflict, but in order to divide the area into two manageable units. Consequently, the two associations work closely together on most community projects. Recent issues concerned opposition to the location of the Bicentennial in Richmond, and the location of a proposed trade school in the community.

The area is predominantly working class with no particular ethnic group dominant. It's approximate population in 1970 would be around 12,000, a decrease of 13% since 1960. Of all the sub-communities in the study area, Richmond would include the largest amount of land, much of which is sparsely populated in the eastern part. There is a wide variety of industry, truck terminals, and meat packing found here.

Richmond already has heavy exposure to traffic, especially truck traffic because of its economy and its role as a feeder to I-95 via Castor and Allegheny Avenues. It is hard to detect strong opposition to the Pulaski Highway in Richmond. Like Bridesburg, they believe they have made their contribution with the construction of I-95 and the widening of Aramingo Avenue. However, they are community minded people and some feel close to their neighbors near the Boulevard. Some of them, therefore, would support the position of their western neighbors. Others are more ambivalent because the issue is remotely relative to their own interests.

c. Frankford Valley (See Plates 56 and 57)

Frankford Valley is an older neighborhood consisting mainly of row homes interspersed with factories and businesses. Its boundaries are the Delaware Expressway, the Pennsylvania Railroad, the Reading Railroad, Van Kirk Street and Tacony Street. It has a high proportion of foreign born and second-generation Americans, principally Polish but also Russian, Ukranian and Lithuanian. The Roman Catholics are the largest single religious group, but there is a Polish Catholic congregation and a number of other Orthodox and Protestant churches. There are few, if any, Jews in the area and no blacks. Families in the area are working and middle class and generally keep their homes up well.

The neighborhood is described as close-knit with strong kin and friendship bonds; adults in the community have very often lived there all their lives. The Frankford Valley Civic Association has some 450 members and is actively fighting to control truck traffic and pollution by industry. The area has been severely affected by the building of I-95 and before that of Aramingo Avenue. It is now seeking to rebuild moral and gain control of its area.

d. East Frankford (See Plate 55)

The East Frankford section of the study area is located in the triangular section bounded by Frankford Avenue, Bridge Street, Torresdale Avenue, and the Frankford-Tacony Creek. The East Frankford Civic Association, represents about 200 dues-paying members. The primary goal of this organization has been and continues to be the redevelopment of the East Frankford area.

East Frankford is characterized as an old but stable community with many homeowners. About one-third of the residents in the area are black and the civic association's members are primarily black. Among the white residents there are groups of Poles and Italians but no ethnic enclaves, as such, exist within this section. There is, however, considerable residential segregation of the black residents in the central part of the area. Baptists, Methodists, and Roman Catholics typify the religious adherence of the residents with more than two-thirds belonging to the Protestant sects.

Socio-economically, the area is primarily lower middle to lower class. The segregated housing patterns and deteriorating housing stock have led most of the grown children to move away after they marry although the older population have generally been born and raised in the area. The major problems of the neighborhood have been housing deterioration and adolescent drug problems. Recreational facilities are "pretty good" but there has been some friction between black and white adolescents in connection with these facilities. The YWCA has been very actively involved with the organization of community activities.

e. Harrowgate (See Plates 57 and 58)

Harrowgate is bounded by Clearfield Street, Erie and Torresdale Avenues, Trenton Avenue and G Street, and comes to a point slightly beyond the Creek. It is basically an area where the great majority of people take good care of their homes and where property values have gone up appreciably. The housing appears to be largely row homes, some of them built in the middle of the nineteenth century.

It is a working and middle class neighborhood with average family income about $9,200 to $10,000. Harrowgate is about two-thirds Catholic. The remainder are almost all Protestants, as there are very few Jewish residents. It is reported that no one nationality stands out in the neighborhood and that very few blacks live there. It is described as a rather close-knit neighborhood. It is very common for adults to have lived all their lives in this community and young people usually stay in the neighborhood when they marry. "It is a community." There are two civic groups in the area, the Harrowgate Civic Association and the Aramingo Civic Association.

f. Westmoreland (See Plate 2)

Westmoreland is a small neighborhood in the area with a heavy population density. It is wedged between Richmond, Harrowgate and Juniata Park.

One informant said the area was 60% of Irish extraction and one might concur with this judgment in talking with people in the vicinity of its leading church, Ascension. It would appear that there are Polish, German and Italian residents in the area as well. It is a working-class area with a large number of young people. Many of the homes are well kept, and a leading status symbol in this row house area is the presence or absence of a front porch. There is some deterioration in Westmoreland. Home ownership is not as high as one finds in many of the other census tracts. Certain social problems associated with delinquency are higher here than in most of the surrounding impact area. Anticipated consequences of this proposed highway seem very remote to many. The leaders of its civic association, however, identify closely with Juniata Park and intend to possibly support this group.

g. Juniata Park (See Plate 57, 58 and 59)

Juniata Park leaders describe the area as middle American, composed of white-collar workers, policemen and firemen, and retired policemen and firemen. Its boundaries are stated as 6th Street, the Frankford Creek, Kensington Avenue, Erie Avenue. Homes are well kept and there is a high degree of home ownership. The area is described as predominantly Roman Catholic with a large Protestant minority but few Jews and no blacks. It is seen as a well organized community that has experienced a rise in community participation and awareness during the last ten years. It is said to have low housing turnover and a large number of residents who have been born and raised there. When the young people marry, they usually move out of the area because of a shortage of rental housing and housing they can afford to buy. It is seen as being somewhere between a neighborhood with close family and friendship ties and a quiet urban area where people prize their privacy. When there is a crisis Juniata Park families pride themselves on their "pitching in" to help.

Juniata Park Civic Association has some 100 to 200 members. Community problems are seen as including some youth problems and fending off changes which threaten to deteriorate the area.

h. Deni (See Plates 57, 58 and 59)

Deni or Lower Frankford is a working-class neighborhood of row houses mixed with factories. It is located on the north side of Frankford Creek with Adams Avenue, Oakland Street, Orthodox Street and Frankford Avenue as its other boundaries. The area is heavily Roman Catholic; it has some Protestant congregations but very few Jews. Its inhabitants are white with mixture of many nationalities. Italians are a substantial and visible part of the neighborhood. The area is also described as a rather close-knit neighborhood. Deni residents often have relatives nearby and many have lived there all their lives. Young people tend to move out when they marry and the area has many aging persons.

Because of problems of crime and drugs, a Town Watch and the Deni Civic Association were formed. The neighborhood has already been effected by the acquistion of homes for the Pulaski Highway.

i. West Frankford (See Plates 57, 58 and 59)

The West Frankford section lies in a triangle formed by Cheltenham, Oxford, and Frankford Avenues. It is described as a nice residential area of upper-middle class families who tend to live in single and semi-detached homes and lower-middle class families who tend to live in row homes. The area is described as over 99% white with a sizeable proportion of Italian-Americans, and as predominantly Catholic with a considerable number of Methodists. The neighborhood is perceived as somewhat cohesive with some socializing among neighbors but with few family ties. It is rather common for adults to have lived there all their lives but the younger people generally move out once they marry.

Adolescent behavior problems led to the formation of a Town Watch group and the West Frankford Civic Association. The economic problem of senior citizens are seen as one of the area's problems.

j. Northwood (See Plates 58 and 59)

Northwood is an upper-middle and middle class neighborhood bounded by Roosevelt Boulevard, Oxford Avenue, Leiper Street, Orthodox Steet, Castor, Ramona and Adams Avenues. The homes are predominantly twins and single homes. Two areas of more expensive homes between Castor Avenue and the Boulevard may be the best parts of this well-respected community.

It is described as having perhaps more Protestants than Catholics but very few Jews, and as being all white with a variety of nationalities. Many of its residents are retired families or individuals. It is described as a close-knit neighborhood in which many of the adults have lived all or most of their lives. Young people are said to stay in the area generally when they marry if housing is available. Turnover, however, is low and available housing has a ready market among families known to be waiting.

The cohesiveness of the neighborhood is said to be based on pride in the neighborhood and determination to preserve it rather than in any ethnic tie. Commercial use of properties in Northwood is barred by a covenant placed in the deed when the neighborhood was first developed, and the people there have fought continually to see that it is respected.

The neighborhood has had some juvenile problems, noise, vandalism, and a minor drug problem. The Northwood Civic Association was begun in 1953. They are concerned with zoning and recreational activities, and have an annual carnival.

k. Maple Lane (See Plate 55)

Maple Lane is a mini-neighborhood of some thirty-five families on a hill overlooking the Wyoming Avenue Bridge and Tacony Park. (This community is north of Wyoming Avenue, south of Tacony Creek and east of Whitaker Avenue). Their neighborhood appears like a small village and is isolated from the rest of the city. It is spoken of as country living in the city, and this is prized by policemen and other city employees there who must live in Philadelphia.

The residents are fairly evenly divided between Protestants and Catholics and are white and of many nationalities. In the private homes turnover is very low. A few people have lived there all their lives and others have been here for many years. The community problems which the neighborhood leaders would discuss were the highway department and the zoning board. Maple Lane Association seems to have been an ad hoc group formed to meet the one threat to the neighborhood, the revived proposed highway.

l. Feltonville (See Plates 55 and 60)

Feltonville is a neighborhood that borders the Boulevard on the east side with boundary streets of Ramona, Hunting Park, and F Street. It was long identified as being a prominent Jewish area. This is no longer true for the area is now quite mixed. One of its main streets is Wyoming Avenue, a fairly typical working-class commercial center. Alternate D through the park would come relatively close to this neighborhood. It has both a civic association and a citizens action group. Neighborhoods like Feltonville which have had to live beside Roosevelt Boulevard are quite concerned about the additional traffic that will find its way to this area if the highway terminates at the Boulevard.

Many of its Catholic children must cross the Boulevard to attend school at St. Ambrose's. Feltonville's major concern at the moment according to its civic leaders is developing a safe community. Even though the Pulaski Highway has not had high priority in its concerns many of its residents would be opposed to this highway.

m. Summerdale (See Plates 55 and 58)

Summerdale is the neighborhood on the west side of the Boulevard running roughly from Sears to Oxford Circle, and westward to Langdon Street which parallels the Penn-Central tracks.

With this neighborhood one would find such institutions as Kennedy Hospital, St. Martin of Tours Church and School, Oxford Village public housing project and Houseman Playground. It is a solid working-class area of well kept homes, most of which are row homes built during the last thirty to forty years. It has therefore a much newer look than most of the other communities in the study area. Socio-economically, it resembles Juniata Park except its housing is more varied and its streets more active with traffic.

It is chiefly a Catholic neighborhood of mixed ethnic vintage. The monthly meetings of its civic association are generally held in the school hall of St. Martin of Tours. An indicator of the many young families in this parish is the elementary school enrollment of 2,400, the largest in the archdiocese. The few blacks in Summerdale are found in Oxford Village, a World War II project of chiefly temporary housing.

If one can sense the feelings of this neighborhood it would be opposed to many of the alternates but willing to rank Alternate D as the lesser of the various evils perhaps because it is the route furthest away. Traffic and the problems with it is something this neighborhood has learned to live with over the years. Sears-Roebuck alone brings hundreds of trucks and thousands of cars into this area daily. Where Summerdale Avenue meets the Boulevard could easily be the most congested intersection in the area. This being a direct result of the east-west flow of traffic across the Boulevard from Adams Avenue.

3. Community Facilities, Services, and Features

Neighborhoods contain an array of institutions and social agencies. In addition to the school system, there are churches, hospitals and recreational centers among the principal social institutions in the community. Two cemeteries should also be identified as major institutions in the area.

a. Schools

There are numerous public and parochial, elementary and high school facilities in the area. Table 23 presents the schools and their racial percentage during two specific periods of time. No school facilities are directly affected by the proposed highway.

b. Churches

The study area is honeycombed with religious institutions ranging from a small Quaker Meeting in Frankford to the wide variety of ethnic congregations found in sections like Richmond. The Catholic parishes range from the massive institutions on the Boulevard to the smaller parishes in Richmond and Bridesburg. Saint Joachim's in Deni is the oldest Catholic parish in the impact area, and a hundred years ago serviced much of the area, including the Boulevard which has its own parishes. With many people of Italian, Irish Polish and German extraction living in the impact area, it would be logical to expect such a Catholic influence.

All of the alternate routes join the Boulevard within the limits of two of the largest Catholic parishes in the city. Alernate D connects with the Boulevard close to Saint Ambrose's. All the other alternate routes terminate in the Saint Martin of Tours parish. The other major Catholic parishes are

Ascension in Westmoreland, Saint Bartholomew's in East Frankford, Holy Innocents in Juniata Park, Nativity in Richmond and Saint John Cantius in Bridesburg.

In stressing the Catholic dimension of religious affiliation the social analyzers have merely called attention to the dominant religious group in the area. Many of the census tracts have no one dominant church group. There are important Presbyterian, Episcopal, Baptist, and other affiliations scattered throughout Frankford, Richmond, and Northwood. Two Jewish Synagogues are on the Boulevard and one is on Allegheny Avenue.

c. Recreational Facilities (See Plate 60)

Public recreational facilities in the area range from very good to very poor. Four of the city's recreational districts share jurisdiction in the impact area.

The major park in the area, Tacony Creek Park, is under the jurisdiction of the Fairmount Park Commission. It is located in North Philadelphia near Olney, Kensington and Frankford. The entire park covers an area of 225 acres, and is the only natural open space in this vicinity. The Tacony Creek Park is the nearest natural area to 460,000 people, approximately 20% of the city's population.

The predominant and chief asset of the park is the great number of trails for pedestrian and equestrian use. These are greatly used by horseback riders and many people come from more than five miles to enjoy this facility. However, as a large natural park located within the densely populated metropolitan area many of the recreational activities are spontaneous. Consequently, the grass meadows provide space for football, softball, golf driving kite flying, walking dogs, etc. There are many such meadows which provide this open space for play. The Juniata Golf Course located to the north and south of Wyoming Avenue, is also a major recreational area and a vital part of the park facilities in the area.

Land belonging to Friends Hospital stretches down into the Tacony Creek Valley and includes a portion of the stream itself. This area appears to be a public park and is open to and used by the public as part of the park system. It is also an essential link in the hiking and riding trails which are among the primary assets of the park.

In addition to this major park facility, the area contains several other smaller parks ranging from Whitehall (11.5 acres) and Northwood (8.6 acres) to the park at Hedge and Orthodox Streets which contains less than an acre of land.

The city organizes many of its recreational services at recreational centers and playgrounds. Some playgrounds have swimming pools or are part of a park facility such as the playgrounds in Juniata Park, Richmond and Kensington. The area has five recreational centers and thirteen playgrounds. The legend provided by the Philadelphia Planning Commission indicates where many of these facilities are located and when many of them will be improved (See Plate 60). There appears to be a fairly good distribution of such facilities with the exception of the Boulevard area.

There are also, in the area, many agencies like the YMCA in Frankford, parish and religious groups, and War Veterans' Clubs which also contribute to the availability of recreational facilities.

d. Cemeteries (See Plate 60)

Oakland Cemetery is a private stock company cemetery run by a father-son combination. As claimed by its owners it may be one of the most beautiful and best maintained cemeteries in the country. It is a heavily endowed cemetery built by the Quakers in 1886-87 whose future maintenance is guaranteed and established by trust funds, which have accumulated through the years. The administration building is 200 years old and at one time was a farm house. Oakland is a member of Northwood Civic Association and has close ties with that community (interest group wise).

Greenwood Cemetery is the other cemetery at the western end of the study area. Its 80 acres are enclosed by Ramona, Adams, Castor and Wyoming Avenues. This cemetery is approximately 150 years of age. It is identified with the Knights of Phythias, a fraternal order which is no doubt largely defunct today.

The cemetery, grounds and buildings are in a poor state of About one burial per week is the present average. The cemetery does not have the income or investments to provide a smooth operation. It contrasts sharply with the neighboring cemetery across the street, Oakland. The administrator of the cemetery paints a very positive future if the highway goes through it and the expected monetary recompense is made available.

e. Hospitals and Nursing Homes (See Plate 60)

Parkview Hospital is a private osteopathic hospital located back-to-back to Greenwood Cemetery. Presently a 172 bed institution, it is soon to expand to 223 beds, including a psychiatric unit among its new facilities. The general number of admissions are from the neighborhoods close to the hospital.

Friends Hospital, founded in 1813, is the oldest private psychiatric hospital in the county with historical buildings on the grounds. Presently it employs 418 staff people to service 165 patients. Northeast Mental Health Center is also located on the grounds though in a separate building. The Azalea Gardens is an annual attraction to 20,000 people or more and is directly in the route of Alternate C of the highway. Some community involvement should be noted as it provides recreation for the mental retarded, it permits newlyweds to take pictures in the gardens, and it employes volunteer workers on the grounds during the summer. Also, an increasing number of their patients now come from the greater Northeast.

Northwood Nursing Home, at the time of this survey, had 65 private patients most of whom suffer from the ailments associated with advancing age. The home is located on Castor Avenue and draws chiefly from Bridesburg, Frankford, and Kensington.

f. Redevelopment Areas (See Plate 62)

Most of Section C of the Pulaski Highway (Leiper Street to I-95) lies within the Aramingo Redevelopment Area. This area has been designated for redevelopment, however, no funds have been appropriated nor have design plans been finalized. The area is replete with deteriorating industrial, commercial and residential land uses as defined by the Philadelphia Redevelopment Authority (P.R.A.) however, some newer facilities have recently been constructed. To state that this area is devoid of all positive aesthetic character would be a value judgement, and would be an injustice to the many residents and people who may work or realize other benefits from the area. However, the fact that this area and the other areas to be discussed have been designed for Urban Renewal must indicate some aesthetic disadvantages.

Southeast of the Aramingo Redevelopment site two more areas have been certified as blighted areas. These areas are the East Kensington and the Port Richmond development areas. These areas have previously been characterized by the P.R.A. as having "unsafe, unsanitary, inadequate and overcrowded dwellings which lack proper area planning, light, air, open space, lot layout and desirable land uses."

To the north of the Aramingo Urban Renewal site are two other areas in which redevelopment plans are being considered. These areas are referred to as the East Frankford Meadow and the Pratt Street redevelopment areas. Again they can be characterized as having a nonconforming variety of mixed land uses.

g. Archaeological and Paleontological Sites

Before the advent of European settlement, Lenni Lenape Indians inhabited the Delaware Valley region. Henry Hudson in 1609 was the first European to set foot in this region, and based on his findings these Indians were the original inhabitors of the area, who received their name by the English after the Delaware River.

In 1683 land was bought west of the Delaware River from the Indians and named New Sweden by the Swedes. These people lived with the Indians on very familiar terms. By 1645 the Swedes had expanded to the Northeast section of Philadelphia, and in 1647 the area began to be influenced by the Dutch. It was not until the 1680's, however, when the English came with William Penn that the area was actually developed. After 1750 Germans began to influx the area, particularly in Bridesburg and Frankford.

The Indians in this area used the Northeast section of Philadelphia mainly for hunting and agricultural purposes. They lived in an advanced Stone Age culture, making pottery and growing corn and tobacco. They lived in bark shelters grouped together in villages, which housed all the members of their families. Numerous arrow heads and bones have been discovered in the hills of Frankford, which is evidence of the Indian Village which once flourished. Oxford and Bridesburg were also sites of Indian Villages. In June of 1974 the Philadelphia Historic Commission indicated that there were no specific archaeological or paleontological sites or diggings presently in the area, however, numerous Indian artifacts have in the past been found. Consequently, the possibility of uncovering artifacts during any excavation is conceivable.

h. Landmarks (See Plate 55)

The only structure in the area considered to be a landmark is the Sears, Roebuck and Company Building at Adams Avenue and Roosevelt Boulevard. This facility is visible from significant distances and serves as a point of orientation.

i. Fire and Police Facilities

Plate 60 includes the locations of existing and proposed fire and police facilities within the study area.

j. Other

Plate 60 also indicates other community facilities such as libraries, health centers, and special facilities located or proposed within the study area.

4. Economic Conditions

a. General

The economic impact area of the proposed Pulaski Highway was delineated subject to three considerations. First, the description of the general economic characteristics of the impact area or the data base used would be census tract data supplemented by data collected from individual companies within the area.

Second, it was necessary to define what might be called the "local economy". The local economy should be one that is more or less centered around the proposed right-of-way and should consider in its analysis the view of consumers (residents) and producers (firms and employees).

Third, it was considered desirable that the economic impact area and the social impact areas be consistent with one another. Consequently, the impact area was worked out in cooperation with the sociological study team.

Given these considerations, the highway right-of-way runs through fourteen census tracts. These fourteen tracts were identified as the micro-impact area. An additional thirteen census tracts were identified as being likely to feel the effect of the highway. These thirteen tracts roughly form a band on either side of the micro-study area. The macro area is bounded roughly as follows: on the east side by the Delaware; on the north by Levick, Oxford and Cheltenham Avenues; on the south by Allegheny Avenue, B,D, G and Front Streets; and on the west by Tabor Road, Godfrey Avenue and Tacony Creek. (See Plate 63).

In characterizing the macro area it can be stated that the area is an old and well established area. It contains both residential and industrial areas. However, in comparison with the City as whole, its importance as an industrial area is relatively greater than its importance as a residential area. In terms of the residential population, it is a comparatively stable area. But the change that has occurred suggests a deterioration relative to the City as a whole. Table 31 provides an overview of the economic impact area in terms of numerical descriptors.

b. Population

About 6.6% of the population of Philadelphia lives in the macro impact area. The people are evenly divided, half living in the micro area and half living in the adjacent tracts. The size of the macro area population, however, deteriorated between the 1960 and 1970 census dates. The population of the impact area was 138,188 in 1960 and 128,906 in 1970, a net decline of 9,282 people. This represents a population loss of 6.7% for the area. The drop may be compared with a population loss for the city as a whole of 2.7%. The SMSA area recorded a population gain of 10.9% and the SMSA area, exclusive of Philadelphia, had a 22.6% gain in population (See Table 32).

c. Stability

The population in the economic impact area is a relatively stable one. In Philadelphia as a whole 61.3% of the population occupied the same residence in 1970 as they did five years earlier. In the study area, fully twenty-three of the twenty-seven tracts exhibited higher levels of stability. The four with a more mobile population (292,299,300, 301) are in the northern part of the study area. Tracts 300 and 301 have a relatively large share of apartment units which are likely to account for some of the mobility. Various implications suggest themselves. A stable population is generally considered an asset in building a stable neighborhood and community. On the other hand geographic mobility is a characteristic, usually associated with upward economic mobility.

d. Income (See Table 33)

The pattern of family income within the study area presents a rather clear picture. That picture suggest that the study area is one of above average income, when compared to Philadelphia as a whole. But that income

TABLE 31

ECONOMIC IMPACT AREA: SUMMARY DESCRIPTORS

Variable	Micro Economic	Macro Impact Area	Phila. City	Phila. SMSA
Population	64.787	128,900	1,938,969	4,817,914
Impact Area Population / Philadelphia Population	3.3%	6.6%	N.A.	N.A.
Population Growth 1960-1970	-4.1%	-6.7%	-2.7%	10.9%
Population Stability	71.6%	71.0%	61.3%	60.2%
Educational Attainment (Median years school completed) 1970	10.35 (1)	10.0 (1)	10.9	12.0
Impact Area Median Income / Philadelphia Median Income	105.8%	102.2%	N.A.	N.A.
Impact Area Median Income / SMSA Median Income	91.9%	88.8%	N.A.	N.A.
Growth in Housing Units	0.9%	-0.6%	3.8%	15.8%
Owner-Occupied Housing	77.8% (1)	76.4%	57.0%	64.7%
Residents' Employment Percentage of: Philadelphia	3.4%	6.8%	N.A.	N.A.
SMSA	1.4%	2.8%		
Automobile Transportation to work	54.6% (1)	50.7% (1)	50.5%	67.5%
Land Use: Residential	29.0%	30.5%	39.2%	14.1%
Industrial	57.7%	58.7%	37.4%	7.1%
Employment Created: Impact Area / Philadelphia		11%		

(1) Median Census Tract
N.A.- Not Applicable

SOURCE: ECONOMIC IMPACT STUDY FOR L.R. 1078

TABLE 32

POPULATION DESCRIPTORS

Tract Number	Population Size 1970	1960	Percent of People In Same Residence As Five Years Ago	Persons Aged Twenty-five Yrs. and over: Median Years of School Completed
(1)	(2)	(3)	(4)	(5)
182	614	1170	80.8%	8.9
183	4963	5794	80.2%	9.3
184	2792	3035	75.0	9.4
185	183	354	67.1	9.9
186	6075	6670	79.9	9.1
187	2162	2412	67.0	9.0
188	8474	9428	70.1	9.5
189	1452	1368	71.1	10.1
190	7854	8165	73.8	10.5
191	7976	8593	82.5	10.4
192	8638	9042	71.2	10.2
289	9744	9804	72.2	10.5
290	6298	6246	73.7	10.9
291	4827	5249	75.7	10.2
292	4482	4626	58.4	11.8
293	3791	4065	66.4	8.9
294	4402	4889	66.7	8.9
295	1282	1418	65.5	8.9
296	1355	2787	72.4	8.5
297	638	999	63.5	8.7
298	5882	5793	71.8	10.4
299	5008	5580	58.3	9.5
300	7614	8391	59.7	10.0
301	5907	5970	61.0	12.0
302	7191	6938	62.0	11.2
303	9003	8915	74.5	11.1
304	599	654	74.4	10.3
	128,906	138,188		
Philadelphia:	1,948,609	2,002,512	61.3%	10.9

SOURCE: Bureau of the Census, 1970 Census of the Population, and 1960 Census of the Population, Washington

TABLE 33
FAMILY INCOME DATE

Census Tract	Median Family Income 1970	Median Family Income 1960	Tract Median Income / Philadelphia Median Income 1970	Tract Median Income / Philadelphia Median Income 1960	Percent of Families with Income below Poverty: 1970 (6) %	No.	Percent of Poverty Families with Public Assistance Income: 1970 (7) %
	$	$	%	%	%	No.	%
182	9,300	5,909	99.3	102.2	4.3	6	-
183	9,839	6,248	105.1	108.1	4.8	64	-
184	9,570	5,814	102.2	100.6	4.1	28	-
185	10,000	5,870	106.8	101.5	-	-	-
186	9,151	6,090	97.7	105.3	5.0	81	16.0
187	9,361	5,995	99.9	103.7	11.2	63	6.3
188	9,489	6,141	101.3	106.2	4.4	97	15.5
189	10,645	6,048	113.7	104.6	8.2	27	-
190	9,583	6,587	106.5	113.9	4.4	92	20.7
191	10,597	6,591	113.1	114.0	3.5	81	7.4
192	9,305	5,933	99.4	102.6	9.0	202	18.8
289	9,583	6,288	102.3	108.8	6.3	166	17.5
290	10,865	6,528	115.4	112.9	4.8	84	7.1
291	9,761	6,075	104.2	105.1	7.7	103	31.1
292	10,980	7,440	117.2	128.7	5.3	61	11.5
293	8,748	5,317	93.4	92.0	10.9	104	9.6
294	8,747	5,333	93.4	92.2	9.5	99	23.2
295	8,758	5,826	93.5	100.8	15.4	55	20.0
296	8,403	6,028	89.7	104.3	6.2	23	-
297	8,214	6,000	87.7	103.8	14.4	26	-
298	9,357	6,181	99.9	106.9	1.6	25	16.0
299	8,401	5,724	89.7	99.0	11.9	156	38.5
300	8,429	5,613	90.0	97.1	10.8	212	15.1
301	10,648	7,290	113.7	126.1	6.7	96	17.7
302	10,585	7,341	113,0	127.0	4.8	92	6.5
303	9,687	6,321	103.4	109.3	7.2	160	40.0
304	11,500	5,957	122.8	103.0	3.4	5	-
Philadelphia:							
	9,366	5,782	102.2	104.6	11.2%		34 .7%

SOURCE: Economic Impact Study for L.R. 1078

advantage has been deteriorating. That is, while median income in the study area has been rising, it has been growing less rapidly than median income in Philadelphia. Thus income in the study area has fallen relative to that of the City as a whole.

In 1960 median family income in the study area was $6,048, 4.6% greater than the Philadelphia median. By 1970 median income had risen to $9,570 compared to the City median of $9,366. But this was only 2.2% greater than the City median. Thus half of the income superiority of the study area had been lost during the decade. Alternatively, median family income grew 62% for the City but only 58% in the study area during the decade. When viewed against the Philadelphia SMSA as a whole, the income picture is much bleaker. Median income for the study area was $1,213 below the SMSA median of $10,783 for a ratio of only 88.8%.

Within the study area itself, the micro area reflects a higher income level, $9,906 in 1970, than the $9,570 for the entire macro area. Further, there has been less deterioration. In 1960 median income for the micro area was 6.6% above the city average. By 1970 the income-advantage ratio had dropped to 5.8%, a slippage of only 12% compared with the 50% deterioration (i.e. 4.6% to 2.2%) for the macro area. Thus the income level in the micro area is clearly superior to and deteriorating less rapidly than the adjacent census tracts as a group.

To evaluate the individual census tracts, the ratio of the tract median income to Philadelphia median income was calculated for each tract. Essentially the same pattern as described above manifiested itself, see Table 33 for individual ratios. A ratio of 100% means that median tract income was above the city average, and correspondingly a ratio below 100% means below average income. In 1960 only four of the twenty-seven tracts reflected below average income. By 1970 fully twelve tracts of 44% were below average. Perhaps more significantly, twenty-one of the twenty-seven tracts both those above and below average, refected relative deterioration.

One of the brighter aspects of the income picture in the study area is that, despite income deterioration, relatively few families have fallen into poverty. In 1970, 11.2% of the families in Philadelphia had an income below the level of poverty as officially defined by the Federal Government. Poverty income is a variable scale determined by several factors such as family size and cannot, as a consequence, be stated as a particular dollar figure. Only three or 11% of the study area tracts exceeded the city-wide poverty average. Further, in Philadelphia 34.7% of families with poverty incomes had to rely on public assistance to make up part of their income. Only two of the study tracts exceeded the city-wide incidence and eight of the tracts required no public assistance funds at all. Economically this suggests a relatively self-relient and self-sufficient population at the present time. Compared with the SMSA, however, the income achievement of impact area families is less encouraging. Only 7.3% of SMSA families had poverty income. This proportion is exceeded by nine of the impact area tracts.

e. Employment

Approximately 6.8% of the employed labor foce in Philadelphia lives in the macro study area. These workers constitute about 2.8% of the Philadelphia SMSA total. Table 34 shows the distribution of labor by occupation. The three major groupings of white-collar, blue-collar, and service workers are subdivided into ten commonly used occupational categories. The percentage distribution of the labor force is shown for the macro study area, the City of Philadelphia and the SMSA area in columns 2, 3, and 4 respectively.

In order to highlight the differences and similarities between the study area and the larger areas, occupational concentration ratios have been calculated and shown in columns 5 and 6. A concentration ratio equal to 100 indicates that the proportion of workers in the study area is the same as the proportion in the larger city or SMSA area. A ratio greater than 100 implies that study area employment is more heavily concentrated in this particular occupation than in the city or SMSA. A ratio less than 100 points to the relative

TABLE 34

RESIDENTS'EMPLOYMENT BY OCCUPATION

(1)	(2)	(3)	(4)	Concentration Ratio		U.S. Projected
	Impact			Impact Area / Philadelphia	Impact Area / SMSA	Growth Rates 1972-1985
Occupation	Area %	Philadelphia %	SMSA %	(5)	(6)	(7) %
White Collar	43.9	47.5	51.9	.92	.85	37.4
Professional & Technical	7.9	12.8	15.7	.62	.50	48.4
Managers & Administrators	4.5	5.5	7.8	.82	.58	30.7
Sales	6.1	6.5	7.7	.94	.79	21.4
Clerical & Kindred Workers	25.4	22.7	20.7	1.12	1.23	38.3
Blue Collar	44.9	37.6	36.1	1.19	1.24	14.8
Craftsmen, Foreman, and Kindred Workers	16.0	12.5	13.9	1.28	1.15	20.3
Operatives (except transportation)	19.3	16.1	14.3	1.20	1.35	12.9
Transportation Equipment Operators	5.5	4.2	3.7	1.31	1.49	12.9
Laborers	4.1	4.8	4.2	.85	.98	6.7
Service	11.2	14.9	12.0	.75	.93	22.2
Service Workers	10.7	13.0	10.6	.82	1.01	29.1
Private Household Workers	0.5	1.9	1.4	.26	.36	-23.5
TOTAL	100%	100%	100%			24.2%

SOURCE: Economic Impact Study for L.R. 1078

absence of particular occupational employees in the study area.

Column 5 compares occupational employment in the study area with that of Philadelphia. It may be seen that employment of study area residents is relatively heavily concentrated in the blue-collar occupations, except laorers, and in white-collar clerical employment. Service workers, including such groups as cleaning, food, health, protective, and personal service workers and private household workers, are underrepresented in the study area in terms of a .75 concentration ratio. Essentially the same results are evident in Column 6 comparing the study area to the SMSA area, except that the differences are magnified. In the SMSA there are relatively more professional and technical workers, managers and administrators, sales personnel, and relatively fewer clerical and blue-collar workers than in Philadelphia and in the study area.

Column 7 provides Bureau of Labor Statistics growth estimates for the various occupational categories during the period 1972-1985. It may be seen that the largest share of job openings will be in the white-collar occupations followed by service and blue-collar categories. White-collar employment is expected to increase both relatively and absolutely compared to blue-collar job expansion. Nationally, some 14.6 million additional white-collar jobs are expected to open up versus 4.2 million blue-collar jobs. The occupational competence of study area residents tends to be heavily concentrated, therefore, in occupations that hold less potential for growth and relatively more competition for the jobs which are available.

A concentration analysis for employment by industrial classification is summarized in Table 35. Columns 2, 3, and 4 show the share of the labor force of the study area, Philadelphia and the SMSA respectively which are employed in each industry. Column 5 suggest that the employment of study area residents is relatively heavily concentrated in manufacturing, transportation, utilities, and trade compared with Philadelphia as a whole. The

TABLE 35

RESIDENTS" EMPLOYMENT BY INDUSTRY

Industry	Impact Area % (2)	Philadelphia % (3)	SMSA % (4)	Concentration Ratio Impact Area Philadelphia (5)	Concentration Ratio Impact Area SMSA (6)	U.S. Projected Growth Rates: 1972-1985 % (7)
Construction	4.3	4.6	5.2	.93	.83	19.1
Manufacturing	36.5	28.2	30.8	1.29	1.19	21.9
Transporation	5.4	3.7	3.4	1.46	1.59	14.9
Communications Utilities, Sanatary	3.0	2.8	3.0	1.07	1.00	12.2
Wholesale Trade	5.4	4.4	4.3	1.23	1.26	21.0
Retail	16.9	15.7	15.7	1.08	1.08	21.7
Finance, Ins., Real Estate	5.4	5.7	5.6	.95	.96	37.9
Business and Repair Service	3.2	3.4	3.4	.94	.94	
Personal Service	2.6	5.5	4.4	.47	.59	
Health Services	3.9	6.3	5.6	.62	.70	34.2
Educational Services	3.3	6.2	7.1	.53	.46	
Other Professional Services	2.6	5.0	4.5	.52	.58	
Public Administration	6.9	8.0	5.8	.86	1.19	41.5
Other Industries	0.6	0.5	1.2	1.20	.50	
TOTAL	100%	100%	100%			25.7%

SOURCE: Bureau of The Census, 1970 Census of The Population, Washington.

study area has relatively few residents employed in service producing industries, public administration, and construction. Essentially the same patterns of concentration prevail with respect to the SMSA. The one exception is that the study area has a relative concentration of residents employed in the public sector when compared with the SMSA than with the city. Bureau of Labor Statistics projections for employment growth during the 1972-85 period by industry are given in Column 7. Compared with the average growth of 25% for all industries, those in which study area residents are concentrated reflect lower growth rates. The service industires with relatively little study area employment are expected to provide relatively more jobs than the industries where area residents tend to find most employment.

f. Housimg (See Table 36)

About 6.0% of the city's housing units are located in the study area. These are evenly divided with about 22,000 units in the micro area and another 22, 000 in the adjacent tracts.

The number of housing units in the city increased 3.8% during the census decade. The number of units in the micro area tracts increased by 0.9% while in the adjacent tracts the number of units decreased by 2% resulting in a net decrease in housing units for the macro area of 0.6% Part, at least, of this net loss, which runs counter to the city pattern, can be attributed to the construction of the Delaware Expressway.

The entire study is characterized by a relatively high proportion of owner-occupied houses, although, like income, the degree of home ownership has deteriorated. This deterioration has been both relative and absolute. Less than 60% of all the housing units in Philadelphia are owner-occupied. However, all but two of the study area tracts have a larger proporation of owner-occupied dwellings than the City average. These two tracts (301, 304),

TABLE 36

HOUSING

Census Tract	Number of Housing Units 1970	Number of Housing Units 1960	Percentage of Housing Owner Occupied 1970	Percentage of Housing Owner Occupied 1960	Owner-Estimated Housing Value 1970	Owner-Estimated Housing Value 1960	Percent of Housing In Multiple-Unit Structures 1970	Vacancy Rate: 1970	Vacancy Rate: 1970
(1)	(2)	(3)	(4) %	(5) %	(6)	(7)	(8) %	(9) %	(10) No.
Micro Area									
183	1632	1700	89.5	91.2	9,300	7,800	4.9	1.8	29
185	72	114	87.0	87.0	8,100	7,600	-	4.2	3
189	442	409	80.4	81.0	7,900	7,200	7.7	3.2	14
190	2,655	2,635	75.1	74.3	11,200	8,900	23.0	1.2	32
289	3,255	3,233	84.5	84.8	10,800	8,300	14.7	1.4	46
290	2,162	2,101	77.4	77.1	12,200	11,400	24.4	1.5	32
291	1,618	1,580	66.9	68.9	12,500	11,600	16.7	0.6	10
292	1,356	1,407	82.4	80.5	12,800	12,400	18.5	2.4	33
293	1,391	1,362	58.0	62.2	7,300	7,000	31.1	5.1	71
294	1,537	1,619	59.0	59.7	6,500	7,000	28.4	6.1	94
295	443	448	81.9	82.8	9,100	7,700	11.1	5.2	23
301	2,562	2,474	46.9	49.2	12,400	11,400	55.5	4.6	118
303	2,648	2,499	78.2	79.8	11,600	9,200	12.2	1.2	32
304	224	228	54.8	67.3	12,700	11,700	40.6	6.3	14
TOTAL MICRO	21,997	21,809						2.5	551
Macro Area									
182	210	344	76.4	80.0	6,700	6,600	3.3	5.2	11
184	927	900	80.5	83.2	7,900	7,000	11.1	6.1	57
186	2,140	2,043	87.8	88.9	7,900	7,300	1.5	3.4	73
187	717	791	81.3	77.1	7,000	6,700	3.8	3.1	22
188	2,948	3,095	75.9	76.0	7,600	7,400	17.5	4.0	118
191	2,769	2,729	91.6	93.7	12,600	11,200	6.3	1.0	28
192	2,849	2,832	79.4	81.2	7,500	7,300	9.7	2.8	80
296	522	938	74.4	74.9	8,300	7,400	14.4	3.6	19
297	218	315	74.4	76.1	7,400	7,500	7.3	3.2	7

TABLE 36 (CONT')

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
298	1,941	1,847	83.0	86.4	10,500	8,300	9.5	1.3	25
299	1,711	1,767	70.7	71.6	8,800	7,500	15.9	3.3	56
300	2,934	2,948	59.1	60.5	8,600	7,500	32.7	4.9	144
302	2,629	2,436	75.1	79.5	12,100	11,200	24.4	2.1	55
Total Macro Area	22,515	22,986						3.0	695
Total Study Area	44,512	44,795						2.8	1246
Philadelphia	673,390	649,036	57%	-	10,600	8,700	33.5%	4.6%	

SOURCE: Bureau of the Census, 1970 Census of Population
1960 Census of Population
1970 Census of Housing, and
1960 Census of Housing, Washington

one adjacent to Castor Avenue and one to Roosevelt Boulevard have relatively large apartment complexes which help account for the low share of home ownership. These two tracts have more apartment units than the city-wide average. All other study area tracts have fewer apartments than the city average. Thus in comparison with the city as a whole, the residential districts of the entire study area can be characterized as having primarily houses, rather than apartments and as having a relatively high degree of home ownership. This pattern is consistent with the low degree of population mobility discussed previously.

Patterns of housing values vary slightly in an east-west direction over the length of the study area. Although there are evident exceptions, generally houses in the eastern tracts, toward the Delaware River, are older and have on the average lower values than the city-wide average. 1970 data indicated that in ten of the tracts the estimated median housing value is above the Philadelphia median, while values are below this level in seventeen tracts. Of the ten above average tracts, seven are west of Castor Avenue and the other three have their western terminus on Castor Avenue. Of these ten, eight are in the micro area. however, not all eight would experience right-of-way damages if the highway is built, since the six alternative routes in Section B run through different tracts.

Between 1960 and 1970 average housing values grew in all but two of the tracts (292, 297). The rate of growth, however, was lower than the city average of 21.8% in all but four of the study area tracts.

Unlike many other mature sections of the city, the study area does not suffer from a high vacancy and abandonment rate in housing. Only six of the twenty-seven study area tracts have a vacancy rate which exceed the city average of 4.6%. The highest study area vacancy rate is about 6%. The vacancy rate averaged 2.5% of the dwelling units in the micro area and 3.0% in the adjacent tracts resulting in a 2.8% rate, equivalent to about 1246 units in the entire macro area.

g. Means of Transportation to Work

In Philadelphia half (50.5%) of workers use a private automobile in traveling to and from work (See Table 37). Of the other half, 37% rely on public transportation and the remaining 12% either walk to work, work at home, or use other means of transportation. Residents in the micro area rely somewhat more heavily on automobile transportation (54.6%). However, reliance on automobiles in the entire macro area (50.7%) is about equal to the city-wide proportaion. In eleven of the study area tracts the proportion of resident-workers using automobile transportation falls below the city-wide average. In the other sixteen tracts reliance on automobiles is equal to or greater than the city pattern. Automobile usage in the study tracts varies from a low of 35% to a high of 64%. Further, reliance on automobiles has been increasing over time. In twenty-three of the tracts the share of driving workers increased during the decade. The proportion fell in only four of the tracts. See Table 37 for specific rates. (See Plate 64).

h. Job Creation by Industry

The relatively heavy concentration of industry in the study area, and especially in some smaller industrial pockets within the study area, lead to the creation of employment within the city and to the demand for workers. Table 38 shows the number of employees by standard industrial classification and by transportation analysis zone. The zonal boundaries generally coincide with tract boundaries for the study area. In several cases, however, zone and tract boundaries are not coincident at the perimeter of the study area and employment was apportioned accordingly.

The picture which emerges from the data is consistant with the analysis of land-use patterns. That is, the study area, compared with the city as a whole is relatively more important as an industrial area than it is as a

TABLE 37

MEANS OF TRANSPORTATION TO WORK

Tract (1)	Percent of Workers Using Automobiles (2)		Mass Transit (3)		Other (1) (4)	
Micro	1970	1960	1970	1960	1970	1960
183	50.7	39.1	31.8	38.6	17.5	22.3
185	63.8	41.8	28.8	45.9	7.4	12.3
189	39.4	40.9	30.4	30.1	30.2	29.0
190	54.8	50.1	34.7	37.1	10.5	12.8
289	59.5	53.2	32.5	39.0	8.0	7.8
290	55.6	52.3	38.1	41.2	6.3	6.6
291	62.7	53.1	27.4	37.9	9.9	9.0
292	61.6	53.5	27.9	36.1	10.5	10.4
293	48.7	36.7	31.6	42.7	19.7	20.6
294	44.3	35.1	37.2	36.9	18.5	28.0
295	39.2	43.9	32.2	33.7	28.6	22.4
301	43.7	41.4	40.7	46.4	15.6	12.2
303	54.4	53.8	33.6	36.8	12.0	9.4
304	62.6	44.0	22.4	31.7	15.0	24.3
Adjacent						
182	48.0	34.7	23.6	38.4	28.4	26.9
184	51.0	34.1	29.8	29.4	19.2	36.5
186	47.0	39.8	31.4	35.8	21.6	24.4
187	56.7	39.2	29.1	35.9	14.2	24.9
188	48.1	40.6	34.6	39.1	17.3	20.3
191	60.6	57.4	30.4	33.0	9.0	9.6
192	50.5	45.7	32.1	36.3	17.4	18.0
296	34.9	37.0	27.8	36.6	37.3	26.4
297	49.8	21.0	21.1	31.7	29.1	47.3
298	54.8	51.5	36.0	35.3	9.2	13.2
299	50.4	42.1	30.3	42.4	19.3	15.5
300	40.7	41.6	43.6	43.1	15.7	15.3
302	59.4	47.4	31.9	43.5	8.7	9.1
Philadelphia	50.5	41.6	37.1	43.8	12.4	14.6

(1) Other includes those who: walk to work, work at home, and use other means of transportation.

SOURCE: The Bureau of The Census, 1970 Population Census, and 1960 Pupulation Census, Washington.

residential area. While this assessment is valid for the study area as a whole, it should be qualified by again pointing to the fact that within the study area there are pockets which are completely or primarily industrial and pockets which are completely or primarily residential. Other sub-areas involve a more even mixture.

The study area, as a residential area, contains a share of the city's population and supplies a portion of the city's labor force requiring employment. Statistically the study contains 6.6% of the city's population and supplies 6.8% of the city's labor force seeking employment. As an industrial area, jobs are created and firms seek or demand employees for these jobs. As of 1970 some 83,600 jobs were created by industry in the area accounting for 11% of all jobs in the city. It is evident then that the study area creates a demand for workers which cannot be satisfied by the resident labor force. If all residents worked in the area there would still be a net daily inflow of 31,700 workers to meet industry's labor requirements. In other words the number of people employed in the area exceed the number of resident workers in the area by 61%. For every eight jobs available in the area only five residents workers are available to fill them. Further, since many workers who live in the study area are employed beyond its perimeters, there is an additional daily commuter flow into and out of the area which is well in excess of the net employment created by study area industry. The area remains, however, an industrial center and a net provider of employment for other parts of the city and the SMSA area.

The distribution of employment by standard industrial classification may be seen in Table 38. Manufacturing is the most important industry providing about 43% of all jobs in the area. Other important sources of empolyment are the trade, government, and services sectors. The concentration ratio in Column (5) shows study area employment to city-wide employment

TABLE 38

EMPLOYMENT IN THE STUDY AREA

Standard Industrial Classification (1)	Employment in Study Area Number (1) (2)	Employment in Study Area Percent (3)	Employment in Philadelphia. Percent (4)	Study Area Employment / Philadelphia Employment (5)
15-17	2,743	3.3	4.6	.72
19-39	35,183	42.9	28.2	1.52
40-49	4,229	5.1	6.5	.78
50-59	15,137	18.4	20.1	.92
60-67	2,031	2.5	5.7	.44
70-89	10,327	12.6	26.4	.48
91-99	12,466	15.2	8.5	1.79
TOTAL	82,166	100.0	100.0	
+ d	1,528			
TOTAL	83,644			

Key: 15-17: Contract Construction; 19-39: Manufacturing; 40-49: Transportation, Communication, and Utilities; 50-59: Wholesale and Retail Trade; 60-67: Finance, Insurance and Real Estate; 70-89: Services; 91-99: Government.

d: Detail of zone and SIC categories not available due to Disclosure Principle.

(i): Employment in Study Area based on the following Transportation Analysis Zones, some of which have been apportioned to coincide with study are boundaries: 22732, 22742, 22830, 27262, 27270, 28111, 28112, 28121, 28122, 28211, 28212, 28213, 28221, 28222, 28311, 28312, 28321, 28331, 29110, 29121, 29122, 29130.

SOURCE: Delaware Valley Regional Planning Commission Employment File by standard industrial classification. The relative important of manufacturing employment in the study area is evident again with a ratio of 1.52 as is government employment where the ratio is 1.79. There is also a very significant concentration of truck transportation firms in the area, compared with other sections of the city. This concentration is not statistically identifiable in Table 38 in part because transportation employment is lumped together with communications, utilities and sanitation employment in the numerical data.

i. Summary

The economic descriptors developed in the preceeding pages may now be summarized. The economic impact area constitutes 7.3% of the land area of the City, contain 6.7% of the population and supplies 6.8% of the city's labor force.

Residents income on the average is above the city-wide average, but only slightly so. More imporantly income levels in the impact area are deteriorating relative to the city averages. Further, residents' income levels are well below SMSA averages. Despite income deterioration the area exhibits a lower incidence of poverty income and of reliance on public assistance than would be expected on the basis of income alone. This suggests the residents are a relatively self-sufficient and self-reliant group.

Residents's employment tends to be concentrated relatively heavily in blue-collar and clerical white-collar positions and to be relatively underrepresented in professional, managerial, and service categories. Blue-collar and clerical positions tend to require relatively less formal education. And this general employment-education pattern is supported by the educational attainment of the impact area residents. Their levels of formal education are generally lower than the city-wide level of education attainment, considerably lower than the SMSA level, and deteriorating relative to both areas.

About 6.6% of the city's dwelling units are located in the impact area. There has been a very slight decline in the number of housing units during the last decade, contrasting with the city's 4% increase. Although the number of owner-occupied housing units has been falling slowly, the proportion of such houses is 34% above the city-wide average. This is consistent with the area's low population mobility and income patterns. However, while the value of housing has risen in the area, it has not increased as rapidly as city-wide values indicating that housing values in the area have deteriorated relative to the rest of the city. This suggests, in summary, an area of generally older, owner-occupied housing units whose residents exhibit a high degree of geographic stability. But is is an area where relative deterioration is evident in several ways: income, educational attainment, housing value and home ownership.

Land use patterns suggest that the area is an important industrial center where the land area used for industrial purposes is double that use for residential purposes. This stands in contrast to the city-wide pattern where slightly more land is used for residential than industrial purposes and in greater contrast to the SMSA where residential land is double that of industrial land. Within the impact area, however, some sections are primarily residential, some are principally industrial, and some exhibit a more evenly-mixed residential-industrial use pattern.

The importance of the impact area as an industrial center has numerous implications. For example, the area is a net supplier of employment. Industry employs a labor force which is about 60% larger than the size of the resident labor force. Thus the impact area creates jobs for the rest of the city and SMSA. A relatively large share of the city wage tax is generated in the area. There is a net daily flow into the area of over thirty thousand workers. The daily gross flow of workers is considerably larger as many residents work outside the impact area. The outward migration of resident workers is matched by an in-migration of non-residents workers over and above the net flow cited above. Area residents rely on private automobile transportation to and from work to about the same extent as the city proportion of 50%. The interests of both the resident and non-resident labor force are served by adequate transportation facilities.

Thus in evaluating the economic impact of the highway on the area, three categories or groups should be considered; the area residents, the area industry, and the area as an economic resources base supplying jobs, tax revenue, and so forth for the city and SMSA.

Finally, it should be noted that there are 54 trucking firms located in the general area of the eastern end of the proposed highway. With respect to the problem of uncertainty, these firms are particularly important. According to the Pennsylvania Motor Truck Association, 42 trucking firms have moved out of Philadelphia in the last decade. It is likely that some of the firms moved because of the restrictions placed on truck movement in the Frankford-Kensington area. Contacts with some of the larger firms still operating in the area indicate that some of these firms are uncertain about whether they will continue to operate in the city. Thus, an early decision would be helpful to them.

5. Land Use

Unlike many of the more recently developed sections of Philadelphia, the study area has historically had a land use pattern which interlaced industrial with residential cities. Some of the structures, both residential and industrial, are quite old and some are of historical significance. Other structures are relatively new. The area thus presents a diversity both in land use and in the age distribution of land structures (See Plate 61).

The study area consists of 5,244 acres exclusive of streets and highways and rivers, streams, and wetlands. The specified acreages are thus potentially usable for residential, industrial or recreational facilities. The micro area accounts for 55% of the study area land and about 4.0% of the total land area in Philadelphia, again excluding streets, etc. The entire macro area accounts for 7.3% of the land area in the city.

Land use patterns are quite similar as between the micro and macro areas, but the study area use patterns that are quite different when compared with the city as a whole (See Table 39 and40). Collectively about 30% of the land in the study area is currently being utilized for residential purposes. Nearly double that amount (59%) is under industrial use while the remaining 11% is divided between recreational land (7.4%) and vacant land (3.4%).

Table 40 compares land use patterns in the micro area with land use patterns for Philadelphia as a whole. The relation between land use in the two areas can best be seen in the concentration ratio in Column (6) showing land allocations in the micro area as a ratio to those of the city. A ratio value greater than one implies that the study area devotes relatively more of its land to that particular use than does the city as a whole. A ratio of less than one implies a relative under allocation of study area land. It may be seen that the micro area uses about three-quarters as much of its land for residential and recreational uses as does the city. On the other hand, the micro area uses 60% more of its land for industrial purposes than does the city. Thus compared to the city as a whole the micro area and the macro area as well exhibit a relatively more extensive use of land for industrial purposes and relatively less for residential purposes.

Land use patterns in the study area are mirrored in zoning classifications. A minority portion of the area is zoned for residential use only. The majority area is zoned either industrial or commercial-residential. Only a marginal share of land in the latter category is actually devoted

TABLE 39

LAND USE IN THE STUDY AREA

Section	Residential	Industrial	Recreation (1)	Unused	Total
		(a) Acres			
Micro Area	845.0	1677.7	273.6	113.1	2909.4
Adjacent Tracts	752.8	1400.9	115.8	65.1	2334.6
Total Study Area	1597.8	3078.6	389.4	178.2	5244.0
		(b) Percent			
Micro Area	29.0	57.7	9.4	3.9	55.5
Adjacent Tracts	32.2	60.0	5.0	2.8	44.5
Total Study Area	30.5	58.7	7.4	3.4	100.0

(1) Data reflect 1970 land use patterns updated through June, 1973.

SOURCE: Delaware Valley Regional Planning Commission: Land Use File.

TABLE 40

LAND USE IN PHILADELPHIA AND MICRO STUDY AREA

Land Use	Philadelphia Acres (2)	Philadelphia % (3)	Micro Area Acres (4)	Micro Area % (5)	Micro Area / Philadelphia (1) (6)
Residential	27,245	37.9	845.0	29.0	.76
Manufacturing	5,181	7.2	411.8	14.2	1.97
Transportation, Communications, Utilities	9,056	12.6	535.4	18.4	1.46
Trade	3,598	5.0	220.9	7.6	1.52
Services	8,095	11.2	509.6	17.5	1.56
TOTAL Industrial	25,930	36.0	1677.7	57.7	1.60
Recreational	8,896	12.4	273.6	9.4	.76
Unused	5,869	8.2	113.1	3.9	.48
Other (2)	3,990	5.5	-	-	-
TOTAL	71,930	100.0	2909.4	100.0	4.0

(1) Micro area only was used because of the large amount of time necessary in compiling the figures from the raw data; and because the land use patterns in the micro tracts and adjacent tracts is essentially the same as may be seen in Table VIII. The data would lead to the same conclusion whether the micro area data alone or the macro area data are used.

(2) Includes: agriculture, forestry, fishing, mining, woodlands and other.

Source: Delaware Valley Regional Planning Commission; Land Use File to residential use.

Within the micro area, industrial land use has been disaggregated by type of industry in Table 41. The largest industrial use category is transportation, utilities, and communications which accounts for 32% of all industrial land. The second most important land use is for services accounting for 30% followed by manufacturing, 25% and trade, 13%.

Land use patterns vary considerably over the study area. And pockets or concentrations of residential and industrial land use are evident. During the nineteenth century the land adjacent to the Frankford Creek provided a natural attraction to industry. This land use had been continued to the present time. Thus most of the land adjacent to the Creek forms an industrial belt running in an east-west direction through the study area until the Creek enters the park area around Castor Avenue. Further, at the eastern end of the micro area there is an especially heavy concentration of industry particularly in the north-south Aramingo Avenue corridor. The right-of-way of the Pulaski Highway passes through an almost solid industrial area from the Delaware Expressway (I-95) to Kensington Avenue.

Although there is a relatively heavier concentration of residential land as one moves in a westerly direction from Kensington Avenue, the right-of-way primarily passes through non-residential land. Affected land use of course depends on which alternative route is involved toward the western end of the study area. The largest single impact of the highway on residential land would occur on the west side of Roosevelt Boulevard where several of the possible ramp configurations would be located.

6. Water Quality Resources - Tacony-Frankford Creek (See Plate 65)

a. Description of Stream

A visual survey of physical stream conditions was conducted on September 23, 1974 by walking and wading segments of the Tacony-Frankford Creek

TABLE 41

DISTRIBUTION OF INDUSTRIAL LAND USE: MICRO AREA

Land Use (1)	Acres (2)	Percent (3)
Transportation, Utilities, Communication	535.4	31.9
Services	509.6	30.4
Manufacturing	411.8	24.5
Trade	220.9	13.2
TOTAL	1677.7	100.0

SOURCE: Delaware Valley Regional Planning Commission: Land Use File.

between Rising Sun Avenue and Aramingo Avenue. Fourteen (14) observation points were established. At each location estimates were made for the following parameters: stream depth and width, substrate composition, type of debris present, vegetation, stability, and height of stream banks, observed recreational uses and general water quality appearance. In addition major changes in the physical characteristic of the stream between observation points, the number of riffles, and the observed point discharges were noted. A brief description of each observation point and its physical characteristics can be found in the Biological and Physical Assessment Basis Report.

b. Condition of Stream

Based on significant changes in the physical characteristics in the 3.3 miles of the stream surveyed, Tacony-Frankford Creek may be divided arbitrarily into five stream sections.

(1) Section 1

Section 1 was characterized by clear water, gravel, rock substrate, and many riffles (24) with several gravel bars. A 6 foot high concrete dam was located between observation points 1 and 2. In general, this section of stream was well shaded. Some erosion was evident along the west bank. Ten storm sewers were observed entering the stream. The southern third of Section 1 contained larger rocks and boulders and deeper pools than upstream areas. The several riffles in Section 1 probably create relatively high dissolved oxygen levels in the stream. A mixture of sand, gravel and rock substrate should provide an appropriate habitat for many stream macroinvertebrates. The riffle-pool structure of this section and the presence of undercut stream banks may provide spawning sites for minnows observed in this section.

(2) Section 2

Section 2 had a much slower velocity, than Section 1, deeper pools less shading vegetation, and more bottom silt. Sections of the east bank were composed of fill material and asphalt. A short segment of shallow riffles with a substrate composed of large rocks and sand was located immediately downstream from the largest pool. Eight riffles and four storm sewers were observed in this secion.

(3) Section 3

Approximately the first 1000 feet of Section 3 had a rocky substrate. The remainder was channelized completely in concrete. No riffles existed in this section. The water was 1.0 feet or less in depth; the stream was 12 feet to 15 feet wide; and the flow was 6.94 cfs (cubic feet per second). Twenty-four point source discharges were observed. This section could not maintain a fish population because of the absence of natural stream habitat. Macroinvertebrate populations may be greatly reduced and possible completely eliminated in this environment.

(4) Section 4

Section 4 had concrete channel sides which ranged from 5 feet to approximately 25 feet in height. The east bank was composed of metal rather than concrete downstream from observation point 13. The stream width averaged about 40 feet. The depth of the water was greater than 3.0 feet in most places. The substrate was natural, and ranged from sand and gravel to large rocks. Sunken logs and other natural debris were abundant at some locations Only one riffle was observed in Section 4. Twenty point discharges were noticed. Shading vegetation generally was absent and only one riffle was observed in Section 4. Some segments of Section 4 appeared turbid and a putrescent odor was detected at several locations.

(5) Section 5

The stream banks in Section 5 were vegetated with grasses and herbaceous shrubs, and the bottom was siltier than in Section 4. This section was tidal and, therfore, water quality in it probably is influenced by water from the Delaware River. The bottom was visible only in areas less than 1.0 foot deep and an oil sheen was observed on the surface. The channel was about 90 to 100 feet wide and was exposed to direct sunlight throughout the day.

c. Water Quality

(1) Sampling Stations

Six sampling sections were established in the Tacony-Frankford Creek. The locations of the stations and the conditions at each of them were:

(a) Station 1

Located in Tacony Creek 25 feet downstream from the Rising Sun Avenue bridge. Samples of macroinvertebrates were collected from a riffle zone in which the water was 4 inches deep. Chemical sampling was conducted in deeper water (18 inches). Substrate in the riffle was composed of sand and stones (1 to 3 inches in diameter). Substrate in the deeper water consisted of silt, sand, and a few large rocks (6 to 24 inches in diameter). Discarded shopping carts, bicycle parts and glass were present in the stream near the sampling area.

(b) Station 2

Located in Tacony Creek 300 feet upstream from the Roosevelt Boulevard bridge. Samples of macroinvertebrates were collected from a riffle zone in which the water was 2 inches deep. Chemical samples were taken in water 2 feet deep. Substrate in the riffle area was sand and stones (1 to 3 inches in diameter). An abandoned automobile, glass, and miscellaneous metal trash were present around the sampling station.

(c) Station 3

Located in Tacony Creek in Tacony Creek Park 100 feet downsteam from the Wyoming Avenue bridge. Samples of macroinvertebrates were collected from a riffle area in which the water was 2 inches deep. Chemical sampling was conducted in deeper water (2 feet). Substrate in the riffle area was composed of sand and stones (2 to 5 inches in diameter). Two discarded automobiles tires were present, but metal trash was absent.

(d) Station 4

Located in Frankford Creek at the Kensington Avenue bridge. Samples of macroinvertebrates were collected from the bridge with a LaMotte sediment sampler in water 2 feet deep. The substrate was composed of sand and broken glass. Water for chemical samples was collected by lowering a bucket from the bridge. At this station the stream is contained within concrete walls, 15 feet high, and surrounded by buildings or cyclone fencing.

(e) Station 5

Located in Frankford Creek at the Frankford Avenue Bridge. Macroinvertebrates were collected from the bridge with a LaMotte sediment sampler in water 1.5 feet deep. The substrate was composed of sand and broken glass. Water for chemical samples was collected by lowering a bucket from the bridge At this station the stream is contained within concrete walls, 10 to 15 feet high, and surrounded by buildings or cyclone fencing.

(f) Station 6

Located in Frankford Creek 15 feet downstream from the Aramingo Avenue bridge. Macroinvertebrates were collected from the bridge with a LaMotte sediment sampler in water 5 feet deep.The substrate was composed of silt and organic detritus. Chemcial samples were taken near the stream bank in water 2 feet deep. At this station the stream is subject to tidal flushing. A visible oil film was present on the surface of the water at the time of each visit.

(2) Pennsylvania Surface Water Classification

To establish surface water quality standards for the Tacony-Frankford Creek, ten water uses were considered, as determined by the Pennsylvania Department of Environmental Resources. These uses are: warm water fishes, domestic water supply, industrial water supply, livestock water supply, wildlife water supply, irrigation, fishing, natural area, power, and treated waste assimilation.

(3) Chemical Water Quality

Water samples were collected 1 foot below the surface at Station 1, 2, 3, and 6. At Station 4 and 5 sample water was collected at the surface of the stream. The methods and instruments used in analyses are summarized in Table 42.

Other data used to evaluate the existing conditions were obtained from the U.S. Geological Survey, the Pennsylvania Department of Environmental Resources and the City of Philadelphia Water Department. Further information on data collection can be found in the basis report.

Filtrable residue, nonfiltrable residue, turbidity, color, temperature, pH, total kjeldahl nitrogen, phenol, cyanide, surfactant, and metal concentrations measured in this study appear to be satisfactory for the maintenance of the aquatic biota. Dissolved oxygen concentrations decrease regularly from upstream to downstream, and the lowest concentrations of dissolved oxygen were observed near the mouth of Tacony-Frankford Creek. Because the concentrations of dissolved oxygen were so low, only very hardy species of fish would be expected to survive near the mouth of the stream. In the tidal segment of Tacony-Frankford Creek, the low concentration of dissolved oxygen in incoming water of the Delaware River was responsible for the poor quality of the stream during periods of rising tides. Oxygen demanding materials as measured by BOD, COD, and TOC that enter Tacony-Frankford Creek also contribute to the low concentrations of dissolved oxygen in the downstream section of the creek. The stream periodically has exhibited high concentrations of oxygen demanding materials.

TABLE 42

Methods and instruments used in analyses of water quality parameters. Standard methods are described by the American Public Health Association (1971).

PARAMETER	METHOD OR INSTRUMENT
Temperature, Conductivity	YSI Model 33 S-C-T Meter
pH	Corning Model 610 pH Meter
Oil and Grease	Standard Method 137
Turbidity	Hach Model 2100A Turbidity Meter
Color	Standard Method 118
Dissolved Oxygen, temperature	YSI Model 51A Oxygen Meter
Dissolved Oxygen Saturation	Standard Method 218B
Chemical Oxygen Demand	Standard Method 220
Total Organic Carbon	Bechman Model 915 Organic Carbon Analyzer
Phosphate	US-EPA, page 235[1]
Nitrate	Standard Method 133A
Total Kjeldahl Nitrogen	Standard Method 135
Ammonia	Standard Method 135
Heavy Metals	Perkin-Elmer Model 303 Spectrophotometer
Filtrable Residue	Standard Method 224
Nonfiltrable Residue	Standard Method 224
Phenols	Standard Method 222C
Cyanide	Standard Method 207
Surfactants (as methylene blue active substances)	Standard Method 159A

[1] United States Environmental Protection Agency, 1971.

Tacony-Frankford Creek was enriched in nutrients. Concentrations of phosphorus and inorganic nitrogen were sufficient to support algal growth.

Measurements at Station 4 during June, 1974 indicated that the quality of the water had improved since the period from 1968 to 1973. Nonfiltrable residue, turbidity, phosphorus, ammonia, total kjeldahl nitrogen, phenols, cyanides, and metals generally were lower in concentration during June, 1974 than between May, 1968 and January, 1973.

Based primarily on 1970 and 1971 data, fecal coliform concentrations indicated that Tacony-Frankford Creek was not suitable for primary or secondary contact recreation. Fecal coliform, total organic carbon, chemical oxygen demand, and phosphorus data indicated that during 1971 the stream periodically received partially treated or diluted sewage. No evidence of this condition was found during the present study. Analyses of a sediment sample from the mouth of Tacony-Frankford Creek indicated that the sediments were not contaiminated by metals. Ranges for each parameter are given on Table 43. Supporting data and information concerning these parameters can also be found in the Biological and Physical Assessment Basis Report.

Based on data presented and standards in Table 43 the water quality in Tacony-Frankford Creek upstream of Station 3 generally was suitable for the maintenance of the aquatic biota. Water quality downstream of Station 4 was likely to support only pollution tolerant organisms. The entire stream below County Line Avenue was not suitable for use as a public water supply, or for contact recreation such as the legal taking of fish, irrigation, or livestock watering. No statements can be made on the basis of this study on the suitability of Tacony-Frankford Creek for other water uses such as industrial water supply, power, and treated waste assimilation. Further information on the parameters measured, the methods and instruments used in the water quality analyses and the findings can be found in the Basis Report.

TABLE 43

Ranges of chemical, physical, and microbiological analyses of surface water samples from Tacony-Frankford Creek from 1965 to 1974 and State of Pennsylvania (DER)[a], Delaware River Basin Commission (DRBC)[b], United States Public Health Service (PHS)[c], and proposed United States Environmental Protection Agency (EPA)[d] standards.

Parameter	Range Minimum	Range Maximum	DER Standard	DRBC Standard	PHS Standard	EPA Freshwater Aquatic Life Standard	EPA Public Water Supply Intake Standard	EPA Wildlife Standard	EPA Recreational Waters Standard	EPA Irrigation Waters Standard	EPA Livestock Standard
Conductivity (umhos/cm)	88	968	-	-	-	-	-	-	-	-	-
Chloride (mg/l)	25	230	-	200	250	-	250	-	-	-	-
Filtrable residue (mg/l)	114	441	750	-	500	-	-	-	-	500-1000	-
pH	6.2	8.8	6.0 to 8.5	6.5 to 8.5	-	6.0 to 9.0	5.0 to 9.0	6.0 to 9.0	6.5 to 8.3	4.5 to 9.0	-
Nonfiltrable residue (mg/l)	2.5	80	-	-	-	80	-	-	-	-	-
Turbidity (FTU/JTU)	0	128	-	150 maximum	5+	-	-	-	-	-	-
Color (cpu)	0	320	-	-	15+	-	75	-	-	-	-
Oil and Grease (mg/l)	1	27	-	-	-	none visible	absent	none visible	-	-	-
Temperature (°C)	1	27	30.6	30.0 maximum	-	-	-	-	30	-	-
Dissolved Oxygen (mg/l)	0.8	15.7	4.0	3.52	-	6.2[h]	-	-	-	-	-
Biochemical Oxygen Demand (mg/l)	0.4	80	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (mg/l)	4	217	-	-	-	-	-	-	-	-	-
Total Organic Carbon (mg/l)	1	54	-	-	-	-	-	-	-	-	-
Total Phosphorus (mg/l)	0.05	19.6	-	-	-	-	-	-	0.1	-	-
Ammonia-Nitrogen (mg/l)	0.0	10.5	-	-	-	0.02	0.5	-	-	-	-
Nitrate-Nitrogen (mg/l)	0.0	11.7	-	-	10	-	10	-	-	-	100
Total Kjeldahl Nitrogen (mg/l)	0.1	11.9	-	-	-	-	-	-	-	-	-
Phenol (mg/l)	0	0.037	0.005	0.005	0.001	0.1	0.001	-	-	-	-
Cyanide (mg/l)	0	0.05	0.025	-	0.01(0.2)	-	0.2	-	-	-	-
Surfactants (mg/l)	0.030	0.239	-	1.0	0.5[i]	0.2[j]	0.5[i]	-	-	-	-
Aluminum (mg/l)	0.108	5.68	-	-	-	-	-	-	-	-	-
Arsenic (mg/l)	<0.025	0.030	-	-	0.01(0.05)	-	0.1	-	-	5.0	5.0
Boron (mg/l)	0.001	0.056	-	-	-	-	1.0	-	-	0.10	0.2
Calcium (mg/l)	10.8	568	-	-	-	-	-	-	-	0.75[k]	5.0
Chromium (mg/l)	0.00	0.71	-	-	(0.05)[d]	0.05	0.05	-	-	-	-
Copper (mg/l)	0.00	0.56	-	-	1.0	-	1	-	-	0.1	1.0
Iron (mg/l)	0.016	5.68	1.5	-	0.3	-	0.3	-	-	0.2	0.5
Lead (mg/l)	<0.03	0.10	-	-	(0.05)	0.03	0.05	-	-	5.0	-
Lithium (mg/l)	0.108	5.68	-	-	-	-	-	-	-	5.0	0.1
Magnesium (mg/l)	10.8	568	-	-	-	-	-	-	-	2.5	-
Manganese (mg/l)	0.010	0.568	-	-	0.05	-	0.05	-	-	-	-
Mercury (ug/l)	<0.02	0.60	-	-	-	0.2	0.002	-	-	0.2	-
Nickel (mg/l)	0.00	0.268	-	-	-	-	-	-	-	-	1.0
Silicon (mg/l)	0.315	26.8	-	-	-	-	-	-	-	0.2	-
Sodium (mg/l)	1.08	56.8	-	-	-	-	-	-	-	-	-
Titanium (mg/l)	0.010	0.568	-	-	-	-	-	-	-	-	-
Vanadium (mg/l)	0.010	0.568	-	-	-	-	-	-	-	-	-
Zinc (mg/l)	0.00	0.32	-	-	5.0	-	5	-	-	-	0.1
Fecal Coliform Bacteria (thousands of organisms/100 ml)	0.2	6900	-	0.770	-	-	2	-	2 average 4 maximum	1	25.0 4

a. Pennsylvania Department of Environmental Resources, 1973.
b. Delaware River Basin Commission, 1970.
c. United States Department of Health, Education, and Welfare, 1969.
d. United States Environmental Protection Agency, 1973.
e. Values which constitute grounds for rejection of a water supply if other more suitable supplies are or can be made available. Concentrations in excess of numbers in parentheses constitute grounds for rejection of a water supply.
f. Applies to finished water.
g. From 1 April to 15 June and 16 September to 31 December dissolved oxygen shall not average less than 6.5 mg/l.
h. At 21°C.
i. As alkyl benzene sulfonate
j. As linear alkylate sulfonate.
k. For sensitive crops.
l. As hexavalent chromium.

d. Aquatic Macroinvertebrates

The bottom dwelling aquatic macroinvertebrate communities of Tacony-Frankford Creek were sampled during June, 1974. Sampling stations were the same as those used for water quality analyses. Three replicate samples were taken with a Surber square foot bottom sampler in shallow riffle zones in Tacony-Frankford Creek (Stations 1, 2, and 3). Direct access to Stations 4, 5, and 6 was restricted by concrete walls and cyclone fencing.

Eighteen species of macroinvertebrates were identified in samples from Tacony-Frankford Creek. The greatest number of species (14) was found at Station 1. There was a gradual reduction in the number of species present at each station between stations 1 and 4. Only three taxa were present at each of the lower three stations 4, 5, and 6.

Macroinvertebrate densities were recorded at each section. In general, densities were low, but not so low that they indicate gross industrial pollution. The increase in the number of tubificid worms at Station 5 reflected an increase in rich, organic sediments in this section of the stream.

Each identified taxonomic group was classified according to its tolerance of organic pollution.

Tolerant: organisms frequently associated with gross organic contamination and generally able to thrive under anaerobic conditions.

Faculative: Organisms that have a wide range of tolerance and frequently are associated with moderate concentrations of organic contaminants.

Intolerant: Organisms that are not found associated even with moderate concentrations of organic contaminants and which generally are intolerant of even moderate reductions in the concentrations of dissolved oxygen.

The percentage of intolerant, facultative, and tolerant organisms at each sampling station are graphically portrayed in Plate 65. A progressive reduction in the proportions of pollution intolerant organisms was observed between Station 1 and Station 4. The fauna at Station 1 included four intolerant taxa: the larvae of caddisflies, mayflies, black flies, and a cranefly. These organisms accounted for 63% of the total density. A mayfly specie made the largest contribution to the total populations of sensitive species at Stations 1, 2, and 3. No intolerant species was collected at Station 4, 5, or 6. At least 97% of the macroinvertebrates found at these downstreams stations were tolerant forms. Tubificid worms and some Tribifex composed almost the entire population of the downstream communities.

e. Plankton

Plankton samples were not collected from Tacony-Frankford Creek. It is doubtful that any true planktonic forms could maintain significant populations in the stream. Sessile diatoms, attached filamentous algae, rotifiers, various protozoans, and other organisms associated with the periphyton of streams are expected to occur in Tacony-Frankford Creek. Filamentous green algae were observed attached to large rocks, sunken logs, and other debris throughout the stream channel between Rising Sun Avenue bridge and Aramingo Avenue bridge.

No algae blooms or clumps of detached filamentous algae were observed at any time during field surveys.

f. Fish

Previous studies were reviewed to augment the sampling program. A study conducted by the Delaware River Basin Commission (1968) included a search for fish in the vicinity of the Frankford Avenue Bridge (Station 5). No fish were captured during the survey.

A visual reconnaissance of the stream was conducted during April, 1970 by the Pennsylvania Department of Environmental Resources (PennDER). The stream was surveyed between the Route 73 bridge in Montgomery County and the Tabor Road Bridge which traverses the stream between Station 1 and 2. Approximately 100 unidentified minnows were reported near the Route 73 bridge and several more were observed at Glenside Park. No fish were seen at any of the six stations located downstream from Glenside Park (PennDER 1970).

Fish were sampled in the vicinity of stations 1, 2, 3, and 6 during July, 1974. Station 4 and 5 were not sampled owing to the inaccessibility of the stream at those points.

No fish were captured during present samplings, but two species of fish were captured with a dip net during the macroinvertebrate investigations. A total of 24 shiners were collected at Station 1. These were juvenile fish less than 2 centimeters in length, species identification was not attempted. Six more juvenile shiners were captured at Station 3, along with 3 adult mummichogs. Two adult mummichogs also were collected at station 6. Fish were not observed at Stations 2, 4, and 5.

Mummichogs were expected to be present in the Frankford Creek, especially near the mouth, because the species is quite common in the Delaware River. It is an exceedingly hardy fish, and is able to survive in water that would be fatal to most fishes. Spawning mummichogs utilize densely vegetated areas, so it is unlikely that the fish spawn in Frankford Creek. The shiners, which generally are less tolerant than mummichogs appeared to be quite young specimens and probably represent a local breeding population. Although the low number of species and individuals of fish collected indicated poor water quality, the young shiner population at Station 1, along with the macroinvertebrate data, suggest this area supports several species which may rapidly repopulate other reaches of the stream if water quality were to impove.

The following fishes are expected to inhabit Tacony-Frankford Creek if water quality improves: carp, silvery minnow, spottail shiner, satinfin shiner, golden shiner, banded killifish, mummichog, tessalated arter, channel catfish, brown bullhead, pumpkinseed, bluegill, and largemouth bass. These fish presently are found in the segment of the Delaware River and its tributaries between Wilmington, Delaware and the mouth of Tacony-Frankford Creek.

With a concommitant improvement of water quality in the Delaware River, several additional species also would be expected to establish populations in this tributary.

g. Hydrology

The drainage area of Tacony-Frankford Creek at a point 400 feet upstream from Torresdale Avenue is 33.8 square miles and is largely developed for residential and industrial use. The main stem of the stream flows southerly across the Piedmont Plateau for about 11 miles and continues into the coastal plain for about 2 miles until it enters the Delaware River.

Owing to the relatively small watershed, the creek is not often subjected to large spring floods. Large volumes of runoff from developed areas, however, may result in flash floods from intense thunderstorms during the summer months. The United States Geological Survey has maintained a gaging station 400 feet upstream from Torresdale Avenue since October, 1965. Some recent maximum and minimum discharge records are given in Table 44. The largest flow probably occured during July, 1931, when the discharge was estimated to be 6,500 cfs. Areas adjacent to the stream in Section C have been protected since early 1950's by flood control structures designed for a 100 year flood (10,000 cfs).

7. Terrestrial Vegetation

A map of the existing vegetation of the study area was compiled from black and white stereographic aerial photographs taken during 1965 and 1971. The map was prepared as an overlay to Delaware Valley Regional Planning Commission maps (1973; scale 1:2,400). Four major vegetation types were delineated and verified by field inspections (forest, scrub, grassland and unvegetated). See Table 45.

a. Forest Types

Forest occupies 110 acres or approximately 8% of the study area. Three forest types were recognized and mapped separately: beech-oak forest, ash-sycamore-boxelder forest, and black-cherry-locust forest. Owing primarily to

TABLE 44

Maximum and minimum discharge records for Tacony-Frankford Creek between 19 July 1966 and 29 September 1970 (United States Geological Survey, 1966, 1967, 1968, 1969, 1970).

MAXIMUM			MINIMUM		
DATE	LEVEL (FT.)*	DISCHARGE (CFS)	DATE	LEVEL (FT.)*	DISCHARGE (CFS
19 July 1966	12.95	4,790	26 August 1966	-	4.8
27 August 1967	14.43	6,000	12 October 1966	4.64	8.6
12 June 1968	13.88	5,530	29 September 1968	4.39	3.3
28 July 1969	14.08	5,700	15 September 1969	-	6.0
23 August 1970	14.56	6,110	29 September 1970	-	9.8

*Adjusted to height above mean sea level, 1929 datum.

Source: The Biological and Physical Assessment report for the Proposed Pulaski Highway

TABLE 45

Estimates of the acreage and proportion (%) of the Pulaski Highway study area characterized by nine landscape types during July 1974.

	ACRES	PERCENT
FORESTS	(110)	(8)
Beech-oak forest	52	4
Ash-sycamore-boxelder forest	34	2
Black cherry-locust forest	24	2
SCRUB[1]	(85)	(6)
GRASSLAND	(322)	(23)
Grassland	105	7
Grassland/trees[1]	159	11
Grassland/ornamentals	58	4
UNVEGETATED AREAS	(894)	(63)
Urban land	859	61
Water	35	2
	1,411	

1. Owing to the overgrown condition of Greenwood Cemetery, approximately 41 acres (84%) of it are included in the scrub type. The remainder and Oakland Cemetery are included in the Grassland/trees subtype.

Source: The Biological and Physical Assessment report for the Proposed Pulaski Highway.

the high intensity of use in park areas, the undergrowth was light to moderate in most areas. Accumulation of debris, including abandoned cars, shopping carts, and domestic trash, were conspicuous in most stands adjacent to Tacony Creek.

The beech-oak forest type included areas in which American beech and red oak predominated. It covered approximately 4% of the study area. Tuliptree and black oak were common associates, and were codominant in some areas. Other associates included white ash, white oak, black cherry and green ash. American elm, shagbark hickory, red maple, and black walnut occured infrequently.

The most notable areas of the beech-oak forest type were situated on moderately to steeply sloping lands adjacent to and southwest of Friends Hospital, and on the east slope of Frankford Creek facing the Hospital. The largest trees observed in the study area were concentrated in these areas.

The undergrowth in the beech-oak forest type was relatively open (easy to walk through). Spicebush was the most common shrub and saplings of hickories and red and black oaks were frequent. Numerous varieties of wildflowers and ferns were common.

Juniata Park and Northwood Park also are occupied by forests of the beech-oak type. No undergrowth was present in these parks, and the field layer was composed of mowed grass. Numerous other associated tree species of this forest type were found in these areas.

The ash-sycamore-boxelder forest type consisted primarily of green ash, sycamore, and boxelder. This type occured in low lying, poorly drained areas along Tacony-Frankford Creek. It occupied 2% of the study area. Common associates include: black cherry, black locust, black willow, red mulberry, and weeping willow. Owing to the high intensity of human use in the majority of these areas, the undergrowth often was lacking.

Black cherry-locust forests occupied 2% of the study area. Black cherry and black locust were the predominant species, but sassafras, red mulberry, tree-of-heaven, and Norway maple were frequent. The undergrowth was variable, but in most of these areas it was very dense.

b. Scrub Types

Scrub areas covered 6% of the study area, and varied from dense nearly impenetrable thickets of shrubs, small trees, vines, forbs, and grasses to rather open areas of scattered small trees, shrubs, forbs, and grasses. The canopies of scrub areas were no more than 20 feet tall, and were less than 15 feet tall in most areas.

Scrub stands on the cindered right-of-way adjacent to the Reading Railroad were composed of scattered tree saplings. Approximatley 90% of Greenwood Cemetery is covered by scurb vegetation. Many of the gravestones were obscured by dense thickets of black locust, black cerry, honeysuckle, and poison ivy. An herbaceous scrub stand along Frankford Creek, near Ramona Avenue, was composed primarily of Japanese knotweed and giant ragweed.

c. Grasslands

Grasslands, which covered 22% of the study area, were composed of dense areas of grasses with occasional forbs. Most areas apparently were subjected to periodic mowing. Three subtypes were mapped separately: grassland, grassland/trees, and grassland/ornamentals.

The grassland subtype included open areas of mowed grass in which woody vegetation was absent or very sparse. It covered 7% of the study area. Several recreation centers, ballfields, a stadium, and other playgrounds were occupied by this subtype.

Mowed grasslands with remnant trees from previously existing forests or with planted specimens of native trees were characterized as grassland/trees. Trees covered no more than 50% of the ground in this subtype. The subtype occurred on 11% of the study area. The Juniata Golf Course, Oakland Cemetery, and about 10% of Greenwood Cemetery were covered by the grassland/trees subtype. An historic American elm (designed by the Elm Research

Institute, Harrisbille, New Hampshire) is located along the fence separating the Oakland Cemetery from Friends Hospital.

The grassland/ornamental subtype consisted of grasslands interspersed with a variety of planted trees and shrubs, most of which were not native to the region. This subtype covered 14% of the study areas. The largest expanse of this type occurred on the grounds of Friends Hospital.

The grounds of Friends Hospital are virtually a botanical garden. Thomas Scattergood founded Friends Hospital in 1813 as the first private mental institution in the United States. In the same year the Committee on Farm and Grounds was appointed to keep the grounds and to supply flowers and plants for the benefit of the patients. Henry Hall who worked on the grounds of Friends Hospital from 1897 to 1946 was responsible for starting the azalea gardens in 1929. One hundred and twenty-two species of trees, 52 species of shrubs, 49 species of wildflowers, and 38 varieties of azaleas were know to grow on the grounds. Many large specimens of exotic trees, such as weeping beech, English walnut, Pacific yew, Katsura tree, copper beech, and saucer magnolia were prominent. Two additional historic elms have been designated on the grounds by Elm Research Institute. One located in front of the administration building recently has succumbed to Dutch elm disease and is to be removed in the near future according to hospital personnel.

d. Unvegetated Areas

Three landscape types were mapped in which native or cultivated vegetation occupied only a small fraction of the land surface: industrial, residential, and water. For the purpose of acreage calculations, industrial and residential areas were combined into an urban type which included 16% (894 acres) of the study area. The channel of Tacony-Frankford Creek occupied 2% of the main study area.

8 Wildlife

a. General

By utilizing previous studies, records from the collections of the Academy of Natural Science of Philadelphia, unpublished observations by local naturalists and various field observations the probable fauna composition of the area was determined.

At least 151 species of wildlife are known or expected to occur in the study area. These include 22 manmmals, 108 birds, 9 amphibians, and 12 reptiles. Of these, 4 species of mammals, 24 birds, 1 reptile, and 1 amphibian were observed during field surveys (July 2, 3, and 22, 1974). The complete listing of fauna to be found in the area and those actually observed, their habitats and scientific names can be found in the Biological and Physical Assessment Basis Report.

All mammals (with the exception of white-tailed deer), amphibians, and reptiles in the study area probably are permanent residents. It is likely that individuals of all these species breed in or near the study area. Of the 95 species of birds, 35 occur in the area during all seasons of the year, and 52 are expected to nest in or near the study area. No nationally threatened species of wildlife (U.S. Office of Endangered Species and International Activities, 1973) is expected to utilize the study area. An official list of rare and endangered species has not been published for Pennsylvania.

b. Habitat Relationships

Six wildlife habitat types were recognized on the basis of vegetation structure, proximity to open water, availability of nearby cover, and other features pertinent to utilization by wildlife. The value of these habitat types of wildlife in the order of decreasing importance are:

(1) Forest

Forest areas support a greater diversity of species, and a large number of species that breed, than does any other habitat type in the study area. They are especially rich in mammals and birds. Based on structural diversity.

and food supplies, beech-oak forest areas probably are the most valuable forest type to wildlife in the study area.

(2) Scrub

The value to wildlife of scrub habitat depends on area development, proximity to other vegetation types and inert cover, and floristic composition. In the project areas, scrub ranks second only to the forest habitat in terms of faunal diversity and the number of species which breed.

(3) Grassland/Ornamentals

Grassland areas interspersed with ornamental trees and shrubs were considered to constitute a separate habitat type because of their artificial nature, their proximty to buildings, and the high degree of management required to maintain them. Grassland/ornamental habitats support a relatively diverse fauna and may be of particular value to birds and mammals. However, the value of any particular area to wildlife will depend on its structural diversity and the intensity of human disturbance.

(4) Grassland

This habitat type includes the grassland and grassland/tree vegetation subtypes. Potentially, grasslands of the study area could support a diverse fauna. They would be utilized as breeding habitat primarily by small mammals and reptiles.

(5) Stream

Tacony-Frankford Creek and its tributaries, and the immediate shorelines of these streams, comprise this habitat type. The known or expected fauna includes 3 mammals, 13 birds, 8 amphibians, and 12 reptiles. Although diversity of species in the stream habitat is relatively low, 36 species occur and 11 species breed. Six species of birds wholly or largely are restricted to the stream habitat.

(6) Urban

Dense residential development, most of which are composed of row houses, and industrial and commercial areas were incorporated into an urban wildlife habitat type. Vegetation typically is scarce or absent in these areas.

Only 17 species are expected to occur in the urban habitat; of these 13 are birds. The two mammals (Norway rat and house mouse) are considered to be pests. No species are exclusive to the urban habitat, but the Norway rat, house mouse, starling, rock dove, and house sparrow are particularly abundant in urban areas.

c. Wildlife Values of Sections of the Study Area

Several distinct sections can be recognized in the study area. Because these sections are well defined, and usually include more than one habitat type, their relative values to wildlife were appraised. These sections, in decreasing order or importance, were:

(1) Tacony Creek Park

The park, for wildlife evaluations, includes Park areas generally west of Tacony Creek between I Street on the southeast and Whitaker Avenue on the northwest. North of Whitaker Avenue it consists of all Park areas on both sides of Tacony Creek south of the northern boundary of the Pulaski Highway study area.

The park includes, except for the urban type and grassland/ornametal type, all habitat types present in the study area. It contains about 95.5 acres. Forty-five percent is coverd by the grassland type, 46% is forested, 6% is scrub, and 2% consists of the grassland/tree type. It is likely that every species of wildlife known to occur in the study area utilizes some portion of Tacony Creek Park.

(2) Friends Hospital

The grounds of the hospital contain several habitat types: forest, scrub, grassland, stream, and grassland/ornamental. The associated buildings can be considered to represent the urban habitat type. All, or nearly all, species of local wildlife are expected to occur on the hospital grounds.

(3) Greenwood Cemetery

The grounds of this cemetery largely are unmanaged. The area primarily is covered by scrub vegetation, but there are some grasslands and scattered trees. The cemetery is a valuable wildlife area and can be expected to support a diverse fauna associated with scrub habitats.

(4) Juniata Golf Course

The golf course primarily consists of mowed grassland, but there are scattered individual trees and small groups of trees, as well as unmowed areas, covered by tall herbaceous and scrub vegetation. Stream habitats are present along Frankford Creek. The mowed fairways and herbaceous roughs provide food for ground feeding birds and probably are utilized by several species of mammals. The value of this habitat is limited by a lack of cover and by intensive human activities. The taller herbaceous vegetation supports a greater diversity of species of small wildlife and Frankford Creek probably is utilized by most stream dwellers, including breeding amphibians.

(5) Ross Nursery

The nursery contains evenly spaced rows of ornamental shrubs and cedar trees in a grassy area. It is bordered by scrub habitat. Various species of wildlife associated with grassland, scrub, and grassland/ornamental habitats are expected to utilize this area. The nursery apparently is not managed intensively; vines and tall herbaceous vegetation were noted in the rows of shrubs and trees. This provided additional cover and increased the value of the area to wildlife.

(6) Juniata Park

This area includes a grassland recreational area; a large park-like beech-oak forest stand with a ground cover of mowed grass and a stand of beech-oak forest with a shrubby and herbaceous undergrowth. The last type is the most valuable wildlife habitat and is expected to support a variety of birds and small mammals. The open grassland is used intensively for recreation, and provides limited food for ground-feeding birds and small mammals. The park-like forest is utilized as a picnic area, and its value to wildlife is limited further by the absence of shrubs and tall herbaceous plants. Small mammals and ground-feeding birds probably are the most common animals in this area.

(7) Oakland Cemetery

This cemetery is maintained intensively. The vegetation consist largely of mowed grasslands, but some areas are covered by tall herbaceous vegetation, shrubs, and a variety of large trees. The cemetery is utilized by gray squirrels and cottontails, and also provides for many birds.

9. Geology and Soils

The project is located in an area underlain by the Wissahickon Formation. This formation generally consists of a medium to coarse grained schist with an excess of mica. It is an easily weathered rock unit with a soil cover usually in excess of five feet. A saprolittic zone (soft, rotten rock) generally extends an additional several feet before hard rock is encountered.

The predominate soil type in the project area is a residual soil weathered from the underlying Wissahickon schist. It is a fine-grained micaceous soil with a relatively high content of silt and clay. Due to its fine-grained nature, the soil drainage is only adequate and the soil is highly susceptible to detrimental frost action. For these reasons early and proper installation of highway drainage and adequate roadway depth for frost protection are imperative. The high mica content of this soil will require strict moisture control in order to obtain satisfactory compaction. Assuming proper construction procedures are followed this soil will perform satisfactorily at subgrade.

This soil is easily eroded when disturbed and left exposed. Following all proper construction procedures including maintaining proper roadway crowning, minimizing soil exposure time, and early establishment of stabilizing plant growth on exposed soil slopes should help to satisfactorily control erosion on this project.

In the low, flat areas immediately adjacent to Tacony Creek the Wissahickon Formation has been covered by recent alluvial deposits. This material varies from silts through sands and gravels depending upon the velocity of the stream at the time of deposition. Fill material containing wood, brick, and glass was also encountered at several locations in the flood plain of this creek.

The groundwater level varies along the length of the project. In the lower section near I-95 the groundwater elevation varied between elevations 0 and + 10. In the vicinity of Wingohocking Street and Castor Avenue the test holes caved in before groundwater measurements could be made indicating a high water table. In the vicinity of Roosevelt Boulevard the groundwater was generally within 10 to 15 feet of the ground surface. Seasonal fluctuations in the groundwater table can be expected.

In the area between Wingohocking Street and Roosevelt Boulevard, the depressed alignments would be below groundwater elevation. For this reason a subdrainage system is essential. The system should be designed with sufficient capabilities to prevent the buildup of hydrostatic groundwater pressure.

The Frankford Creek which crosses the alignment several times is the only water carrying channel in the project area. Surface runoff is presently carried mostly by storm sewers which empty into Frankford Creek.

The pH value of the water in Frankford Creek was measured in June, 1974 to range between 6.9 and 7.5. The water is nearly neutral and has gradually become slightly more basic in recent years. There should be no detrimental effects on any drainage facilities or roadway structures exposed to those waters.

10. Existing Air Quality

a. The Delaware Valley Region's Climate *

The proximity of Delaware Bay probably has some effect on temperature conditions locally. Periods of extended cold weather are relatively rare and periods of abnormally high temperatures seldom last more than 3 or 4 days. However, because of the prevalence of maritime air during the summer months, humidity adds to the discomfort of the high temperatures.

Precipitation is fairly evenly distributed throughout the year with maximum amounts during the late summer months. Because of higher elevations, snowfall amounts are usually greater in northern portions of the city and suburbs than in cnetral and southern sections. Heavy fog seldom occurs over a large section of the city, except during the fall and winter months and then on an average only about 10 times a year. The prevailing wind during the summer months is southwest; during the winter months, northwest.

b. Mesoscale Air Quality

The mesoscale air quality analysis was performed by the Delaware Valley Regional Planning Commission (DVRPC) and included in their report on the Pulaski Highway Alternatives. This study presents a comparative analysis of estimated pollution emissions from alternative highway networks in the mesoscale area and in the corridor of the proposed Pulaski Highway (L.R. 1078). The mesoscale area is indicated in Plate 66 along with the Pulaski Highway Corridor.

Vehicular exhaust emissions from three highway network configurations were calculated for three primary pollutants: carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NOx). Emissions for both peak hour and 24 hour periods for each of the two areas by vehicle classification (automobile and trucks) were calculated. Information on daily and peak hour

* Taken from Bulletin Almanac 1975

emissions, by zone, for the two analysis areas is provided in the appendix of the DVRPC's Report

DVRPC's mesoscale analysis indicated the following findings related to the existing (1972) transportation network:

TOTAL EMISSIONS IN KILOGRAMS

	Carbon Monoxide	Oxides of Nitrogen	Hydrocarbons
Mesoscale			
Peak Hour	24,600	1,600	2,800
Daily	206,500	16,300	25,400
Pulaski Highway Corridor			
Peak Hour	2,700	200	300
Daily	23,200	1,800	2,900

c. Microscale Air Quality

The air quality impact study of L.R. 1078 from its interchange with I-95 to its intersection with Roosevelt Boulevard was conducted by Scott Environmental Technology, Inc. Values obtained in this study were compared to the National Ambient Air Quality Standards (See Table 46).

The National Ambient Air Quality Standards (NAAQS) were established after considerable research into the effects of air pollution on human beings. The standards are aimed at providing, with a margin of safety, a safe level for the especially sensitive person (such as a person suffering from asthma or subject to elevated carbon hemoglobin levels). The effects of carbon monoxide on normal human beings varies with respect to the time of exposure as indicated by Plate 67. The NAAQS (35 ppm for one-hour exposure and 9 ppm for eight-hour exposure)offers a substantial margin of safety for the normal human being.

The existing air quality was determined through ambient air measurements made with three mobile monitoring laboratories during June and July of 1974. These laboratories, herein referred to as Primary, Secondary and Tertiary, monitored pollutant variables at thirty-five (35) different sites in the area. Each laboratory was equipped with the monitoring equipment

TABLE 46

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standards[3]		
		Primary[1, 5]	Secondary[2, 5]	Method[4]
Photochemical Oxidants[6] (Corrected for NO_2)	1 hour	160 ug/m3 (0.08 ppm)	Same as Primary	Chemiluminescent Method
Carbon Monoxide	12 hours	- - -	Same as Primary	Non-Dispersive Infrared Spectroscopy
	8 hours	10 mg/m3 (9 ppm)		
	1 hour	40 mg/m3 (35 ppm)		
Nitrogen Dioxide	Annual Average	100 ug/m3 (0.05 ppm)	Same as Primary Standard	Colorimetric Method Using NaOH
	1 hour	- - -		
Sulfur Dioxide	Annual Average	80 ug/m3 (.03 ppm)		Pararosaniline Method
	24 hours	365 ug/m3 (0.14 ppm)		
	3 hours	- - -	1300 ug/m3 (0.5 ppm)	
	1 hour	- - -	- - -	
Suspended Particulate Matter	Annual Geometric Mean	75 ug/m3	60 ug/m3	High Volume Sampling
	24 hours	260 ug/m3	150 ug/m3	
Lead (Particulate)[7]	30 Day Average	- - -	- - -	- - -
Hydrogen Sulfide	1 hour	- - -	- - -	- - -
Hydrocarbons (Corrected for Methane)	3 hours (6 - 9 a.m.)	160 ug/m3 (0.24 ppm)	Same as Primary	Flame Ionization Defection Using Gas Chromotography
Visibility Reducing Particles	1 Observation	- - -	- - -	- - -

[1]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the Environmental Protection Agency (EPA).

[2]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after implementation plan is approved by the EPA.

[3]Federal standards other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year.

[4]Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" to be approved by the EPA.

[5]Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25° C and a reference pressure of 760 mm of mercury.

[6]Corrected for SO_2 in addition to NO_2.

[7]Pennsylvania Air Quality Standard for lead is five (5) micrograms per cubic meter for a 30-day average.

necessary to perform its function within the program design concept. Plate 68 and Table 46A indicate the location of monitoring laboratories.

The Primary and Secondary air quality laboratories were equipped with instrumentation required for the continuous monitoring of carbon monoxide, nitric oxide, total oxides of nitrogen, ozone, particulates, wind speed and wind direction. The Tertiary air quality laboratory was equipped for the continuous monitoring of carbon monoxide only. A complete description of the instrumentation, sampling systems and calibration procedures can be found in the Air Quality Study Report.

A total of thirty-five air monitoring sites were chosen to identify the existing air quality in the area. These sites were divided into three classes, depending upon their purpose within the investigation.

The Primary site was chosen to provide background air quality data for the duration of the one-month program. An attempt was made to locate this site in an area central to the whole project and also away from local, concentrated sources of pollution. The four Secondary sites were located strategically along the corridor to determine the existing air quality in areas to be directly affected by the various highway alternates under consideration. Thirty Tertiary sites were selected for short-term, rush-hour measurements of carbon monoxide at localized "hot spots" around the Primary and Secondary sites.

Plate 68 shows the relative locations of these same sites. Individual site maps and site descriptions are presented in the Air Quality Study Report. For purposes of correlation, meteorological data was obtained from the National Weather Service Station at the Philadelphia International Airport and air quality data was collected from both the Philadelphia Air Management Services Laboratory at Castor Avenue and Lycoming Street and the CAMP Station located at 20th and Race Streets.

TABLE 46A
AIR MONITORING RECEPTOR SITES

SITE NO*	TYPE	LOCATION
90	Primary	Northwest corner of Cayuga Avenue and "O" Street.
10	Secondary	Northwest corner of the intersection of Whitaker Avenue and Tacony Creek.
20	Secondary	300 ft. southwest of the intersection of Adams and Ramona Avenue.
30	Secondary	90 ft. southeast of the intersection of Leiper Street and Adams Avenue.
40	Secondary	350 ft. west of I-95 on Luzerne Avenue.
11	Tertiary	150 ft. northeast of the intersection of Loudon and Whitaker Avenues.
12	Tertiary	100 ft. north of the intersection of Bingham and Ruscomb Streets.
31	Tertiary	200 ft. north of Roosevelt Boulevard on Bingham Street.
14	Tertiary	150 ft. southeast of the intersection of Wyoming and "H" Streets.
15	Tertiary	250 ft. southwest of the intersection of Garland and Pennway Streets.
16	Tertiary	350 ft. west of the intersection of Whitaker and Ashdale Avenues.
21	Tertiary	Friends Hospital parking lot - 300 ft. southwest of Roosevelt Boulevard.
22	Tertiary	150 ft. southwest of Wyoming Street overpass on "I" Street.
23	Tertiary	Parkview Hospital parking lot - 450 ft. northeast of Wyoming Avenue.
24	Tertiary	200 ft. southeast of the intersection of Castor Avenue and Arrott Street.
25	Tertiary	550 ft. southwest of the intersection of Glendale and Summerdale Avenue.
26	Tertiary	90 ft. northeast of the intersection of Adams and Ramona Avenues
27	Tertiary	30 ft. west of Roosevelt Boulevard near Adams Avenue intersection.
31	Tertiary	250 ft. northeast of the intersection of Hunting Park Avenue and "O" Street.
32	Tertiary	50 ft. southeast of the intersection of Adams Avenue and Church Street.
33	Tertiary	125 ft. north of the intersection of Frankford and Adams Avenue.
34	Tertiary	200 ft. southeast of the intersection of Worrell and Kensington Avenue.
35	Tertiary	400 ft. northwest of the intersection of Griscom and Deal Streets.
36	Tertiary	175 ft. west of the intersection of Jasper Street and Frankford Avenue.
41	Tetiary	210 ft. northeast of the intersection of Coral and Vici Streets.
42	Tertiary	50 ft. west of the intersection of Adams Avenue and Ashland Street.
43	Tetiary	775 ft. northeast of the intersection of Wheatsheaf Lane and Aramingo Avenue.

* refer to Plate 68

TABLE 46A (Cont.)

SITE*	TYPE	LOCATION
44	Tertiary	220 ft. south of the intersection of Church and Pearce Streets.
45	Tertiary	380 ft. northwest of the intersection of Richmond and Luzerne Streets.
91	Tertiary	250 ft. south of the intersection of Castor and Hunting Park Avenues.
92	Tertiary	350 ft. south of the intersection of Castor and Cayuga Avenues.
93	Tertiary	210 ft. west of the intersection of Oakland and Orthodox Streets.
94	Tertiary	370 ft. southwest of the intersection of Wingohocking and Adams Streets.
95	Tertiary	200 ft. west of the intersection of Castor and Wyoming Avenues.
96	Tertiary	85 ft. west of the intersection of Adams and Orthodox Avenues.

* refer to Plate 68

The findings of the microscale air quality study related to existing air quality indicate that existing (1974) pollution levels throughout the highway corridor exceed the National Ambient Air Quality Standards for particulates, oxidants, and carbon monoxide. The high particulate and oxidant concentrations result primarily from sources outside the highway corridor.

Regarding the existing meteorology in the study area, the typical or "most probable" meteorological condition is that condition which is expected to occur most frequently on an annual basis. The pollutant levels associated with this condition are taken to be the average background concentrations measured. The meteorological aspects are normally average wind and atmospheric stability conditions for the area involved. Generally, most probable air quality levels comply with the National Ambient Air Quality Standards.

The "worst case" meteorological condition represents that situation which is expected to occur at least twice per year and produce the highest pollution levels in the area involved. Often "worst case" air quality levels approach or exceed the Air Quality Standards. Normally, peak concentrations occur during periods of very stable atmospheric conditions accompanied by low wind speeds. Frequently, peak one-hour levels result when these meteorological conditions occur simultaneoulsy with peak traffic periods. Violations of the eight-hour carbon monoxide standard may occur during any eight-hour period; however, the conditions most conducive to high eight-hour averages are light winds accompanied by restricted vertical mixing.

Table 47 defines the existing air quality in the Pulaski Highway study area in terms of meteorology and carbon monoxide levels. Figures and tables also follow which indicate typical ozone, nitric oxide and particulate levels in the study area.

Ozone concentrations were measured at the primary site from 6/6/74 through 7/8/74 and at the Whitaker Avenue and Luzerne Street sites. Numerous

TABLE 47

DEFINITION OF EXISTING AIR QUALITY

"MOST PROBABLE" CONDITIONS

- Pasquill stability Class D (neutral)
- Winds from the southwest at 9.2 mph (8 knots)
- Carbon monoxide background level of 2.5 ppm.

"WORST CASE" CONDITIONS

- Pasquill stability Class F (very stable)
- Calm winds at 0.8 mph
- Slightly over 60% cloud cover
- Late fall to early spring period
- An inversion height of 100 meters
- On a weekday during peak morning traffic period or just after the evening peak traffic period for the maximum eight-hour concentration and during either peak traffic period for the maximum one-hour concentration
- Carbon monoxide background levels of 13.5 ppm for the eight-hour period and 24.0 ppm for the maximum one-hour period.

Source: Scott Environmental Technology Air Quality Study violations of the 0.08 ppm one-hour standard were recorded at all three sites. Highest ozone concentrations were recorded at the Luzerne Street locations (Site 40) during the period of July 2 to July 8. Analysis of the data indicates that peak concentrations occurred at the Primary and Secondary sites at essentially the same time each day. Peak concentrations were influenced both by the ceiling height in the Philadlephia area and the nitric oxide concentrations at the location involved (See Plates 69, 70 and 71).

Particulate loadings in the Pulaski Highway corridor were measured at the Primary van location from 6/6/74 through 7/8/74. Simultaneous measurements were made at the Whitaker Avenue site from 6/22/74 to 6/30/74 and at the Luzerne Street site from 7/1/74 on. The data obtained is tabulated in the Air Quality Report along with the daily average wind direction as recorded at the Philadelphia Airport. (See Table 48).

The Primary standard for particulates was exceeded once and the Secondary standard violated thirteen times during the 33 days of monitoring at the Primary site. One violation of standards occurred at the Whitaker Avenue site, while standards were exceeded 5 out of 7 days at the Luzerne Street site.

It should be noted that all violations occurred when the wind was blowing from the southwest, with maximum concentrations resulting from a 240° wind. While there undoubtedly are nearby sources influencing the particulate level at the tree sites examined, it is most obvious that sources outside the Pulaski Highway corridor produce a significant loading. This conclusion is well demonstrated by the peak concentrations at the two sites involved for the four days - 7/2/74 through 7/5/74.

More detailed discussion of the particulate loadings in the Philadelphia area is contained in the appendix of this report (See Scott Environmental Technology's letter dated April 21, 1975) and in the report " A Study of the Nature and Origin of Airborne Particulate Matter in Philadelphia," prepared for Air Management Services by Scott Environmental Technology, Inc. (January

TABLE 48

PARTICULATE LOADINGS - μg/m³*

Date	Primary		Secondary		NWS** Wind Direction (degrees from north)
6/6	154.0	x	not measured		165
6/7	122.2				69
6/8	120.8				67
6/9	113.9				286
6/10	153.7	x			215
6/11	159.1	x			284
6/12	134.7				280
6/13	122.3				107
6/14	146.1				133
6/15	121.5				23
6/16	81.7				150
6/17	110.7				128
6/18	93.3				273
6/19	195.1	x			219
6/20	168.5	x			214
6/21	229.3	x			240
6/22	157.8	x	137.7		274
6/23	66.6		61.3		33
6/24	76.6		141.0		66
6/25	74.2		146.8		48
6/26	115.9		162.8	x	277
6/27	147.5		134.1		106
6/28	73.8		61.9		74
6/29	177.9	x	131.7		235
6/30	169.7	x	119.3		241
7/1	110.9		——		256
7/2	204.2	x	287.2	xx	238
7/3	268.2	xx	306.2	xx	236
7/4	225.5	x	194.8	x	238
7/5	190.5	x	196.4	x	238
7/6	126.8		87.8		262
7/7	94.1		85.1		312
7/8	196.6	x	180.2	x	289

x Exceeds Secondary Standard of 150 μg/m³

xx Exceeds Primary Standard of 260 μg/m³

*ug /M³ = Micrograms per cubic meter

** NWS = National Weather Service Station at Philadelphia International Airport

Source: Scott Environmental Technology Air Quality Study

1975).

11. Existing Noise Environment

a. General

This section is a summation of a Draft Noise Study for the project which was written and compiled in December of 1974. This study is for Sections B and C of the Highway project. Information and data for Section C was compiled and written by Scott Environmental Technology, Inc. and submitted to the Pennsylvania Department of Transportation. Information and data for Section B was compiled and written by the Pennsylvania Department of Transportation Environmental Staff. These two reports were then integrated into the Draft Noise Study Report. Several basic noise concepts and terminologies are appropriately discussed at this point.

b. Noise Terminology

Sound is composed of vibrating air particles set into motion by a vibrating solid body or by an oscillating sound source, for example an automobile tire rotating on the road. Sound propogates as a pressure wave, with each air particle in the wave oscillating back and forth and striking its neighboring air particles. Sound energy is thereby transmitted by this successive transfer of vibration from one particle to the next. The decibel is the measurement unit of sound and is abbreviated as the dB. Please refer to Table 49 for an illustration of respective levels.

c. Highway Noise Sources

Highway noise is created by the travel of two general types of vehicles: automobiles and trucks. The sources of highway noise are the vehicles themselves and the interaction between the vehicles' tires and the roadway.

Automobile noise is generated near the roadway surface and is composed primarily of mid-and high-frequency energy resulting from tire-roadway contact. It is thus highly dependent on vehicle speed.

Truck noise is the result of tire-roadway contact also, but is also a function of engine noise and exhaust noise emitted through the vehicle's

TABLE 49

Illustrative Noise Levels

Sound Pressure in bar	Sound Level in dB	Environmental Conditions
	140	
1 mbar		Threshold of pain
	130	
		Pneumatic chipper
	120	
100 µbar		Loud automobile horn
	110	
		Inside subway train (New York)
	100	
10 µbar		Average peak noise from diesel truck at 35 ft. from pav't edge
	90	
		Inside motor bus
	80	
1 µbar		Downtown traffic in large cities from sidewalk
	70	
		Conversational speech at 3 ft.
	60	
0.1 µbar		Typical business office
	50	
		Living room, suburban area
	40	
0.01 µbar		Library
	30	
		Bedroom at night
	20	
0.001 µbar		Broadcasting studio
	10	
		Threshold of hearing
	0	

bar=14.504 pounds per square inch (psi)
ubar = 10^{-6} bar
Mbar = 10^{-3} bar

Taken from "Acoustic Noise Measurements" by Jens Trampe Broch exhaust stack, eight to ten feet above the roadway surface.

d. Design Noise Levels

Extensive research has resulted in the development of design noise levels as related to particular land use classifications. The design noise levels shown in Table 50 have been promulgated by the Federal Highway Administration (FHWA) and may not be exceeded without a formal exception. The design noise levels are expressed in terms of L_{10} noise values, with L_{10} being that noise level which is exceeded ten percent (10%) of the time. The symbol L_{50}, the noise level exceeded fifty percent (50%) of the time, is also used in this report. This gives some indication of "average" noise conditions, and compared with L_{10} values, it provides an indication of the fluctuation of noise intensity.

The design noise levels are concerned with peak noise periods. By directing abatement and consideration of noise to these period, assurance is given that the greatest possible consideration is also afforded to conditions during quieter periods of the day.

e. Existing Noise Levels

From February to May in 1973 and from June to October in 1974 noise measurements were taken in the study area. These measurements were taken by Department of Transportation personnel using a Bruel and Kjaer Model 2205 standard sound level meter. Readings were taken during the morning and evening peak hours and during off peak hours.

In addition Scott Environmental Technology, Inc., used a General Radio Model 1551-c sound level meter, and monitored in a similar manner as explained above during June of 1974. Further information concerning monitoring procedures is contained in the previously mentioned noise report.

Noise monitoring was performed at a total of 65 sites in the study area. These sites are shown on Plate 72 and listed in Table 50A.

TABLE 50

DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS

Land Use Category	Design Noise Level - L_{10}	Description of Land Use Category
A	60 dBA (Exterior)	Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parts or portions of parks, or open spaces which are dedicated or recognized by appropriate local officals for activities requiring special qualities of serenity and quiet.
B	70 dBA (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
C	75 dBA (Exterior)	Developed lands, properties or activities not included in categories A & B
D		For requirements on undeveloped lands see paragraphs 5a (5) and (6), of PPM 90-2.
E	55 dBA (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

Taken from Federal Highway Administration, Policy and Procedure Memorandum 90-2, (PPM 90-2) "Noise Standards and Procedures."

TABLE 50A
NOISE LEVEL
MONITORING AND ANALYSIS SITES

RECEPTOR NUMBER	LAND USE	LOCATION
1	I	Aramingo Avenue and Frankford Avenue
2	R	Bermuda and Church Streets
3	R	Coral and Vici Streets
4	Inst.	North Catholic High School
5	P	Adams, Kensington and Frankford Avenues
6	R	Deal and Romain Streets
7	R	Deal and Leiper Streets
8	R	Frankford Creek and Leiper Street
9	R-C	Leiper Street - Between Ruan and Adams
10	R	Ruan Street - Between Leiper and Penn
11	P	Deni Playground
12	R	Rear of Potter Street homes
13	R	Adams Avenue - Between Factory and Pilling
14	R	Wingohocking Street - Between Adams and Unity
15	R	Unity Street - Between Adams and Horrocks
16	P	Castor Avenue - Near Frankford Creek
17	R	Naples Street - North of Orthodox
18	R	Castor Avenue - North of Wyoming
19	Inst.	Parkview Hospital
20	R	Castor Avenue - Between Wyoming and Orthodox
21	R	Overington Street - East of Reading R.R.
22	Inst.	Northwood Nursing Home
23	Cem.	Greenwood Cemetery
24	R	Castor and Adams Avenue
25	P	Simpson Memorial Park
25A	R	Arrott Street - West of Reading R.R.
26	R	Herbert Street - East of Reading R.R.
27	P	Northwood Park
28	Cem.	Greenwood Cemetery
29	Cem.	Oakland Cemetery
30	Cem.	Oakland Cemetery
31	Cem.	Oakland Cemetery
32	R	Harrison Street and Castor Avenue
33	R	Allengrove Street - North of Castor Avenue
34	R	Ramona Avenue - Between Adams & Blvd.
35	R	Filmore Street - Between Castor and Blvd.

TABLE 50A (Cont'd)

RECEPTOR NUMBER	LAND USE	LOCATION
36	R	Allengrove Street - Between Castor and Blvd.
37	R	Roosevelt Blvd. and Wakeling Street
38	R	Ramona Avenue and Roosevelt Boulevard
39	R	Ramona Avenue and Foulkrod Street
40	R	Roosevelt Blvd. - East of Summerdale Ave.
41	R	Roosevelt Blvd. - East of Reading R.R.
42	R	Summerdale Avenue - North of Boulevard
43	R	Roosevelt Blvd. and Langdon Street
44	P	Houseman Recreation Center
45 & 45A	Inst.	Friends Hospital
46	Inst.	Friends Hospital
47	Inst.	Friends Hospital
48	R	Ramona Avenue - Between Wyoming Ave and Fisher's Lane
49	R	Fisher's Lane and Ramona Avenue
50	R	Fisher's Lane - East of Tacony Creek
51	R	Fisher's Lane - West of Tacony Creek
52	P	Tacony Creek Park
53	R	Rear of Maple Lane homes
54	R	Rear of Tampa Street homes
55	P	Tacony Creek Park
56	R	Whitaker Avenue - East of Tacony Creek
57	R	Ruscomb Street - East of Tacony Creek
58	R	Bingham Street - West of Tacony Creek
59	R	Roosevelt Blvd. - Between Creek and "F" Street
60	R	Roosevelt Blvd. and Bingham Street
61	R-C	Roosevelt Blvd. and "F" Street
62	R	Rear of "F" Street homes
63	R	Bingham and Ashdale Streets

Key:
R = Residential   I = Industrial   P = Park-Recreation
C = Commercial   Inst. = Institutional   Cem. = Cemetery

Plate 73 indicates the existing L_{10} noise levels based on monitoring within the study area. A discussion of the existing L_{10} noise levels by specific areas follows:

(1) I-95 to Frankford Avenue

Noise levels presently range from the low 60's (in areas shielded from major streets) to the low 80's (adjacent to Aramingo Avenue).

(2) Frankford Avenue to Wingohocking Street

Noise levels range from the high 50's and low 60's in shielded areas to the mid 80's near roads with significant truck traffic (Adams and Wingohocking area).

(3) Wingohocking Street to Castor Avenue

Noise levels are lowest in internal sections of the Northwood Community (high 50's-low 60's and highest along Castor Avenue - near 90 dBA).

(4) Castor Avenue to Roosevelt Boulevard

A wide variation exists dependent upon relation to existing roads; interior Northwood (mid to upper 50's) to upper 80's along Roosevelt Boulevard.

(5) Greenwood Cemetery

Levels range from 60 dBA in rear to 75 dBA near Adams Avenue.

(6) Oakland Cemetery

Noise levels generally in mid 50's but approach mid 70's near Adams Avenue.

(7) Friends Hospital

Noise levels in occupied areas are in mid to upper 60's. Rear portions exhibit readings in mid 50's.

(8) Tacony Creek Park

Noise levels in remote portions are in low to mid 50's; in mid 60's near Whitaker Avenue; and in upper 80's near Roosevelt Boulevard.

Existing noise levels at receptors in the general vicinity of Kensington Avenue are influenced by the Frankford Elevated transit line. The impact of the Frankford Elevated varies significantly and depends on several variables such as the distance one is from the Elevated and the number and condition of the cars.

Adjusted L_{10} and L_{50} noise levels to separate the Elevated noise from the remainder of the measured noise was determined. Generally, noise generated by the Frankford Elevated adds from 1 to 3 dB's to the L_{10} noise levels at several receptors near this facility.

F. PRESENT ATTITUDES AND OPINIONS REGARDING THE PROJECT

1. General

Perceptions and evaluations of the proposed Pulaski Highway varied in the summer of 1974 from relative indifference through strong support to angry opposition. It was viewed as progress too long delayed and as a monstrous Chinese wall that had to be stopped.

Where one stands on whether the Pulaski Highway should be built depends on where one is standing geographically in relation to the highway and what one is doing there. (The following attitudes and opinions may be perceptionally true to the persons interviewed, however, in reality, the opposite, in some instances, may be the truth).

2. Social Attitudes and Opinions

Leaders of civic associations had varying views on the highway depending on how traffic from the Betsy Ross Bridge, the Pulaski and its ramps was perceived as affecting them and upon how close the highway would be to them. There were community leaders near the Delaware River who felt that the Pulaski Highway had to be built without additional delay or the trucks and cars from the Betsy Ross Bridge would seriously aggravate an already bad traffic situation in their area, particularly with regard to trucks. One interviewee argued that unless the ramps connecting the bridge and I-95 were finished by next September, the Pulaski would definitely be needed. He further indicated that it appeared very likely that these ramps would not be ready. He did not, however, think that the Pulaski would do much to relieve the present problems of his community with truck traffic unless the city, state, and Port Authority combined to extend Delaware Avenue and run ramps to it from the highway at the bridge.

There seemed to be a feeling among some of these leaders that they had already paid a heavy price for progress in the building of I-95 and that now with the opening of the Betsy Ross Bridge, they should not have to pay further in congestion, pollution and safety problems. In their view it was time that the neighborhoods up the hill took their share of this burden.

Not all civic leaders in this area took this position. There was some ambivalence in the minds of those interviewed concerning the highway. There seemed to be a judgement on the part of most of the civic leaders spoken to in the area that unless the Pulaski Highway was built, truck and auto traffic on such streets as Richmond, Bridge, Margaret and Orthodox would become even more severe. On the other hand, some seemed reluctant to urge the imposing social costs of highway construction and operation on the neighborhood through which it would pass and to oppose their neighboring civic association on an issue it considered grave. The need for harmony and mutual support among these associations seems to influence their position. In one civic association for a neighborhood in the micro area that is west of I-95 but near the eastern end of the micro area, two leaders of the association took opposing points of view in two separate interviews as to whether the Pulaski should be built. One argued that the highway would give easier access to jobs for the residents in the area and should go forward. The other saw the highway as a potentially heavy blow to the area's efforts at self-improvement. In one area where the highway would affect families and properties to a marked degree, one of the four interviews which were done discovered residents who favored the highway. Other interviews in the area held that the highway would displace or adversely affect many older families in the area, that air pollution from the highway would harm older people with respiratory ailments, that noise and dirt from the highway would be a problem and that it would collect trash beneath it when it was built, that the construction phase involved danger to neighborhood children and that the highway would be a Chinese wall blighting the neighborhood so that no one but families with the least resources and the lowest behavioral standards would want to live near it.

In another neighborhood halfway up the proposed highway section from I-95 to the Boulevard, the leaders of the civic association opposed the highway. It was seen as threatening the children of the neighborhood with a ramp which will direct traffic right past a playground and a projected boy's club, as bringing additional air and noise pollution, as being an eyesore with illegal billboards, and mainly as bringing in poorer people to the adjoining neighborhood and into their own neighborhood, thus ruining property values.

A neighborhood leader at the western end of the highway opposed all alternative routes particularly the routes that he maintained would destroy or damage that neighborhood. Only if the highway were started at Route 309 in Montgomery County and built east would he consider any alternate acceptable.

Another civic group expressed intense opposition to the route which passed near them, with the objections that it would wreck the park and cut off their direct access to the park, would bring noise and air pollution, would bring heavy blasting because of the blue rock their homes are built on, and the blasting could damage their homes. The highway could cut off the area prone to brush fires from access by the fire department, and the bridle path relocated over the highway could provide a temptation to juveniles to throw rocks at cars passing below along the Pulaski. Officers and members of this civic association selected the "No-Build" route on grounds that they should not wish on others what they did not want themselves. In the previous description of civic associations, this theme is advanced on a number of occasions.

The officer of one neighborhood association near the northwestern end of the macro area favored building the Pulaski Highway as it would offer quicker access to center city and New Jersey and could relieve some of the traffic congestion near the Tacony-Palmyra Bridge. Another leader of a civic group west of the area just mentioned, opposed the highway and all its alternatives, maintaining it would turn the streets in his neighborhood into crowded feeder streets affecting first the main streets and when they are jammed, the parallel ones. He declared that the highway would severly damage the nearby neighborhoods of Summerdale and Deni and would probably not decrease the traffic on Levick and Robbins Streets.

With allowances then for differing opinions sometimes among leaders of the same group, civic association leaders at the eastern end of the impact area who saw their neighborhoods getting the brunt of the Betsy Ross traffic if the Pulaski Highway were not built tended to favor building the highway. Stronger opposition was encountered in the Deni and Juniata sections and in the neighborhoods near the Boulevard. One major argument was that the Pulaski, by ending at Roosevelt Boulevard, would flood that already overcrowded artery at rush hours, and would bring a heavy and dangerous amount of traffic into their neighborhoods on feeder streets. This argument seems almost identical with the one given by people at the other end of the impact area for building the highway.

An interview was held with a very active participant in the Northeast Citizens Planning Council and in other transportation organizations in the area. He has been extensively involved in the various phases of the Northeast Freeway/Pulaski Highway planning efforts. He stated that he was originally in favor of the highway when it was designed as a parkway or, at least, a depressed highway linking I-95 with U.S. 309. He is primarily opposed to the present plans because, in his opinion, they are a piecemeal approach and no longer make sense for the highway network. In his opinion, the Pulaski should be linked to a comprehensive plan which would also involve mass transit designs for the area. He sees the social consequences as catastrophic with destruction of property along the Boulevard and heavy increase in traffic, pollution, etc. in the entire area.

A final group of interviewees were members of the Northeast Transportation Action Council (NETAC). Four person from NETAC were contacted, some of them because of roles they had in other civic groups. They showed considerable similarity in their views. The Pulaski Highway was seen as an isolated action, separated from any comprehensive program for the Northeast, which program should include or empasize mass transit. The highway was seen causing noise and air pollution in the area and disrupting families and neighborhoods. NETAC members held that Roosevelt Boulevard had already been declared inadequate for the traffic it was carrying by the Federal Department of Transportation. The Pulaski Highway was said to be justified by inadequate studies. NETAC's opposition to the Pulaski appears closely related to their views on the Northeast Freeway and, of course, the Tacony Parkway.

3. Economic Attitudes and Opinions

All of the firms which might be directly affected by the highway were included in a survey conducted during the course of this study. A copy of the survey questionnaire is included in the appendix of the Economic Basis

Report. A total of 53 firms were contacted and 51 interviews were completed. Several firms were not willing to provide some detailed information, particularly information about gross sales, and wages and business taxes. In these instances, estimates of wage and business taxes were made on the basis of the number of employees. Gross annual sales are extremely difficult to estimate and since so many firms were unwilling to provide reliable information, this information was not included.

Before presenting and analyzing specific data, it should be noted that the most important single result of the survey is the importance of the uncertainty over the highway. Virtually every business firm interviewed emphasized this point. The significance of this uncertainty cannot be overemphasized. Successful operation of a business is difficult when there is uncertainty over a project which would so significantly affect business. All firms must deal with some uncertainty all of the time. But a firm can learn from experience how to cope with a normal degree of uncertainty. However, highway construction which might cause relocation, significant disruption, or a loss of business which could be temporary or permanent, can hardly be considered normal uncertainty. In the case of the Pulaski Highway, this uncertainty has existed for more than a decade. Fifteen of the business firms contacted indicated that they delayed plans for expansion and improvements. Several had postponed improvements for several years and then went ahead with them very recently, believing that the highway would not be built. It is likely that there have been other firms which have experienced similar problems. In any case, it is clear that all of the business firms directly involved would prefer a definite decision as early as possible.

Uncertainty is not limited to firms located on the right-of-way. Some firms in the vicinity of the proposed highway have also been affected by this problem. This point was stressed at a meeting with officials and members of the Northeast Chamber of Commerce. The official view of the Chamber is that the highway should be built, regardless of the route chosen. But the main stress was put on the need for an early definite decision.

Not all businessmen were in favor of the highway. One small business man who was interviewed in his role as a civic leader was actively opposed to any and all of the proposed alternatives of the highway. Another, whose business and neighborhood were both in the path of the highway, vowed to fight it and to relocate outside the city if his fight proved unsuccessful. Another businessman and civic leader favored the highway even though it might go rather near his own home.

The official position of the Northeast Philadelphia Chamber of Commerce is to build the highway as soon as possible. They are concerned with the loss of revenue in bridge bonds and the paying of taxes on land in the area which cannot be used because of highway plans. Although traffic on Roosevelt Boulevard may increase, they are convinced that this is the lesser of two evils. Business concerns are with the attraction of light industry to the area and they would like to see more land made available for industrial use which they claim would improve the entire area. This agency would favor Alternate D but would be supportive of others.

4. Other Attitudes and Opinions

Officials of city agencies and in churches, schools and recreation oriented groups, spokesmen for hospitals, cemeteries, et. al, expressed their views. Some took a determinedly neutral stand. They would cite advantages, e.g., possible alleviation of traffic on side streets, and disadvantages, e.g., disruption of the Deni area and relocation problems, but as a matter of policy would not take a stand on the highway. Some assumed that the highway was going to be built and did not seem to feel that it was their role to oppose or advocate it. They sometimes argued against the route which immediately affected their program but sometimes shied from specifying where the highway should go. Still others among these leaders of agencies and institutions held that the highway was needed, that they would not stand in the way of progress or of improving the traffic flow of the city, but they would express concern about specific impacts the highway would have on their facilities and services. Concern was expressed about how Route C and ramps from other routes would affect accessibility to the Northeast Community Mental Health Center, especially accessibility by public transit, and how the traffic congestion and noise would affect the emotional state of those who come to the Center and who use its emergency care facilities. Quiet was cited as one important ingredient of treatment. There was further concern with how traffic patterns in the area near the Center would affect the safety of the patients, many of whom are preoccupied and more susceptible to injury.

An interview with the Philadelphia Police Department Community Relations representative (15th District) for the study area (although the District boundary stops at the Creek) focused on police problems in the area. The area is not considered a high crime rate area. Major problems have been with gang-like cliques of youngsters and drug uses. Playgrounds are a focus for youth harrassment, drinking, and drug distribution. Major playground problems center around White Hall Common, with minimum difficulty in Simpson and Bridesburg recreation areas. There is some racial tension in the area but not much overt violence. The highway may be upsetting to the community but some police feel it is needed due to traffic congestion on Roosevelt Boulevard, on Frankford Avenue, and on Bridge and Pratt Streets.

The YWCA in Frankford is located on the corner of Arrott and Penn Streets in the heart of the Frankford section of the study area. The local community worker has been extensively involved with redevelopment efforts in the East Frankford area in cooperation with the East Frankford Civic association. The YWCA also carries on several community programs for women and the elderly, including emergency aid to the aged and those on welfare and an SSI Alert Program. The service area includes the section between Torresdale Avenue and Frankford Avenue going north to Wakeling. Their attitude toward the highway is neutral. The Pulaski Highway will only affect the tip of the East Frankford triangle where housing is already blighted and although relocation problems may occur, the highway will probably be an improvement on the area. It is believed nevertheless, that the highway is not likely to have any major benefits for the East Frankford population.

There are many social agencies in the study area that have not been mentioned. One thinks of groups like the Lower Frankford Senior Citizens Association or the Philadelphia Bicycle Coalition. They, as well as numerous others, were interviewed and take various positions on projecting a highway through the community. As most of these groups represent a particular interest group within the community, their views have of course provided an additional input to the study.

SECTION II

LAND USE PLANNING

A. REGIONAL GROWTH

Regional growth should be stimulated by construction of the Pulaski Highway. It will provide a vital link in the planned regional transportation network which is part of the Delaware Valley Regional Planning Commission's 1985 legally adopted Comprehensive Plan. This plan provides regional guidelines for the development of highways, public transportation, land use, water supply, sewage disposal, conservation and recreational facilities.

Regional access will also be gained to Route 90 in New Jersey via the newly completed Betsy Ross Bridge by the Pulaski Highway. Local access to these facilities as well as to Interstate 95 and the Roosevelt Boulevard could be provided via the Richmond, Aramingo and Wingohocking Street Ramps. These facilities are also part of the Regional Comprehensive Plan. The Delaware River Port Authority (DRPA) has jurisdiction over the Betsy Ross Bridge, as well as the Richmond Street Ramps.

At present, the Frankford Arsenal is near the Pulaski Highway Corridor. The Corps of Engineers, in the immediate future, will be dredging the Delaware River in order to improve the port facilities for shipping. Construction of the Pulaski Highway will improve access and egress to both the Frankford Arsenal and the port facilities. The Boulevard extension as part of the regional plan may be programed for improvement in the future.

The preliminary plan for the Tacony Expressway (General Casimir Pulaski Highway) was prepared for the City of Philadelphia as early as 1949. In an ordinance dated April 30, 1965 the Philadelphia Department of Streets was authorized by the City Council of Philadelphia to place the Tacony (Pulaski) Expressway on the official City Plan. The Pulaski Highway is also contained in the Comprehensive Plan of the Philadelphia City Planning Commission (See Plate 61) and is an integral part of its proposed land use plan.

B. NEIGHBORHOOD GROWTH

Neighborhood growth will be both negatively and positively affected by the proposed facility. Traditionally, growth has been measured by the amount of new development in an area, and by the observation of how a neigborhood affects the inner city. Factors such as a high rate of home maintenance, evidence of private rehabilitation, high homeownership with low residential mobility, consequently all affect the inner city and ultimately contribute to the city's growth and stability. These exact positive factors also typify the communities which would be affected by the proposed highway. The degree, however, to which these parameters would be affected is not certain, and varies with each alternate. Nevertheless, through a disinvestment on the part of residents a negative impact on existing market values of presently stable neighborhoods could possibly result in a negative impact or negative growth to the respective communities.

Anticipated positive results from the proposed facility will be to relieve automobile, as well as excessive truck traffic from neighborhood streets. This eventually will provide an economic saving to the vehicle operators, as well as improved safety to the residents. The highway will also divert much of the existing traffic in the area onto arterials which are designed to carry a higher volume. This diversion of truck traffic, in one respect, will reduce truck vehicular miles traveled (V.M.T). A direct negative impact, however, may be that this new facility may generate additional traffic on the area's major arterials because of this improved access. A secondary impact may be the possible conversion of unused land to industrial use, consequently, increasing the tax base for the city and employment in the area. These positive aspects may also affect neighborhood growth.

If the no-build decision is chosen, Greenwood Cemetery, as they have indicated, may be forced to sell a large tract of their land. If such a sale of land took place, a totally new neighborhood or an extension of the Northwood section of Philadelphia could occur.

C. LAND USE AND ZONING

Land use is expected to change in certain areas due to the Pulaski Highway, however, in other areas it will remain the same. The area which should not experience any change is between Kensington and Aramingo Avenues. Much of the existing land use in this area is industrial and requires good highway access, which will be enhanced by the Pulaski Highway.

All the proposed alignments result in some industrial land adjacent to the highway being segmented. This may result in the creation of some unusable industrial land. In addition, the area between Kensington Avenue and Wingohocking Street contains sections that potentially could have drastic land use changes. Currently the area is predominately residential with mixed industrial and commercial uses. If a demand for land use changes in this area does materialize, it may result in a change from the existing land classification toward a more industrial land use.

Zoning within the area is a reflection of land use. In Section C, the proposed highway runs through large tracts of industrially zoned land. It is expected that in this section neither zoning nor the accompaning land use will change. In other areas, however, where isolated residential areas border industrial areas zoning could change. This is particularly the case when a residential area will be cut off from a larger residential area by an expressway. A case in point is the residential land fronting on the portion of Deal Street not required for the expressway. This land could become industrial if the expressway is built.

The alternates which damage the institutional land off Roosevelt Boulevard could induce an eventual conversion to medium density residential. It is unlikely that the predominant residential zone would be maintained since development is unlikely to take place at the low density required by the zone.

Under the no-build alternate these zoning changes on institutional land could, similarly, occur. The changes would probably happen further in the future since the land would be less accessible and there would not be the impetus brought about by property condemnation for an expressway. (See Plates 74 and 74A which indicate the relationship of depressed and elevated sections of the Pulaski Highway to adjacent land uses.)

SECTION III

THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

A. DIRECT IMPACTS

1. Natural, Ecological, and Scenic Resources Impacts

There are several parks and institutions within the macro area which have significant scenic as well as ecological value. Some areas in the Tacony Creek Park, as well as Friends Hospital, have natural stands of trees which would be impacted by several alternatives. Not all alternates affect these areas, however, specific impacts of those alternatives that do affect these resources can be found in the Alternative section.

The Pennsylvania Department of Environmental Resources and the Philadelphia Fairmount Park Commission are members of the Advisory Group to the Interdisciplinary Team. Both agencies have received all studies and reports during the process.

2. Impact of Relocation

a. Relocation Policy

The Pennsylvania Eminent Domain Code (P.L. 84 of June 1964 and its amending Acts, number 169 of December 1971) has authorized that the Pennsylvania Department of Transportation (PennDOT) provide assistance to those residents and businesses required to relocate due to the construction of any federally aided highway project. By means of the Pennsylvania Relocation Assistance and Real Properties Acquisition Policies Act of 1970, relocation assistance as well as supplemental payments are available to all relocatees in order to assure all equitable reimbursements.

The Pennsylvania Department of Transportation publication (Bulletin 47) details the conditions and amounts of supplemental payments available. This Bulletin was distributed to many citizens during the August 7, 1974 Interdisciplinary Team meeting. A discussion of its contents was undertaken concerning the various payment procedures for moving costs, replacement housing, mortgage interest rate differentials, closing costs and appeal procedures.

Prior to the start of any property acquisition, if the proposed build alignment is chosen, an in-depth pre-acquisition survey will be conducted by PennDOT to establish each resident or business relocation problem. This procedure will enable the Relocation Advisor to render the best possible relocation assistance.

PennDOT is also coordinating its efforts with the U.S. Departments of Health, Education and Welfare, Housing and Urban Development, the Pennsylvania Department of Community Affairs and the Philadelphia Redevelopment Authority. When the draft EIS is completed, copies will be sent to these agencies for their review and comments.

b. Relocation of Individuals and Businesses

Residents and businesses will be displaced by construction of the proposed Pulaski Highway, however, the degree to which this will occur depends on the particular alternate alignment chosen (See Section IV).

In general, the area shows a decreasing population, which is considerably older than for the City proper. There is a high proportion of foreign stock and very few black people living in the area. There are strong family ties which are related to residential stability, high home ownership and a lower home vacancy rate than the standard metropolitan statistical area (SMSA) or the City. The percentage of families below the poverty level in the area is below that of the City or the SMSA; while the average income is slightly above the average for the City but lower than the SMSA. Over 30% of all families were dependent on some phase of the Social Security System. This factor, consequently, reinforces the high number of elderly people and people living on a fixed income.

All of Section C and most of Section B crosses or is near the Tacony-Frankford Creek watershed which traditionally has been the natural boundary between the neighborhoods. Consequently, the alignments, in general, do not sever the neighborhoods nor do they separate the community facilities from the residents. One alignment, Alternate E, however, would notably disrupt and sever the Northwood Community. In this same respect, Alternate F would eliminate housing as well as the Northwood Nursing Home for the elderly on the edge of this same community.

As for business relocations, Section IV explains the effect of business dislocation on the economics of the community. It should be noted, however, that many businesses will be able to continue and maintain operations due to only partial land acquisition.

A replacement housing survey (January 1975) was conducted by PennDOT in consultation with the Northeast Board of Realtors. It indicates that the area has a relatively good availability of residential properties, with the yearly turnover by sales and rentals being substantial.

Depending on the alternate route selected, the amount of families to be relocated from apartments will vary from approximately 25 to 85 families. From the amount of apartments advertised daily in the Philadelphia papers and from interviews with realtors, no problems would be anticipated in relocating the largest number of apartment tenants.

Since this survey indicates that there will be homes available in all price ranges, in general, no person living on a fixed income will be forced to relocate to a higher priced home and thus pay higher taxes and maintenance costs.

PennDOT has also been informed, by verbal comment from the Philadelphia

Planning Commission on July 16, 1975, that the only housing program in the area is the Meadow Housing project. This project consists of low to medium income houses, many of which have subsidized mortgages. The effect of this housing project will be to create more available housing within the immediate Pulaski Corridor area.

3. Social-Economic Impacts

a. General

The communities are affected negatively and positively and in varying degrees by each alternate. While some individuals from minority, low income, racial, ethnic or illiterate groups may be affected because of relocations, construction of the Pulaski Highway will not affect any of these above groups significantly. No farms are affected. No religious institutions or schools are adversely affected, however, because of relocation there may be a decrease in the number of people or children who utilize these facilities. Community parks are affected both directly and indirectly by Alternates D and E. Much of the area is industrialized, consequently, the proposed Pulaski Highway will provide better access to places of employment, as well as improved access to the hospitals, schools, churches, shopping areas and recreational and community facilities from other areas in the region and city. Other positive effects are that school children, pedestrians (non-drivers), elderly, handicapped and bicyclists may be safer on the existing streets due to some traffic being taken off the neighborhood streets and routed onto a limited access facility.

In general, those people dependant on public transportation will not be affected by the proposed build alternative, because SEPTA facilities and bus routes are not affected. With the no-build, however, SEPTA operations would be hampered because of increasing area congestion. If, in the future, exclusive bus lanes are implemented on a built Pulaski Highway, those dependent on public transportation will benefit because of the greater access to the Central Business District or to New Jersey via the Betsy Ross Bridge.

The Sociologists were also concerned with the culture of the social system. Consequently, interviews were conducted with community knowledgeables whose attitudes are representative of the residents in the study area. The results of these interviews are reported in an earlier section. These attitudes should not be viewed merely as "opinions" with no possible relation to behavior. To the sociolgoical researcher these attitudes are indicators to ideas and beliefs which are likely to influence, in a positive or negative fashion, how the residents are going to accept the construction or non-construction of the highway and what behavioral consequences are likely to follow. For example, even if a citizen who takes a negative view of the Pulaski Highway is presented with objective evidence that the highway will be beneficial to the community, he may well continue to hold his negative beliefs and act accordingly. Thus these ideas and beliefs must be treated as data in themselves and their potential consequences weighed in the decision-making process. Furthermore, the views of area residents on the highway should not be regarded as irrational sentiments. Many of these residents have lived in the area and worked with its problems for a number of years. Their perception of the impact of the highway may well be as valid from their unique vantage points as those of a highway contractor or a college professor.

b. Sociological Analysis

An assessment of the advantages and disadvantages of each of the alternative routes and of the No-Build Alternative requires a blend of what is known about the neighborhoods and people involved, about the impact of highway construction on other neighborhoods, and about the future of the local and national economy and of the energy supplies within that economy. While the judgements below are based on many hours of interviewing and researching the relevant literature concerning the area,they are still conditioned by uncertainties about energy supply, inflation, unemployment and the ways travel and residential patterns will respond to changes.

The evaluation of the social-cultural impact of the construction of the Pulaski Highway or the No-Build Alternative from a sociological perspective was based on several principles:

(1) The sociological investigators were concerned primarily with the impact of the seven alternatives and the No-Build Alternative on the social structure of the affected micro and macro areas.

(2) The social structures analyzed during the study were the culture of the residents and their systems of social organizations.

(3) Special concern has been given to the social organization of the study area, because of the thinking that it is the degree to which a given geographical area structures social relationships, social groups and social institutions which determines the stability and cohesiveness of that area's communities. Areas which fail to create and maintain these social sub-systems are described by sociologists as being socially disorganized with accompanying social problems. It is clear from the description that the study area (both macro and micro) is characterized by a high degree of social organization although it has beginning symptoms of deterioration in comparison to most urban sub-areas. Indicators of this high degree of social "health" as well as indicators of deterioration include:

(1) Indicators of Social Cohesion

(a) Higher percentage of old and middle age individuals,

(b) High prevalence of foreign born and of foreign stock,

(c) High clustering of individuals with similar ethnic, racial and economic characteristics,

(d) Residential stability, as indicated by high incidence of home ownership and low vacancy rates,

(e) Relatively high incidence of familism,

(f) A generally sound income structure as evidenced by relatively high median income and a lower proportion below the poverty level,

(g) High frequency of neighborhood organizations and a relatively high degree of commitment to neighborhood improvement,

(h) Relatively high degree of religious identification with local churches,

(i) Relatively low crime rate compared to other sections of the city.

(2) Indicators of Deterioration

(a) Areas have experienced a larger population loss than the city in general,

(b) Loss of younger members of the area once they marry,

(c) Some increase in racial tension and barriers to interaction across inter-racial lines,

(d) Decrease in familism similar to urban trends,

(e) Increase in overcrowding,

(f) Higher percentage of people depending on social security incomes,

(g) Incipient employment problems due to the occupational mix and the relatively low educational level,

(h) Loss of membership in some civic organizations,

(i) Area characterized by traffic congestion and concomitant pollution problems.

Additionally, the sociologists have been concerned with the effects on particular institutions in the area which, while not necessarily an important part of the community social structures, are likely to be affected. These include two cemeteries, two hospitals and one nursing home. Please see the Alternatives section of this study for more specific social-economic impacts.

4. Air Quality

a. Air Pollution Effects*

(1) General

Air pollution causes many effects, some of which are immediate and obvious (sore eyes, difficult breathing, diseased vegetation), and nearly all of which could result in chronic degradation of man and his resources under specific conditions. The net results of pollution on man can be said to be economic and/or time effects. The economic effect is the direct and indirect cost of controlling air pollution. The immediate costs of providing pollution controls is an economic burden, but these costs can be received back, sometimes with a profit. The time consideration implies length of life. Most data show that air pollution is detrimental to life, but it is also known that some pollutants are beneficial.

Air pollution effects can be generally classified into three categories dealing with the effects on vegetation, the effects on man and animals, and the effects on materials.

(2) Effects on Vegetation

Excessive pollution can cause plants and crops to be bleached, discolored and stunted. Small amounts of pollution can increase growth rate. Estimates of costs due to excessive air pollution damage in the United States vary from

* Discussion based on material presented in Understanding and Controlling Air Pollution, Second Edition, by Howard E. Hesketh, Ph.D., P.E., 1974. Used with permission of publisher, Ann Arbor Science Publishers Inc., Post Office Box 1425, Ann Arbor, Michigan, 48106.

$4 to $20 billion per year. No income costs are made for benefication of plants by pollution or for secondary effects of poisoning of animals who eat poisoned plants.

Plant damage, as the result of exposure to air pollutants, varies with the plant and the type of pollutant, as well as with the time of day of exposure and the concentration of pollution in the atmosphere. Threshold concentrations which cause damage to plants vary with the length of exposure of the plant to the pollutant. Also, there is a time lag which exists from the time of exposure until the time when the symptoms appear. This sometimes makes it difficult to relate the pollution damage to a field plant with a specific pollutant and pollution exposure period. Plant insects and diseases can cause damage which appears similar to certain types of pollution injury.

(3) Effects on Man

Air pollution affects man internally when he inhales and ingests it as well as externally when it comes in contact with the body. In addition to the actual direct contact, animals ingesting polluted vegetation can pass the pollution on to man.

Pollution can enter the body through ingestion by the mouth, inhalation through the respiratory system where it can enter the body blood chemistry and by absorption through the skin where it can enter into the body blood chemistry. Once in the blood, the pollutants may be absorbed by body tissues or may be deposited in the body organs. The most susceptible organs are the liver, kidneys, lungs, heart, and brain.

Superficial irritation by pollutants of the skin, eyes, and respiratory system may occur immediately upon contact with the pollutant. The damage also may be more extensive and not become evidenced for a relatively long period of time.

It is often possible for the body to clean itself by the normal elimination process and thereby eliminate the pollutants or the reaction products from the pollutants. The damaged tissues and organs then may (or may not) recover from the pollution damage. Organs such as the liver, which purify other parts of the body, can become poisoned themselves during the clean-up operations.

It is also possible for pollutants to damage the body by only temporarily displacing some other substance. Binoxia, which is death from lack of oxygen, can be caused by the presence of excessive amounts of simple asphyxiants (such as carbon dioxide or methane) in the air. When this happens, the lack of oxygen destroys brain cells and slows down the central nervous system. The major gaseous pollutants associated with the internal combustion automobile engine are discussed briefly below:

(a) Carbon Monoxide (CO) when considered as a pollutant is the second most abundant atmospheric pollutant in urban atmospheres. Carbon monoxide is not toxic in itself and is non-cumulative. The dangers with carbon monoxide occur because of the strong affinity the hemoglobin has for carbon monoxide (affinity for CO is 300 times that for O_2). This causes oxygen to leave the tissues resulting in anoxicity. The effects are headaches, loss of visual acuity and decreased muscular coordinations. The actual degree of saturation depends upon the original carbon monoxide saturation in the exposure time. A concentration of 100 ppm may or may not be safe--depending on the individual, the length of exposure and the initial burden. People exposed to high concentrations of CO by smoking (there is up to 40,000 ppm CO in cigarette smoke) are already burdened by an initial saturation of as much as 15%. 1000 ppm would normally cause immediate death after a short, continuous exposure. Plate 67 in Volume II shows the effect of various saturation levels as a function of time.

(b) Hydrocarbons are a vast number of different compounds containing carbon and hydrogen. Some hydrocarbons, such as methane and acetylene, are simple asphyxiants and dilute the air by removing oxygen to a level which is not adequate to support life. Methane typically exists in urban air at concentrations of about 9 ppm. Other hydrocarbons, such as anthracene, are nontoxic but are carcinogenic and produce cancers because of the impurities they contain. Organic compounds which can be derived from hydrocarbons, such as phenol, can quickly poison the body by affecting the central nervous system. These pollutants may be either inhaled or absorbed through the skin. Absorption of phenol has caused death in as short a time as thirty minutes. Prolonged breathing of these types of compounds causes digestive disturbances, difficulty in swallowing, excessive salivation, nervous disorders and skin eruptions.

(c) Nitrogen Oxides (NO_x) affect the body by irritating the nose, eyes, and lungs. Nitrogen dioxide can be smelled at about 3 ppm. From short time exposure: nose and eye irritation begins at 10 ppm, chest discomfort is noticed when the concentration reaches 25 ppm, and death occurs when the concentration is greater than 500 ppm. Nitrogen dioxide is suspected of accelerating tumor growth and decreasing the resistance of the body to diseases.

(d) Oxidants - Ozone-- Atmospheric oxidants can be primarily ozone. Ozone in the atmosphere alters visual acuity which prevents the eyes from focusing properly. It also increases the calcification of bones resulting in premature aging and depletes body fat. Ozone affects the lungs by reducing tidal volume. It also collapses the alveoli. Ozone in the concentration of 0.1 to 1.0 ppm oxidizes body enzymes creating chemically active radicals.

(e) PAN (Peroxyacetyl Nitrate and Peroxyacyl Nitrates) is a pollutant that affects vegetation more so than man. However, PAN does cause eye irritation and increased respiratory airway resistance. Both eye and respiratory irritation have been observed at concentrations of 0.5 ppm. PAN is also a photochemical oxidant.

Several particulates associated with automobile operation are discussed below:

(a) Lead-- This includes lead, the lead oxides (PbO, Pb_2O_3 and Pb_3O_4), as well as the lead slats (PbClBr and $PbNH_2Cl$) which originate from automobile exhausts. Lead is a cumulative poison. It damages the nerves causing deadening of the nerve sense receptors. A burning feeling of the feet is noticed in cases of lead poisoning. It also causes anemia which is a deficiency of red blood cells, and therefore, prevents absorption of vitamin B_{12} resulting in malnutrition. Lead poisoning also causes bleeding. Probably no other chemical has a greater compilation of toxilogical literature than does lead.

Lead compounds can be inhaled. This makes it extremely important that the tetraethyl lead and tetramethyl lead additives in gasoline should be removed to prevent air pollution of lead due to auto exhaust.

Lead can be absorbed through the skin and by ingestion. Air pollution deposited on plants which are eaten by foraging animals can, in turn, be eaten by man resulting in lead poisoning to man. Man also can eat the lead poisoned plants. Other foods that can contain lead include water and beverages. Tobacco smoke is known to contain lead and chewing on articles containing lead based paints can result in lead poisoning.

(b) Asbestos-- Asbestos is a group of magnesium silicate minerals which exist in fibrous form. Asbestos causes a lung disorder called asbestosis which is similar to that of beryllosis or silicosis. Prolonged exposure to asbestos results in shortness of breath, coughing and chest cancer. It eventually can affect the heart and can cause clubbed fingers (clubbing of fingerprints occurs in heart and lung diseases and is a rounding and broadening of the fingertips).and persons exposed to asbestos are more subject to respiratory disorders.

(4) Effect on Wildlife and Vegetation *

The effects on wildlife of automobile and industrial air pollutants is poorly understood. Most research historically has been conducted on laboratory animals under artificial conditions and usually employed doses greater then those that exist in natural situations. The relative susceptibility of different species to air pollutants generally is unknown, but apparently mammals are considerably more susceptible than birds. Numerous studies have indicated that air pollution can effect animals in various deleterious ways.

Air pollutants can affect forest vegetation in several ways. Under conditions of low pollution load the forest acts as a sink for pollutants. Data on the relation between airborne heavy metals and urban trees indicated that leaves and current twigs (of a sugar maple with a diameter of 30 cm) removed 60 mg (0.002 ounce) of cadmium, 140 mg of chromium, 5800 mg of lead, and 820 mg of nickel from the atmosphere during the course of one growing season.

Plant surfaces also may remove substantial volumes of particulate matter by interference with air currents. In addition, several studies

* Source: Biological and Physical Assessment for the Proposed Pulaski Highway; Jack McCormick and Associates, Inc., 1974.

have shown the effect of how ozone concentration remains over a forest have dissipated before reaching the forest floor.

Intermediate air pollution loads may result in chronically reduced growth and reproduction of individual trees, or may even weaken trees to the point that secondary agents such as insects and disease may cause death.

Heavy pollution loads, which are sufficient to cause symptomatic injury to a large proportion of plants, may result in the destruction of vegetation.

(5) Effects on Materials

In addition to affecting living organisms, air pollution also has effects on material objects--these can be broken down into direct and indirect effects.

Table 51 summarizes a few of the direct damages inflicted on materials by air pollutants.

b. Air Quality Impacts of the Project

(1) General

The previous discussion is intended to give the reader a general idea of types and effects under certain conditions of various harmful pollutants. These conditions, such as the combination of peak hour traffic and worst case meteorology, may occur only a few times during the year. For instance, the above combination is likely only during approximately four (4) morning peak hours and three (3) afternoon peak hours during the year. These conditions are further influenced by the specific wind direction, which further reduces the probability of exceeding the Air Quality Standards at a particular site. The Air Quality Standards are significantly below the more harmful levels discussed in the preceeding section. (See also Section I).

As identified in Section I, the National Ambient Air Quality Standards (NAAQS) are presently being exceeded in the Pulaski Highway Corridor. However, the Delaware Valley Region is predicted to experience an improvement

TABLE 51-DIRECT MATERIAL DAMAGE BY AIR POLLUTION

MECHANISM	PRINCIPLE MATERIALS ATTACKED	DAMAGE RESULTING	AIR POLLUTANTS	AIDING NATURAL FACTORS
Abrasion	Stone, masonry, metals, painted surfaces, ceramics	Scratching, wearing away, esthetics	Fly ash, dust, metal oxides	Wind, sun, mechanical wear
Deposition	All	Esthetic value lowered	All particulates	Wind
Chemical attack	Painted surfaces, textiles, metals rubber dyes, papers	Peeling, weakening, cracking, aging, esthetics	SO_2, H_2S, O_3, acids	Sun, moisture, temperature
Secondary chemical attack	Leather, building materials	Weakening, cracking, esthetics	SO_2, organics	Mechanical and physical wear, wind, sun, temperature
Electrochemical corrosion	Metals	Oxidation, weakening, esthetics	Acids, salts	Moisture, sun temperature

Reference: Understanding and Controlling Air Pollution, Howard E. Hesketh, Ph.D. ,P.E., Ann Arbor Science Publishers Inc., Post Office Box 1425, Ann Arbor, Michigan; 1974. Used with permission of publisher.

in overall air quality, compared to existing levels, if the Pulaski Highway is built or not built. This is due mainly to the effects of emission controls and further reduction in vehicular emissions realized as the result of the Pennsylvania State Implementation Plan.

(2) Mesoscale Air Quality

The Delaware Valley Regional Planning Commission (DVRPC) performed a mesoscale air quality study indicating the results of a comparative analysis of vehicular pollutants emitted from three alternative highway configurations in the northeast sector of Philadelphia. Exhaust emissions from the 1972 existing highway system were calculated. Also, a comparative assessment was conducted, of emissions from 1985 project travel on a No-Build system, and from a projected network containing the proposed Pulaski Highway (L.R. 1078). These networks are as follows:

(a) Existing 1972 Network - Existing 1972 traffic on the network opened to traffic as of December 31, 1972.

(b) 1985 No-Build Network - Anticipated 1985 traffic on a No-Build Network (existing highways plus the Interstate System).

(c) 1985 Build Network - Anticipated 1985 traffic on the DVRPC Adopted Freeway Plan.

The analysis of the three primary pollutants (CO, HC, and NO_x) emitted from the three highway networks was conducted on two levels. The first was an analysis of the effect of the entire highway system on emissions for the total study area (sub-region). The second level of analysis measured the effect of the highway system on emissions for the Pulaski Highway Corridor. (See Plate 66). Emissions for both peak hour and 24 hour periods for each of the two areas by vehicle classification (automobiles and trucks) were calculated. A complete computer print-out of daily and peak hour emissions, by zone, for the two analysis areas is provided in the DVRPC Report. A link data print-out is available for review at DVRPC. The impact of the alternative networks on emissions in two areas delineated for purpose of the analysis, are summarized as follows: The additional freeway capacity afforded by the proposed Pulaski Highway will have the effect of providing a higher level of service to increased traffic in this sector of the region by 1985. Average daily speed will increase by 6 percent over 1972 and by 25 percent over the No-Build Network when the Pulaski Highway is included in the 1985 Build Network for this area. During the peak hour, average speed with the Pulaski Highway will be approximately 56 percent higher than average speed of the No-Build Network. The effect of these higher average speeds for the 1985 Build Network would be reduction in daily emissions of carbon monoxide and hydrocarbons by as much as 9 percent when compared to those estimated for the 1985 No-Build Network. For the peak hour, emissions of carbon monoxide and hydrocarbons are estimated to be as much as 25 percent lower when the Pulaski Highway is included in the proposed network for this area.

Emissions of nitrogen oxide from the Pulaski Highway Network were predicted to be higher than those emitted from the No-Build Network. There is a direct relationship between NO_x emissions and speed. Therefore, the higher average speed of the Pulaski Highway Network tends to produce higher emissions of this pollutant when compared to the No-Build Network.

An area in the immediate corridor of the Pulaski Highway was delineated in order to further evaluate the impact of emissions by the alternative highway configurations.

Results of the comparative analysis conducted in this smaller area further indicate that the inclusion of the Pulaski Highway in the proposed network would have the effect of providing a higher level of service to estimated traffic anticipated by 1985. Estimated average daily and peak hour speeds were higher than those computed for the No-Build Network.

Concurrent with this high level of service, would be the attraction of increased travel to the Pulaski Highway in this corridor. This diversion of traffic would cause increased emissions when compared to travel in this corridor under the No-Build Network. However, a comparison of emissions per vehicle mile of travel shows that these values would be lower than those computed for the No-Build Network.

Tables 52 and 53 compare the estimated amount of emissions generated by travel on the three networks considered in this analysis. A breakdown of pollutants emitted by automobiles and by trucks is also included in these tabulations.

The higher level of service provided by the proposed network containing the Pulaski Highway would have the following impact on emissions within the total study area:

(a) Daily emissions of carbon monoxide are reduced by 49 and 9 percent, respectively, when compared to the 1972 existing conditions and the 1985 No-Build Network. During peak hours, the emissions of carbon monoxide pollutants are reduced by 45 and 25 percent, respectively.

(b) Daily emissions of hydrocarbons are reduced by 49 percent from 1972 conditions and by 5 percent from the 1985 No-Build conditions.

(c) While nitrogen oxides are reduced 7 percent from 1972 conditions, this pollutant increases by 13 percent over the No-Build Network. Emissions of NO_x increase with increasing speed above 22 miles per hour. Below this speed emissions of NO_x are constant.

Pollutants emitted by the Build Network when compared to the Existing (1972) Network and the No-Build Network within the immediate Pulaski Highway Corridor shows the following impact:

(a) Total 1985 daily emissions of carbon monoxide are

TABLE 52
PEAK-HOUR-AND DAILY
EMISSIONS (KILOGRAMS)
(TOTAL STUDY AREA)

VEHICLE CLASS	PEAK HOUR									DAILY								
	Existing (1972) Network			1985 No-Build Network			1985 Build Network			Existing (1972) Network			1985 No-Build Network			1985 Build Network		
	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC
AUTOS	22,100	1,300	2,400	5,700	500	600	4,400	500	600	184,800	13,400	21,800	38,800	4,600	5,100	34,100	4,800	4,700
TRUCKS	2,500	300	400	12,200	800	1,100	9,100	900	900	21,700	2,900	3,600	77,000	8,900	8,400	70,700	10,400	8,100
TOTAL	24,600	1,600	2,800	17,900	1,300	1,700	13,500	1,400	1,500	206,500	16,300	25,400	115,800	13,500	13,500	104,800	15,200	12,800

TABLE 53
PEAK-HOUR-AND DAILY
EMISSIONS (KILOGRAMS)
(PULASKI CORRIDOR

VEHICLE CLASS	PEAK HOUR									DAILY								
	Existing (1972) Network			1985 No-Build Network			1985 Build Network			Existing (1972) Network			1985 No-Build Network			1985 Build Network		
	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC	CO	NOX	HC
AUTOS	2,400	150	250	700	100	100	700	100	100	20,700	1,500	2,500	4,700	600	600	5,100	900	700
TRUCKS	300	50	50	1,400	100	100	1,600	200	200	2,500	300	400	8,900	1,000	1,000	12,700	2,100	1,500
TOTAL	2,700	200	300	2,100	200	200	2,300	300	300	23,200	1,800	2,900	13,600	1,600	1,600	17,800	3,000	2,200

SOURCE: Air Pollution Impact Analysis of the Pulaski Highway Corridor reduced by 23 percent when compared to 1972 conditions and by 15 percent during the peak hour. When compared to the 1985 No-Build Network, CO emissions are increased by 31 percent daily and by 9 percent during the peak hour. However, the emissions (in kilograms) per vehicle mile of travel for the Pulaski Highway Network are .0175 (daily) and .0236 (peak hour) while the corresponding values for the No-Build Network are .0193 and .0300, respectively.

(b) Hydrocarbons emitted daily by the Build Network are 24 percent lower than the Existing (1972) Network. During the peak hour, emissions from the two networks are the same - 300 kilograms. When compared to the No-Build Network, daily emissions of HC increase by 37 percent and peak hour emissions by 50 percent. The emissions per vehicle mile, however, for the Build Network are .0022 (daily) and .0031 (peak hour) while the corresponding values for the No-Build Network are .0023 and .0029, respectively.

(c) Daily and peak hour emissions of nitrogen oxides are increased when compared to the Existing (1972) Network and the No-Build Network. The emissions per vehicle mile of travel for the Build Network, however, are .0030 (daily) and .0031 (peak hour). The corresponding values for the Existing (1972) Network are .0051 (daily) and .0056 (peak hour). The 1985 No-Build Network values are .0023 and .0029 respectively.

(3) Microscale Air Quality

Microscale air quality analyses were also performed for receptors close to the right-of-way of each alternate highway alignment. These analyses were performed for most probable and worst case meteorological conditions using the Environmental Protection Agency developed HIWAY model. Results of these analyses are discussed in the "Alternatives" section of this document.

(4) Consultation During Study

All reports dealing with both the meso and microscale air quality impacts have been reviewed by the Environmental Protection Agency, the Pennsylvania Department of Environmental Resources, and the City of Philadelphia Health Department's Air Management Services. These agencies are members of the Advisory Group. Their comments, and the replies from the appropriate team representative, are listed in the "Comments and Coordination" section. Additional review opportunity will be afforded these agencies via the draft EIS review process and any indirect source review processes.

(5) Consistency with State Implementation Plan

On a regional and sub-regional basis, the construction of the Pulaski Highway is consistent with the State Implementation Plan in that it results in less bulk emissions than the No-Build Alternative. The sub-regional impact, as identified by the meso-scale analyses, of constructing the Pulaski Highway indicates an improvement in air quality in the central business district (CBD) as compared to the No-Build Alternative. This is indicated by the Pulaski Highway fulfilling its role as a circumferential highway around the central area and the resultant reduction in traffic and pollution along I-95 approaching the CBD. This indicates the consistency of the Pulaski Highway with the concept of reduced carbon monoxide emissions in the CBD, the primary goal of the Transportation Control Strategies in effect in the region.

5. Noise Impacts

a. Noise Effects

(1) General *

Noise Terminology is discussed in Section I. This section will address the general effects of noise on man. The degree of disturbance or annoyance of an unwanted noise depends essentially on three (3) things: the amount and nature of the intruding noise, the amount of backgroundnoise present before the intruding noise, and the nature of the working or living activity of the people occupying the area where the noise is heard.

Regarding the nature of noise, three (3) attributes (frequency, intensity, and time pattern) are significant. Humans have a better hearing sensitivity in the high frequency region than in the low frequency region. This is borne out by many reliable tests on large numbers of people listening to many types of noise. Higher (more intense) noise levels are more overpowering and may make it difficult or impossible to hear things one wants to hear.

The time pattern of noise can be related to both the time characteristics of the noise source and the time at which the noise is heard. In terms of the time characteristics of the noise, a smooth continuous flow of noise (such as from a fan) is more comfortable or acceptable than impulsive (such as from a jack hammer) or intermittent noise (such as from a psssing truck). There is evidence that noise levels that change markedly with time are more identifiable than noise levels that remain constant. Related to traffic noise, this suggest that a steady flow of traffic and a steady-state continuous noise level are less objectionable than intermittent flow with time-varying noise levels. The time at which the unwanted noise occurs is a factor. For example, an automobile horn at 2:00 A.M. is more annoying than the same sound twelve hours later.

People tend to compare an intruding noise with the background noise that was present before the new noise came into existence. If the new noise has distinctive sounds that make it readily identifiable or if its noise levels are considerably higher than the background levels, it will be noti-

* Based on data presented in U.S. Department of Transportation Report FHWA-HHI-HEV-73-7976-1, Fundamentals and Abatement of Highway Traffic Noise; June, 1973; prepared by Bolt Beranek and Newman Inc.

ceable and possibly objectionable. On the other hand, if the new noise is a rather unidentifiable, unobtrusive sound and its noise levels blend into the background levels, it will hardly be noticeable and probably will not be considered objectionable.

People trying to sleep in quiet suburban homes do not want very much intruding noise; while office workers in a busy mid-City office could have greater amounts of noise without even noticing it; and factory workers in a continuously noisy manufacturing space might not even hear a nearby noise source.

(2) Noise Interference

Considerable research has been performed on the interference of speech communication by intruding noise. Table 54 gives an indication of noise levels which permit acceptable communication.

Noise is also known to cause some interference with sleep. Although studies have been performed on noise interference with sleep, there are no definitive tests upon which reliable criteria for highway noise can be based. However, certain tests have indicated that noise levels of approximately 45 to 50 dBA will awaken about 50% of the people tested, while some people did not awaken even at the 75-80 dBA noise level.

Tests similar to the above where the basis for the development of the Noise Standards and the design noise levels described in Section I.

(3) Noise - Induced Damage *

The effects of continuing loud noise are cumulative-they build up over a period of time. Eventually they cause a wearing away of the microscopic hair cells in the ears, which play such a vital part in transmitting sound to the brain. Cells which do not recover when the noise stops disintegrate

* Date from Pollution: The Noise We Hear by Jones, Claire et. al.; Lerner Publications Co., 1972 and U.S. Department of Transportation Report Fundamentals and Abatement of Highway Traffic Noise.

TABLE 54

A. MAXIMUM L_{50} A-SCALE NOISE LEVELS THAT WILL PERMIT ACCEPTABLE SPEECH COMMUNICATION FOR VOICE LEVELS AND LISTENER DISTANCES SHOWN

DISTANCE (ft)	VOICE LEVEL* LOW	NORMAL	RAISED	VERY LOUD
1	60 dBA	66 dBA	72 dBA	78 dBA
2	54 dBA	60 dBA	66 dBA	72 dBA
3	50 dBA	56 dBA	62 dBA	68 dBA
4	48 dBA	54 dBA	60 dBA	66 dBA
5	46 dBA	52 dBA	58 dBA	64 dBA
6	44 dBA	50 dBA	56 dBA	62 dBA
12	38 dBA	44 dBA	50 dBA	56 dBA

B. MAXIMUM L_{10} A-SCALE NOISE LEVELS THAT WILL PERMIT BARELY ACCEPTABLE SPEECH COMMUNICATION FOR VOICE LEVELS AND LISTENER DISTANCES SHOWN

DISTANCE (ft)	VOICE LEVEL* LOW	NORMAL	RAISED	VERY LOUD
1	66 dBA	72 dBA	78 dBA	84 dBA
2	60 dBA	66 dBA	72 dBA	78 dBA
3	56 dBA	62 dBA	68 dBA	74 dBA
4	54 dBA	60 dBA	66 dBA	72 dBA
5	52 dBA	58 dBA	64 dBA	70 dBA
6	50 dBA	56 dBA	62 dBA	68 dBA
12	44 dBA	50 dBA	56 dBA	62 dBA

*Based on men's voices, standing face-to-face outdoors.

Reference: U.S. Department of Transportation Report Fundementals and Abatement of Highway Traffic Noise completely. Loud noise is also known to cause a constriction of the tiny blood vessels in the body, a condition which, it is believed by some, could possibly lead to a chronic state of blood deprivation in the inner ear and finally to the death of the cells involved in hearing.

When an intense noise occurs, the muscles of the inner ear contract, tightening the eardrum and the tiny bones in the inner ear. This action presents the full force of the vibrations from being transmitted to the inner ear. But these muscles can be weakened by too much use so that they are no longer capable of diminishing loud noise.

The strong vibrations of a sudden loud noise can cause excess blood to be sent to the eardrum; this reaction causes intense pain and in extreme cases may cause the eardrum to bleed. The eardrum can also be ruptured by violent soundwave pressure such as that caused by big guns or bomb explosions. If the bones of the middle ear are not damaged, then the eardrum usually heals and some hearing returns.

A very loud noise or explosion can cause temporary loss of hearing. Immediately after being exposed to a loud noise it may be difficult to hear sounds such as normal conversation. It can ususally take several hours for the ears and brain to adjust.

As discussed previously, noise can affect sleep. Researchers have found that women are more likely than men to be roused from sleep by noise. They believe this fact may also explain why women suffer from depressive illness twice as often as men - interrupted sleep is known to be related to this kind of illness. Noise also seems to be a factor in other kinds of mental and emotional illnesses, not only as a result of its physical effects on the body, but also because of its direct influence on our thoughts and feelings. Different people react differently to different noise environments and conditions. For example, music may soothe some people while irritating others. Symptoms of hypertension, vertigo, hallucinations, paranoia, heart disease, mental illness, and, on occasion, suicidal and homicidal impulses have been blamed on excessive noise.

The Walsh - Healey Public Contracts Act of 1969 and the Occupational Safety and Health Act of 1970 ("OSHA") established the following maximum permissible noise exposures for persons working in noise environments:

Duration per day (Hours)	Continuous Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
$1^1/_2$	102
1	105
$^1/_2$	110
$^1/_4$ or less	115

Uninformed people sometimes interpret this to mean that any noise level above 90 dBA will cause loss of hearing, regardless of exposure time. It is essential that the full implication of this table is understood. The table is intended to apply to industrial areas and workers and it is intended to protect the hearing of people exposed on a daily basis for these noise levels and durations over a life-time of employment.

To experience continuous 90 dBA noise levels from highway traffic, one would have to stand approximately ten to twenty feet from a highway lane carrying 1000 trucks per hour. To approach the OSHA exposure limits, one should then remain there beside the highway for eight hours per day on a daily basis for many years. This is a rather unrealistic situation and thus it is unlikely that residents near a highway are receiving hearing damage due to traffic noise.

Nonetheless, it is important that highway noise be abated wherever practicable and feasible in order to minimize the annoyance and interference factors discussed above.

(4) Noise Effect on Wildlife*

Research on the effects of noise on terrestrial wildlife is a new field of enquiry and few substantive data are available. Experiments with laboratory animals indicate that exposure to acute noise levels may result in damage to the auditory system and in symptoms of physiological stress. In some cases, prolonged exposure to sound-induced stress interfered with normal reproductive processes and increased the susceptability of test animals to mortality by other causes. The few data available indicate that animals avoid intense noise. Sound is an important method of animal communication. Bird vocalizations convey a variety of information and it is reasonable to suppose that background noise can interfer with these signals.

Many predators employ sound signals for hunting and prey animals often avoid predators by detecting their sounds. It is likely that increased background noise levels interfere with these processes. Bats are known to avoid signal jamming by altering their orientation while hunting, but otherwise there is little information on background noise interference with predator-prey interactions. It is expected that continuing research will reveal that noise exerts far-reaching and complex effects on wildlife.

In a recent summary report it was recommended that "caution should be exercised in allowing sound intrusion into animal habitats, not only because of possible direct effects on the animals themselves but also on items in the food chain of the animal."

b. Noise Impacts of the Project

Noise levels in the immediate study area vary widely at present as indicated in Section I of this document. Activities in the area also are

* Source: Biological and Physical Assessment for the Proposed Pulaski Highway; Jack McCormick and Associates, Inc., 1974.

diversified, ranging from highly industrial to predominately residential land uses and including cemeteries, parks, and institutional lands.

The extent of noise impact on a site is greatly related to the proximity of the particular alternate alignment. Noise abatement measures are feasible in many locations and are discussed in the "Alternatives" section. These abatement strategies are generally capable of reducing noise levels in the immediate vicinity of the facility by 3 to 4 dBA's.

Even with abatement, there are certain locations associated with certain alternate alignments where increased noise levels (as compared to the No-Build Alternative) will exist. However, on the average, only a slight (1 to 3 dBA) increase in noise levels will occur due to the construction of the Pulaski Highway.

The major positive noise impact of the Pulaski Highway is related to the reduction of trucks on local arterials. The predominance of truck-restricted streets in the area exemplifies the unwillingness of residential areas to accommodate trucks on local roads. This unwillingness is due largely to noise. As further restrictions are placed on truck travel, truck volumes increase on the few remaining available routes in the area. This is typified by recent complaints of increased noise from residents along Castor Avenue as the result of restricting truck travel on Arrott and Orthodox Streets.

Since the industries in the area, and the associated employment, are dependent upon truck access, the Pulaski Highway will provide a vital truck route while relieving the noise impacts of truck travel on most local residential streets.

During construction of the proposed Pulaski Highway, noise will be emitted via construction vehicles and operations. During construction the contractor will be governed by local noise ordinances and by any noise regulations in effect at the time.

The contractor will be encouraged by PennDOT to use the quietest equipment available. PennDOT will also direct that all practical noise abatement measures be taken during construction operations to assure the minimum adverse effect.

6. Water Quality Impacts

a. General

The ecological consultant on the Interdisciplinary Team contacted the Pennsylvania Department of Environmental Resources (PennDER) during the preparation of their basis report for the Environmental Impact Statement. PennDER is responsible for the State water quality standards. PennDER as well as the Environmental Protection Agency (EPA) were members of the Advisory Group to the Interdisciplinary Team preparing this document. The Delaware River Basin Commission, and City of Philadelphia Health and Water Departments were also contacted during the study process.

Most water runoff in the study area ultimately reaches the Tacony-Frankford Creek, which at present shows various degrees of pollutant content. However, current pollution content is not as significant as in the past. The major contribution of pollutant discharge into the creek from the proposed facility will be from erosion and sedimentation during construction. After construction, contamination due to deicing agents used to melt snow and ice on the roadways during winter storms, and from oil, grease, and other debris which is a by-product of the automobile will continue to pollute the stream. The Pennsylvania Department of Transportation construction controls which call for early seeding of cut ground areas, sedimentation ponds when applicable, and energy dissipators to reduce run-off impacts will be utilized to control erosion and sedimentation, however, these controls cannot entirely eliminate this problem.

Other contaminants which contribute to the pollution in the Tacony-Frankford Creek are chemicals from industries located near the Creek and sewage from the surrounding residential and industrial communities. Weed, rodent and insect control products are not known to be used in the area. Spillage of poisons or chemicals by trucks into the creek is possible at any time, as it is now. Solid waste dumping into the creek is not permitted by the Fairmount Park Commission, however, due to past abuse, the creek presently contains large quantities of solid waste such as automobiles, shopping carts, refrigerators, tires, etc.

b. Wetlands and Coastal Zone Effects

No wetlands or coastal zones are affected by this project, consequently, there are no inconsistencies with wetlands or coastal zone management programs.

c. Stream Modification and Impoundment

Stream modification or impoundment impacts occur in the lower section of the Tacony-Frankford Creek. The project would not require any impoundment of the Tacony-Frankford Creek. Stream modifications are required for only one alternative as indicated on Plate 146. These modifications include open channel realignments both north and south of a box culvert required for the creek to pass under Roosevelt Boulevard and a ramp.

Consultation was made concerning these impacts with PennDER, and the Pennsylvania Fish Commission under the Project Notification and Review System (PNRS) which was formalized by Pennsylvania Act 120. Both agencies found L.R. 1078 to be consistent with their overall comprehensive plans. The U.S. Fish and Wildlife Service has been contacted (See letter in the Appendix) and any comments from this agency will be addressed.

d. Flood Hazard Evaluation

Sections of Alternate D transverse areas of the Tacony-Frankford Creek which can be considered flood plain. Owing to the small watershed area of the creek, it is not subjected to large spring flooding. Due to runoff from developed area, however, flash floods during summer thunderstorms can be expected. The U.S. Geological Survey has maintained a gaging station 400 feet upstream from Torresdale Avenue. Some recent maximum and minimum discharge records can be found in Section I (See Table 44). Areas adjacent to the stream in Road Section B have been protected since the early 1950's by flood control structures designed for a 100 year flood (10,000cfs). The largest flood probably occurred during July 1931 when the discharge was estimated to be 6,500 cfs.

7. Construction Impacts

Certain positive and negative impacts can be attributed to the construction activities of the proposed Pulaski Highway. Numerous new jobs will be created on a temporary basis and it is likely that the workers will spend significant money at establishments within the study area.

Actual construction activities will cause increased noise levels and dust in the area during certain operations. Procedures are practiced (such as noise control systems on equipment and watering to reduce the transport of dust) to minimize such adverse effects. During construction, sedimentation retention basins will be constructed so as to minimize any sediments reaching Tacony Creek. Selective seeding and mulching of newly exposed slopes will also be performed to prevent erosion.

Traffic congestion will occur in the vicinity of the Roosevelt Boulevard interchange during the construction period. The interchange will require the relocation of the existing travel lanes on the Boulevard and some of the lanes will be closed during the interchange construction period. The construction can be scheduled so that work will not be in progress during the peak travel periods and the work will be accomplished in stages designed to minimize disruption to travel along the Boulevard. This traffic congestion may adversely impact retail sales at the Sears complex and would inconvenience access to Friends Hospital during the construction period.

The construction of the project may require blasting in the depressed highway sections near Roosevelt Boulevard. If blasting is required ground vibrations will be monitored during the construction period. The blasting methods can be made to incorporate such measures as time delay shots and can be coordinated with local school officials, cemetery officials, businessmen and residents so that they can be scheduled to minimize disruption to the surrounding communities.

During the construction period all activities will be coordinated to assure that any disruptions of essential utility services is kept to an absolute minimum.

Removal of solid wastes from the construction area will be performed by the contractor under the direction of the PennDOT inspectors in accordance with specifications described in PennDOT's Form 408. Required permits from the Pennsylvania Department of Environmental Resources for disposal sites will be obtained as needed. No on-site burning of solid waste will be permitted by the contractor.

8. Traffic Impacts

a. General

In general, the implementation of the proposed Pulaski Highway would result in lesser future traffic volumes on the local arterial streets in the study area because the proposed Highway would attract the through traffic in the study area away from the local streets.

With the No-Build Network, 1985 average daily traffic (ADT) volumes on the local arterial streets would increase significantly over the existing volumes because of regional and local area growth in population, employment, and other related factors influencing trip making. With the proposed Pulaski Highway, 1985 average daily traffic volumes on the local arterial streets would be less than with the No-Build Network. Exceptions to this general condition would occur for sections of Roosevelt Boulevard and a few local arterial streets leading directly to interchanges with the Pulaski Highway.

b. Origins of Traffic on the Pulaski Highway

The origins of the trips assigned to the Pulaski Highway were determined through a selected link analysis performed by the DVRPC. This analysis is discussed in Section I and the results are indicated below:

Area of Trip Origins	% of Total
Northeast Philadelphia	17%
Northwest Philadelphia	26%
North Philadelphia, Philadelphia CBD and Southwest Philadelphia	17%
Bucks County	11%
Montgomery County	8%
Delaware and Chester Counties	3%
External Trips (including New Jersey)	18%
Total	100%

This analysis indicates that only 17% of the traffic which would utilize the Pulaski Highway originates in Northeast Philadelphia. The remaining 83% of the traffic originates in other areas of the Delaware Valley Region, indicating that the Pulaski Highway, proposed as part of an intermediate loop freeway system, would mainly serve travel with diverse origins within the Delaware Valley Region.

The area which contributes the most significant amount of traffic to the proposed Pulaski Highway is Northwest Philadelphia (26%). This indicates that the Pulaski Highway would carry a significant amount of circumferential type travel as it is planned to do. The Pulaski Highway would fulfill a regional transportation system need because these circumferential type trips with diverse regional origins cannot be effectively served by mass transit facilities.

c. Additional Traffic in the Study Area due to the Pulaski Highway

New expressways in urban areas usually attract additional traffic into their travel corridor from other sections of the urban area. In the case of the Pulaski Highway this additional traffic is illustrated by the screenline volume analyses prepared by the DVRPC (See Plate 34).

A comparison of the total daily traffic volumes crossing the screenlines, with the No-Build Network and the two Pulaski Highway Build Networks, is shown below:

Total Assigned 1985 ADT Volumes

	Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave.-Align.)
Screenline A	451,500	451,700	451,900
Screenline B	283,300	310,500	293,900

This data indicates that the proposed Pulaski Highway would attract only a minor amount of additional traffic into the study area across Screenline A. The majority of the additional traffic attracted to the study area is attracted across Screenline B from the Northwest Philadelphia area. This increase is the result of regional circumferential type travel being attracted across screenline B by the Pulaski Highway. Some of this travel would be attracted to the Betsy Ross Bridge from other Delaware River crossings. The remainder would be attracted from the arterial streets in the study area and adjacent neighborhoods which lead to the I-95 interchanges at Girard Avenue, Allegheny Avenue and Castor Avenue.

With Network E, the additional traffic attracted across Screenline B by the Pulaski Highway would amount to 10,600 trips per day in 1985. Of these trips, 6,100 would be additional river crossings over the Betsy Ross Bridge which would otherwise not pass through the study area. The remaining 4500 additional trips across screenline B are trips destined for I-95. With the No-Build Network these trips would travel over local arterial streets through the study area and adjacent neighborhoods to reach I-95 without crossing Screeline B.

With Network C, the additional traffic attracted across Screenline B by the Pulaski Highway would amount to 27,200 trips per day in 1985. The difference in Screenline B crossings between Network E and Network C is due to the location of the Pulaski Highway alignment and the ability of Roosevelt Boulevard to accommodate the circumferential travel demands. With Network C, the Boulevard is considered as a combined expressway-arterial facility with the center lanes upgraded to provided six expressway lanes while with Network E the circumferential travel accommodated by the Boulevard is restrained by the existing capacity of the Boulevard.

Of the 27,200 additional trips attracted across Screenline B, 6100 would be additional river crossings over the Betsy Ross Bridge which would otherwise not pass through the study area. The remaining 21,200 trips are destined for areas along I-95 from Northeast and Northwest Philadelphia. These trips would approach the Pulaski Highway along Adams Avenue and Roosevelt Boulevard and would cross Screenline B along the Pulaski Highway. With the No-Build Network, these trips would travel over the arterial streets in the study area to reach I-95 without crossing Screenline B.

A comparison between the additional traffic volumes attracted across the screenlines because of the proposed Pulaski Highway and the total traffic volumes crossing the screenlines with the No-Build Network indicates that the Pulaski Highway would not cause a significant increase in 1985 traffic volumes in the study area. The great majority (97.8%) of the traffic travelling across the screenlines would be in the study area even if the Pulaski Highway is not constructed.

The Pulaski Highway would result in a slight increase (approximately 2%) in vehicle miles travelled (VMT) in the study area in 1985 on a daily basis and on a peak hour basis when compared to the No-Build Network. The influence of the additional freeway capacity provided by the Pulaski Highway, however, would result in significant increases in vehicle operating speeds in the study area. The net result would be the accommodation of the relatively constant traffic demand in the study area at a higher level of service. This system performance analysis was prepared by the DVRPC and the results are indicated below:

COMPARISON OF SYSTEM OPERATING AND PERFORMANCE CHARACTERISTICS (TOTAL STUDY AREA)

Characteristics	1972 Existing	Network A (1985 No-Build)	Network C (1985 Pulaski)
Peak Hour VMT	320,300	577,600	583,700
Daily VMT	3,124,700	5,787,700	5,897,900
Avg. Peak Hour Speed (MPH)	20.8	12.1	18.9
Avg. Daily Speed (MPH)	23.8	20.3	25.3

d. Reduction of Arterial Street Traffic in the Study Area due to the Proposed Pulaski Highway

The Pulaski Highway would result in lesser 1985 traffic volumes on the local arterial streets in the study area. Exceptions to this statement would occur along certain sections of the Roosevelt Boulevard and a few of the other arterial streets which lead directly to the proposed interchanges with the Pulaski Highway. This reduction of local arterial street volumes is illustrated by the screenline analyses performed by the DVRPC.

A comparison of the total volumes for arterial street travel and expressway travel across the two screenlines indicates that the 1985 traffic volumes along the local arterial streets in the study area would be less with the Pulaski Highway than with the No-Build Network.

Total 1985 daily traffic volumes across Screenline A are increased by 400 vehicles per day because of the Pulaski Highway. This minor difference (less than 1/10%) indicates that traffic changes across this screenline are the result of variations of the traffic patterns rather than variations in the traffic volumes. As indicated below, the Pulaski Highway would cause significant changes in the traffic patterns across Screenline A with Network E and only minor changes with Network C.

SCREENLINE A
ASSIGNED 1985 ADT

	Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
Roosevelt Boulevard Traffic	106,600	106,600	121,200
Arterial Traffic	182,900	183,300	175,500
Delaware Expressway Traffic	162,000	161,800	155,200
Total Traffic	451,500	451,700	451,900

With Network C, the Pulaski Highway interchange with Roosevelt Boulevard is located at F Street. This location is too far to the west of Screenline A to result in any significant changes in the traffic patterns across the screenline and traffic volumes along the arterial streets are not significantly changed. With Network E, however, the Pulaski Highway interchange with Roosevelt Boulevard is located at Summerdale Avenue near Screenline A. Significant changes in the traffic patterns across Screenline A would result due to the re-routing of traffic from Northeast Philadelphia which is destined for the Betsy Ross Bridge and the Delaware Expressway (I-95). With Network E this traffic would travel over Roosevelt Boulevard to the Pulaski Highway and then along the Pulaski Highway to the bridge and I-95 instead of traveling over the local arterial streets to I-95 interchanges. This routing change results in the reduction of traffic along the local arterial streets crossing Screenline A and the concentration of through traffic along Roosevelt Boulevard as indicated above.

Total 1985 daily traffic volumes across Screenline B are increased by the Pulaski Highway as discussed previously. As explained the traffic increases across this screenline are due to the attraction of 6100 additional river crossings through the study area and the re-routing of traffic which would otherwise pass through the study area without crossing Screenline B. The increased traffic in the study area (6100 ADT) is not significant (2%), however, significant changes in the traffic patterns in the study area due to the Pulaski Highway would result in increased traffic volumes across Screenline B as indicated below:

SCREENLINE B
ASSIGNED 1985 ADT

	Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave.-Align.)
Roosevelt Boulevard Traffic	133,600	127,400	154,300
Arterial Traffic	149,700	119,700	139,600
Pulaski Highway Traffic	0	63,400	0
Total Traffic	283,300	310,500	293,900

With Network C, arterial traffic across Screenline B is significantly reduced because traffic from Northwest Philadelphia which is destined for the Pulaski Highway reaches the highway at F Street before crossing the screenline. This traffic then crosses the screenline along the Pulaski

Highway instead of along the local arterial streets. This diversion of traffic to the Pulaski Highway results in significantly less through travel along the local arterial streets in the study area.

With Network E, the Pulaski Highway does not cross Screenline B and the Northwest Philadelphia traffic must cross Screenline B along Roosevelt Boulevard and the local arterial streets before reaching the Pulaski Highway at Summerdale Avenue and at the Castor-Wingohocking local interchange area. The traffic reductions on the local arterial streets crossing Screenline B are not as significant as with Network C because of the highway location.

These traffic analyses indicate that the Pulaski Highway would result in substantially lesser 1985 daily traffic volumes along the local arterial streets in the study area. The traffic patterns across the screenline would be changed and through traffic destined for the Betsy Ross Bridge and I-95 would be rerouted along the Roosevelt Boulevard and the Pulaski Highway. With the No-Build Network this through traffic would pass through the study area along the local arterial streets.

The Pulaski Highway would benefit the local neighborhoods because of these reductions in 1985 traffic volumes along the local arterial streets. The existing arterial street system in the study area consists of many old and narrow streets. In addition, this street system is fractured due to the location of the Tacony-Frankford Creek and the meshing of four major street grid systems with four different orientations. These conditions place the local arterial system at a particular disadvantage in its ability to accommodate significant growth in traffic volumes.

The traffic reductions along the local arterial streets provided by the Pulaski Highway would result in freer traffic movement along the local arterial streets. Local traffic within the study area would move more freely, benefiting the local area residents and businesses. The traffic volumes diverted from the local arterial streets to the Roosevelt Boulevard and the Pulaski Highway is through traffic which would be better served by those major highway facilities.

The net effect of the Pulaski Highway would be to direct through travel in the study area to the major highway facilities and provide for freer movement of local traffic along the arterial streets.

e. Impact of the Pulaski Highway on Regional Transportation Facilities

If the Pulaski Highway is not constructed the traffic which is assigned to this facility would not redistribute to other expressway facilities in other sections of the Delaware Valley Region. The traffic would remain in the study area, however, it would be carried by the local arterial streets.

This consistency of travel demand in the study area is indicated by the screenline analysis and the system performance analyses performed by the DVRPC. Both of these analyses indicate only minor differences in 1985 traffic in the study area between the Build and No-Build Network.

The Pulaski Highway would result in significant decreases in traffic volumes along the Delaware Expressway as indicated below:

DELAWARE EXPRESSWAY TRAFFIC
ASSIGNED 1985 ADT

Section	Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. - Align.)
Bridge-Buckius	162,000	161,800	155,200
Buckius-Betsy Ross Bridge	219,900	211,100	204,900
Betsy Ross Bridge-Castor	228,900	187,500	195,100
Castor-Allegheny	217,000	178,800	186,000

This data indicates that the traffic decreases along the Delaware Expressway due to the Pulaski Highway would amount to 41,400 vehicles per day in the vicinity of the Betsy Ross Bridge. These decreases are mainly due to the rerouting of circumferential travel between the Northwest section of the city and the areas along the Delaware Expressway. Instead of travelling over the local arterial streets to reach the Delaware Expressway, this traffic would utilize Roosevelt Boulevard and the Pulaski Highway. These decreases are also partially due to traffic destined for the Betsy Ross Bridge. The Pulaski Highway would carry approximately 25,300 vehicles per day which are destined for the Betsy Ross Bridge. Without the Pulaski Highway 14,900 of these vehicles would divert to other bridges and the remaining 10,400 would utilize the arterial streets in the study area to reach the Betsy Ross Bridge via the Delaware Expressway and the Richmond Street Ramps.

Decreases in traffic volumes at interchanges of the Delaware Expressway with local arterial streets in the Northeast Philadelphia area resulting from the Pulaski highway and the traffic redistributions cited above are indicated in the following table prepared by the DVRPC.

TRAFFIC VOLUMES AT I-95 INTERCHANGES
ASSIGNED 1985 ADT

Interchange	Network A (No-Build)	Network C (Park Align.)
Academy Road	28,100	21,300
Cottman Avenue	35,800	30,200
Castor Avenue	15,300	12,500
Allegheny Avenue	25,400	20,200

The Pulaski Highway would also result in decreased traffic volumes across the presently congested four lane Tacony-Palmyra Bridge. This decrease is due to the diversion of trips from this bridge to the Betsy Ross Bridge as indicated below:

	EXISTING ADT	ASSIGNED 1985 ADT		
Bridge		Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
Tacony-Palmyra	73,400	55,400	46,600	46,600
Betsy Ross	0	66,600	81,500	81,500
Total	73,400	122,000	128,100	128,100

The Pulaski Highway would not result in decreased usage of mass transportation facilities. The traffic projections for the Pulaski Highway were prepared with consideration of increased transit ridership on the Frankford Elevated, the Penn-Central and Reading commuter railroad lines and the surface mass transit network in Northeast Philadelphia as shown in Plate 54.

In addition, ridership on rail mass transit facilities which have not yet been constructed has been considered. The proposed Broad Street Subway Extension into Northeast Philadelphia which would pass directly through the Pulaski Highway study area, and the proposed extensions of the Lindenwold High Speed Line in New Jersey were considered in operation in the preparation of the traffic estimates for the proposed Pulaski Highway. Ridership on these proposed transit facilities are indicated on Plates 41 through 45.

Ridership on the proposed Northeast Subway Extension and the Lindenwold High Speed Line Extension are primarily trips which would be diverted from the highway system. Without the proposed Northeast Subway Extension, highway trips would account for a much larger share of the total trips in the Northeast Philadelphia area and highway traffic assignments along the Pulaski Highway would be substantially higher than the current estimates.

The reverse condition, i.e. substantial increases in the 1985 mass transit ridership projections because of the deletion of the Pulaski Highway would not be the case. As indicated by the analyses of the origins of trips assigned to the Pulaski Highway, this highway facility would mainly serve circumferential type trips with diverse regional origins. The vast majority of 1985 trips between Northeast Philadelphia and the CBD have already been assigned to mass transit facilities including the proposed Broad Street Subway Extension as indicated on Plate 42. The majority (approx. 90%) of the 1985 highway trips assigned to the Pulaski Highway are not destined for the

CBD as the mass transit facilities are oriented. These highway trips have diverse origins throughout the region and could not be effectively served by mass transit facilities. The DVRPC projections and analyses indicate that it is unlikely that transit ridership will vary to any significant extent because of the Pulaski Highway.

f. Truck Routing Impacts

At the present time there is a significant amount of travel through the study area by heavy trucks. This is due to the location of the port facilities, the large industrial centers and the major trucking center within the study area as indicated on Plate 51.

Heavy truck traffic throughout the study area has been restricted along the local arterial streets. Castor Avenue and Harbison Avenue are now the only direct routes between the Roosevelt Boulevard (U.S. 1) travel corridor and the trucking, port, and industrial centers located along I-95. Truck traffic along Castor Avenue and Harbison Avenue will increase as the region grows and the port and industrial centers become more intensely utilized.

The Pulaski Highway would provide a significant improvement for truck travel in the study area because it would provide a direct non-stop connection between the Boulevard and I-95 and between the Boulevard and the Betsy Ross Bridge. Heavy truck traffic between these areas would utilize the Pulaski Highway rather than fight through the stop and go conditions along Castor Avenue and Harbison Avenue. In addition, the proposed interchange at Aramingo Avenue would connect the Pulaski Highway directly to the heart of the major trucking center in the study area. Heavy truck travel between the Boulevard and the Aramingo Avenue truck terminals would definitely use the Pulaski Highway instead of Castor Avenue because of the convenient location of these ramps (See Plate 75).

Most of the heavy truck traffic presently traveling along the arterial streets between the Boulevard and the port, trucking, and industrial centers would be diverted from these streets to the Pulaski Highway because it would provide a quicker and more direct route for this travel. The heavy truck travel over the local arterial streets, which is a major complaint of study area residents, would be significantly reduced.

g. Neighborhood Build Vs. No-Build Traffic Comparisons

A comparison of the assigned 1985 average daily traffic (ADT) volumes on the arterial street system in the study area under Build and No-Build Network conditions is outlined here. The comparisons are made for each neighborhood in the study area (See Plate 2) utilizing data obtained from the traffic projection studies performed by DVRPC.

The average daily traffic (ADT) volume differences in each neighborhood are shown in the tables below for the Build Networks with the Pulaski Highway terminating at Roosevelt Boulevard (Networks C and E) and the No-Build Network (Network A). The Roosevelt Boulevard was not included in these comparisons and will be treated separately (See part h.).

(1) Lawndale-Crescentville

	EXISTING ADT	ASSIGNED 1985 ADT		
Arterial Street		Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
RISING SUN AVENUE				
C-Tabor	N.A.	33,200	29,200	29,200
Tabor-Adams	N.A.	24,000	15,100	15,100
Adams-Levick	N.A.	22,700	21,200	19,400
C STREET	N.A.	8,400	8,800	8,800
TABOR ROAD				
Rising Sun-Adams	8,500	23,900	17,300	15,800
Adams-Levick	15,300	25,700	27,400	24,400

ADAMS AVENUE				
Boulevard-Tabor	24,400	39,700	38,600	35,300
Tabor-Rising Sun	11,700	29,700	25,400	24,600

The data above indicate that there will be significantly less assigned traffic on the arterial streets in the Lawndale-Crescentville neighborhood with the Pulaski Highway Build Networks than with the No-Build Network. In addition, this tabulation indicates there will be less traffic with Network E than with Network C due to the location of the Pulaski Highway-Roosevelt Boulevard interchange in this neighborhood with Network C (Park Alternate).

(2) Summerdale

	EXISTING ADT	ASSIGNED 1985 ADT		
Arterial Street		Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
SUMMERDALE AVENUE				
Boulevard-Godfrey	13,100	16,600	17,600	19,100
Godfrey-Oxford	13,100	18,100	19,200	23,800
LANGDON STREET	N.A.	5,400	3,800	4,600
OXFORD AVENUE				
Blvd.-Summerdale	15,100	19,000	18,600	19,400
Summerdale-Langdon	N.A.	17,400	10,800	11,500
Langdon-Devereaux	17,600	21,600	14,000	15,200

The data above indicate that there will be less assigned traffic on the arterial streets in the Summerdale neighborhood with the Pulaski Highway Build

Networks than with the No-Build Network. In addition, this tabulation indicates there will be less traffic with Network C than with Network E due to the location of the Pulaski Highway interchange in this neighborhood with Network E (Adams Avenue Alternate).

In both Network C and Network E, traffic on Summerdale Avenue is higher than with the No-Build Alternate because Summerdale Avenue is a main feeder street to the Roosevelt Boulevard. Traffic from the Burholme and Upper Northwood areas will use Summerdale Avenue to reach the Pulaski Highway interchange with either of these networks.

(3) Oxford (Upper Northwood)

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
OXFORD AVENUE				
Langdon-Devereaux	17,600	21,600	14,000	15,200
Devereaux-Martins Mill	N.A.	29,800	19,600	21,200
Martins Mill-Levick	N.A.	17,300	12,800	14,400
Levick-Cottman	14,400	19,800	19,400	19,600
CASTOR AVENUE	13,000	18,500	21,400	20,600
SUMMERDALE AVENUE				
Oxford-Devereaux	N.A.	16,500	18,400	21,100
Devereaux-Levick	N.A.	12,200	15,400	17,600
Levick-Cottman	N.A.	18,500	16,900	17,400
MARTINS MILL ROAD	4,600	12,500	6,800	6,800

Arterial Street		Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
DEVEREAUX AVENUE				
Castor-Summerdale	6,800	8,700	7,800	7,800
Summerdale-Oxford	N.A.	9,400	9,000	9,000
LEVICK STREET				
Summerdale-Oxford	13,900	35,300	22,200	20,600
Oxford-Martins Mill	14,200	22,700	20,200	20,200
Tabor-Rising Sun	7,900	24,200	22,600	22,600

The data above indicate that there will be less assigned traffic on the arterial streets in the Oxford neighborhood with the Pulaski Highway Build Networks than with the No-Build Network. In addition, this tabulation indicates there will be less traffic with Network C than with Network E due to the location of the Pulaski Highway interchange in the adjacent Summerdale neighborhood with Network E (Adams Avenue Alternate).

Traffic on Castor Avenue will be increased with either of the Build Networks because Castor Avenue is one of the main feeder streets to Roosevelt Boulevard. Traffic will use Castor Avenue to get to the Pulaski Highway interchange with either of these networks.

Traffic on Summerdale Avenue between Levick Street and the Summerdale neighborhood will be increased with either of the Build Networks because it also is a main feeder street to Roosevelt Boulevard. Traffic on Summerdale Avenue between Cottman Avenue and Levick Street is higher with the No-Build Network because, without the Pulaski Highway, Summerdale Avenue acts as a feeder to Levick Street and the Tacony-Palmyra Bridge. Without the Pulaski Highway, more traffic in this section of Northeast Philadelphia would utilize Levick Street and the Tacony-Palmyra Bridge. Also, traffic destined for I-95 would utilize Levick Street and then travel through the Wissinoming neighborhood to reach I-95.

(4) Feltonville

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Avenue Align.)
C STREET	7,500	14,600	13,200	13,200
WYOMING AVENUE				
Rising Sun-C	N.A.	14,800	13,800	14,400
C-Whitaker	13,300	16,400	16,100	16,700
Whitaker-G	9,700	18,200	18,600	19,300
WHITAKER AVENUE				
Blvd.-Wyoming	13,700	25,600	14,100	14,800
Wyoming-Hunt. Park	17,600	23,700	17,700	17,400
Hunt. Park-Erie	14,700	22,100	19,600	19,600
HUNTING PARK AVENUE				
Front-Whitaker	21,500	21,300	18,400	19,200
Whitaker-G	20,400	22,900	20,900	21,800

The data above indicate that there will be significantly less assigned traffic on the arterial streets in the Feltonville neighborhood with the Pulaski Highway Build Networks than with the No-Build Network. Traffic variations between the two Build Networks are minor.

The most significant difference between the Build and No-Build conditions in this neighborhood is the traffic volumes assigned to Whitaker Avenue. This indicates the diversion of trips from the Northeast and Northwest sections of the City to the Pulaski Highway under the Build Network condition and the assignment of work trips and trucking trips for the industrial center in this neighborhood to the Pulaski Highway interchange at Roosevelt Boulevard.

(5) Juniata Park

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Avenue Alignment
WYOMING AVENUE				
G-Ramona	9,700	19,300	17,500	19,100

Arterial Street		Network A (No-Build)	Network C (Park Align.)	Network E (Adams Avenue (Alignment)
Ramona-Castor	8,800	13,600	13,600	14,800
CAYUGA STREET	6,700	10,400	9,900	12,400
WINGOHOCKING STREET	8,000	9,600	13,800	22,700
HUNTING PARK AVENUE	13,100	23,600	17,900	22,500
ERIE AVENUE	15,600	21,700	17,300	20,600
G STREET				
Wyoming-Cayuga	8,200	18,400	15,200	16,000
Cayuga-Hunting Park	8,200	13,500	13,100	13,800
Hunting Park-Erie	11,300	16,700	15,800	16,200
CASTOR AVENUE				
Wyoming-Cayuga	N.A.	13,700	21,900	25,400
Cayuga-Hunting Park	14,300	18,500	17,500	21,300
Hunting Park-Erie	15,700	17,700	18,200	18,200

The data above indicate that there will be less assigned traffic on the arterial streets in the Juniata Park neighborhood with the Pulaski Highway network with the Park alignment (Network C) than with the No-Build Network. There will be significantly more assigned traffic in the neighborhood with the Pulaski Highway Build Network with the Adams Avenue alignment (Network E) than with the No-Build Network.

Under the Network C conditions, assigned traffic on all of the arterials is less than with the No-Build conditions except for Wingohocking Street and Castor Avenue. Volumes are higher on these two streets due to the proposed location of local interchanges on these streets. Traffic will converge along Castor Avenue to get to the Pulaski Highway ramps. These increases are mainly due to increased attraction of traffic along Castor Avenue from the Northwood, Oxford, and other Northeast Philadelphia neighborhoods.

Under the Network E conditions traffic increases over the No-Build Network are indicated on Wyoming Avenue, Cayuga Street, Wingohocking Street and Castor Avenue. All other streets would have less traffic under the Build Network conditions than under the No-Build Network conditions. The increase in traffic on Wyoming Avenue and Cayuga Street is due to the assignment of work trips and truck trips for the industrial center west of Juniata Park to the local interchange proposed at Wingohocking Streets. The increases on Castor Avenue are mainly due to this industrial center traffic also.

(6) Northwood

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
ADAMS AVENUE				
Blvd.-Ramona	15,300	18,000	17,000	17,600
Ramona-Castor	14,200	17,400	16,500	17,000
Castor-Orthodox	5,900	11,900	6,900	6,900
Orthodox-Wingo-hocking	3,500	7,500	6,200	6,200
CASTOR AVENUE				
Godfrey-Adams	18,300	21,700	21,800	18,000
Adams-Wyoming	N.A.	22,600	30,200	22,400
ORTHODOX STREET				
Castor-Adams	N.A.	11,300	8,100	8,100
Adams-Frankford	4,900	9,100	6,500	6,500
ARROTT STREET	4,000	8,300	6,600	6,600
RAMONA AVENUE	9,000	14,800	12,000	12,000

The data above indicate that there will be less assigned traffic on the arterial streets in the Northwood neighborhood with the Pulaski Highway Build Networks than with the No-Build Network. The data also indicates that there will be significant differences between the Park Alignment Network (Network C) and the Adams Avenue Alignment Network (Network E).

Under the Network C conditions, assigned traffic on all of the arterial streets is less than with the No-Build Network except for Castor Avenue. The volumes on Castor Avenue are significantly increased due to the attraction of the local interchange proposed in the vicinity of Castor and Wyoming Avenues. Because the Roosevelt Boulevard interchange is further to the west in this network, traffic destined for the Pulaski Highway from neighborhoods in the Northeast Section of the City will converge along Adams Avenue and Castor Avenue in the vicinity of the proposed local interchange.

Under the Network E conditions, assigned traffic on every arterial street in this neighborhood will be less than with the No-Build Network conditions. Traffic destined for the Pulaski Highway will be diverted to the Roosevelt Boulevard and traffic along Adams and Castor Avenues will be reduced.

A comparison of volumes on Orthodox Street and Arrott Street between the Build and No-Build conditions indicates the diversion of a significant amount of the through travel between Roosevelt Boulevard and I-95 in this neighborhood to the Pulaski Highway.

(7) West Frankford

	EXISTING ADT	ASSIGNED 1985 ADT		
Arterial Street		Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
OXFORD AVENUE				
Blvd.-Pratt	8,800	14,200	11,400	11,400
Pratt-Frankford	9,800	12,500	12,200	12,200
PRATT STREET	9,100	10,900	9,700	10,100

The data above indicate there will be less assigned traffic on the arterial streets in the West Frankford neighborhood with the Pulaski Highway Build Networks than with the No-Build Network.

The significant difference is indicated in the Oxford Avenue volumes between the Roosevelt Boulevard and Pratt Street. This indicates a diversion of trips in Northeast Philadelphia to the Pulaski Highway from the Bridge Sreet route to I-95.

(8) Westmoreland

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
ERIE AVENUE				
Castor-G	15,600	21,700	17,300	20,600
G-Whitaker	N.A.	18,900	15,600	17,900
Whitaker-Front	N.A.	19,300	18,600	19,100
G STREET	7,900	14,600	12,300	12,800
WHITAKER AVENUE	16,800	21,500	19,300	19,200
TIOGA STREET	8,800	15,200	10,700	14,300
KENSINGTON AVENUE	9,800	12,500	12,400	12,400
ALLEGHENY AVENUE	15,800	24,300	19,400	23,700

The data above indicates there will be less assigned traffic on the arterial streets in the Westmoreland neighborhood with the Pulaski Highway Build Networks than with the No-Build Network.

The signifciant differences between the Build Networks and the No-Build Networks occur with the Park alignment. Traffic reductions under the Network C conditions are significant along Erie Avenue, Tioga Street and Allegheny Avenue. This indicates a diversion of travel between the industrial center to the north and I-95 to the south to the Pulaski Highway.

The differences between the Adams Avenue Alignment Network (Network E) and the No-Build Network are not as significant due to the location of the interchange with the Roosevelt Boulevard further to the west with Network E. Traffic from the industrial center to I-95 would continue to use the arterial streets through the Westmoreland neighborhood with Network E.

(9) Harrowgate

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
CASTOR AVENUE	13,900	18,700	17,100	17,300
KENSINGTON AVENUE	9,800	12,500	12,400	12,400
FRANKFORD AVENUE				
Erie-Castor	8,700	14,300	11,400	11,200
Castor-Allegheny	9,000	13,900	8,100	8,100

The data above indicate there will be less assigned traffic on the arterial streets in the Harrowgate neighborhood with the Pulaski Highway Build Networks than with the No-Build Network. There is no significant difference between the two Build Networks on the arterial streets in this neighborhood.

The significant difference between the Build and No-Build conditions will occur along Frankford Avenue between Allegheny Avenue and Erie Avenue. This indicates a diversion of trips through this neighborhood to the Pulaski Highway. This through traffic is mainly travel between the Roosevelt Boulevard area and the I-95 area.

All of the arterial streets in this neighborhood will have less assigned traffic with Network C and all arterial streets, except Adams Avenue, will have less assigned traffic with Network E. This increase in Adams Avenue traffic is due to the location of the proposed local interchange in the vicinity of Adams Avenue and Wingohocking Street with Network E.

(10) Frankford (Deni and East Frankford)

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
FRANKFORD AVENUE				
Orthodox-Oxford	11,800	26,300	24,300	24,600
Oxford-Bridge	13,400	15,700	16,500	17,100
ARROTT STREET	4,000	8,300	6,600	6,600
MARGARET STREET	N.A.	10,600	8,200	8,200
OXFORD AVENUE	9,800	12,500	12,200	12,200
BRIDGE STREET	8,300	13,400	11,100	11,100
ORTHODOX STREET				
Adams-Frankford	4,900	9,100	6,500	6,500
Fkfd.-Torresdale	6,400	9,200	7,200	7,200
FARINA STREET	5,200	7,300	6,000	6,000
UNITY STREET	N.A.	3,700	2,000	2,000
ADAMS AVENUE	3,600	5,400	5,100	8,900
TORRESDALE AVENUE	9,600	15,000	14,700	14,700

The data above indicate there will be less assigned traffic on the arterial streets in the Frankford neighborhood with the Pulaski Highway Build Networks than with the No-Build Network.

Significant traffic differences between the Build Networks and the No-Build Network in this neighborhood occur along Orthodox Street, Arrott Street, Margaret Street and Bridge Street. These differences clearly indicate the diversion of through traffic in this neighborhood to the Pulaski Highway. This through traffic is mainly travel between the Roosevelt Boulevard and the I-95 area.

All of the arterial streets in this neighborhood will have less assigned traffic wth Network C and all arterial streets except Adams Avenue will have less assigned traffic with Network E. This increase in Adams Avenue traffic is due to the location of the proposed local interchange in the vicinity of Adams Avenue and Wingohocking Street with Network E.

(11) Frankford Valley

	EXISTING ADT	ASSIGNED 1985 ADT		
Arterial Street		Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
TORRESDALE AVENUE	N.A.	25,500	19,100	19,100
ARAMINGO AVENUE	N.A.	22,800	24,500	24,500
HARBISON AVENUE	16,400	28,400	28,300	26,200
ORTHODOX STREET	N.A.	13,500	11,800	11,300
BRIDGE STREET	N.A.	18,200	16,700	14,800

The data above indicate there will be less assigned traffic on the arterial streets in the Frankford Valley neighborhood with the Pulaski Highway Build Networks than with the No-Build Network.

Under both of the Build Network conditions, assigned traffic will be significantly less on all of the arterial streets in this neighborhood except

Aramingo Avenue. The Aramingo Avenue volume is slightly higher with the Build Networks due to the location of the proposed local interchange with Aramingo Avenue in the vicinity of the Frankford Creek. Traffic from the industrial areas in Bridesburg and Tacony will be attracted to this proposed Aramingo Avenue interchange.

There is significantly less assigned traffic with the Pulaski Highway Build Networks on Torresdale Avenue, Orthodox Street, and Bridge Street in this neighborhood. This indicates a diversion of through travel between I-95 and the Roosevelt Boulevard areas to the Pulaski Highway. In addition, since these streets are the major trucking routes through this neighborhood, the Pulaski Highway will significantly reduce truck travel over these narrow streets through the Frankford Valley neighborhood.

(12) Wissinoming

Arterial Streets	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
HARBISON AVENUE				
Bridge-Torresdale	16,400	28,300	28,300	26,200
Torresdale-Levick	19,200	26,500	26,500	21,400
TORRESDALE AVENUE	N.A.	17,500	14,500	14,500
TACONY-STATE ROAD	20,800	24,700	23,600	24,400
LEVICK STREET				
Blvd.-Harbison	17,000	17,600	16,100	16,100
Torresdale-Keystone	N.A.	15,600	12,500	12,500
ROBBINS AVENUE				
Blvd.-Harbison	15,400	16,300	16,100	16,100
Torresdale-Keystone	N.A.	15,600	12,500	12,500
COTTMAN AVENUE	N.A.	26,300	25,200	25,200
TACONY-PALYMRA BRIDGE	73,400	55,400	46,600	46,600

The data in this table indicate there will be less assigned traffic on all of the arterial streets in the Wissinoming neighborhood with the Pulaski Highway Build Networks than with the No-Build Network.

Significant differences between the Build and No-Build conditions will occur on Levick Street, Robbins Avenue, Cottman Avenue and the Tacony-Palmyra Bridge. The traffic on these arterials will be significantly less with the Pulaski Highway Build Networks. This indicates that the Pulaski Highway will divert through trips between the Roosevelt Boulevard and I-95 from the arterial streets in this neighborhood.

In addition, some of the truck traffic presently using the Tacony-Palmyra Bridge, Tacony Street and Harbison Avenue can be expected to divert to the Pulaski Highway and Betsy Ross Bridge because of the improved access to the Betsy Ross Bridge from areas to the west and northwest.

(13) Richmond

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
CASTOR AVENUE	N.A.	15,300	12,500	12,900
RICHMOND STREET				
Fkfd. Creek-Castor	9,200	18,600	12,800	12,800
Castor-Allegheny	10,400	13,400	12,600	12,600
ARAMINGO AVENUE				
Fkfd. Creek-Castor	N.A.	22,800	30,800	30,800
Castor-Allegheny	20,200	24,500	19,200	19,200

The data above indicate there will be significantly less assigned traffic on all of the arterial streets in the Richmond neighborhood with the Pulaski Highway Build Networks than with the No-Build Network except for the section of Aramingo Avenue between Castor Avenue and the Frankford Creek.

Under the Build Network conditions, traffic on the residential section of Aramingo Avenue between Lehigh Avenue and Castor Avenue will be significantly less than with the No-Build Network. The traffic between Castor Avenue and the Frankford Creek through the industrial areas along Aramingo Avenue will be significantly higher with the Build Networks because of the attraction of traffic to the local interchange proposed along Aramingo Avenue in the vicinity of the Frankford Creek. Traffic will be attracted to the proposed interchange along Castor Avenue and Aramingo Avenue.

(14) Bridesburg

Arterial Street	EXISTING ADT	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
RICHMOND STREET	9,200	15,800	12,400	12,400
ORTHODOX STREET	4,100	6,900	5,000	5,000
BRIDGE STREET	N.A.	18,200	16,700	14,800
RICHMOND STREET RAMPS	0	14,800	5,600	5,600

The data above indicate there will be significantly less assigned traffic on all of the arterial streets in the Bridesburg neighborhood with the Pulaski Highway Build Networks than with the No-Build Network.

The main reason for these differences is the inclusion of the Richmond Street Ramps in both the Build and No-Build Network conditions. The traffic volumes on the streets in this neighborhood would increase significantly without the Pulaski Highway due to the attraction of trips destined for the Betsy Ross Bridge to these ramps from the surrounding neighborhoods.

h. Traffic Impact on Roosevelt Boulevard

A comparison of the assigned 1985 volumes on the Roosevelt Boulevard under the Pulaski Highway Build Networks with the Pulaski Highway terminating at Roosevelt Boulevard (Networks C and E) and the No-Build Network (Network A) is shown below: (See Plates 17, 19, 21, 32, and 33).

Section	ASSIGNED 1985 ADT Network A (No-Build)	Network C (Park Align.)	Network E (Adams Ave. Align.)
Devereaux-Oxford	107,600	104,000	105,800
Oxford-Pratt	113,000	107,800	112,400
Pratt-Godfrey	106,600	104,600	117,200
Godfrey-Summerdale	106,600	106,600	121,200

Section	ASSIGNED 1985 ADT Network A (No-Build)	 Network C (Park Align.)	 Network E (Adams Ave. Align.)
Summerdale-Adams	133,600	127,400	154,300
Adams-Whitaker	126,100	128,900	146,900
Whitaker-Pulaski		125.200	
Pulaski-C Street	100,500*	151,400	138,600*
C Street-Rising Sun	113,800	151,400	N.A.
Rising Sun-Mascher	115,300	146,600	N.A.
Mascher-5th Street	117,500	146,600	N.A.
5th Street-Wyoming	114,300	143,800	N.A.
Wyoming-9th Street	118,700	143,800	N.A.

* Whitaker-C Street

Volumes shown between C Street and 9th Street were obtained from the special study performed by the DVRPC along Roosevelt Boulevard. This study compared No-Build Network volumes and Network C volumes only. Traffic projections for Network E between C Street and 9th Street are not available, however, they would be less than the Network C volumes due to the capacity restrains of the existing Roosevelt Boulevard.

A comparison of the assigned 1985 traffic volumes on the Roosevelt Boulevard between the Build Network with the Park Alignment (Network C) and the No-Build Network (Network A), indicates that there will be less traffic on the Boulevard between Adams Avenue and the Northeast section of the city with Network C than with the No-Build Network. This reduction is due to the rerouting of river crossings from the Tacony-Palmyra Bridge to the Betsy Ross Bridge. The rerouting is due to the improved access to the Betsy Ross Bridge from the Northwest Philadelphia area provided by the Pulaski Highway.

Between Adams Avenue and Whitaker Avenue, the assigned 1985 traffic volumes on the Boulevard are slightly higher with Network C than with the No-Build Network. This is due to the re-routing of traffic from the Northwest sections of the city which is destined for the Betsy Ross Bridge and the Delaware Expressway (I-95). With Network C, the portion of this traffic which approaches the study area along Adams Avenue would turn west along Roosevelt Boulevard to reach the Pulaski Highway at F Street. With the No-Build Network this traffic would approach the study area along Adams Avenue and then turn east along the Boulevard and travel through the study area along Adams Avenue, Castor Avenue and Orthodox Street to reach the bridge and I-95. This rerouting is indicated by the lower Network C traffic volumes along Orthodox Street, Adams Avenue and the sections of Castor Avenue not influenced by the local interchanges at Castor Avenue and Wingohocking Street. This rerouting is also indicated by the lower I-95 interchange volumes at Castor Avenue and at Allegheny Avenue.

Between Whitaker Avenue and Rising Sun Avenue, the 1985 traffic volumes along the Boulevard are significantly higher with Network C. This is due to the location of the Pulaski Highway interchange along this section of the Boulevard. The Boulevard acts as a feeder road to this interchange from Whitaker Avenue, Rising Sun Avenue and C Street. The Pulaski Highway also attracts traffic from Northeast Philadelphia which would otherwise turn south along Whitaker Avenue. This rerouting results in more traffic along this section of the Boulevard and a significant decrease in the traffic along Whitaker Avenue.

Between Rising Sun Avenue and 9th Street the 1985 traffic volumesalong the Boulevard are significantly higher with Network C. This increase is due to the attraction of traffic to the Pulaski Highway interchange at F Street. This additional traffic is due to the rerouting of circumferential type trips from the local arterial streets in the study area. This traffic is rerouted to approach the Pulaski Highway along Roosevelt Boulevard instead of travelling through the study area along Wyoming Avenue, Hunting Park Avenue and Erie Avenue. This rerouting is indicated by the reduced traffic volumes on those arterial streets with Network C. In addition, traffic along this section of the Boulevard is increased because of the 6100 additional river crossings that are attracted through the study area by the Pulaski Highway.

A comparison of the assigned traffic volumes between the Build Network with the Adams Avenue alignment (Network E) and the No-Build Network (Network A) indicates that there will be less traffic on Roosevelt Boulevard between Pratt Street and the Northeast section of the city with Network E than with the No-Build Network. This reduction is due to the rerouting of river crossings from the Tacony-Palmyra Bridge to the Betsy Ross Bridge. The rerouting is due to the improved access to the Betsy Ross Bridge from the Northwest Philadelphia area provided by the proposed Pulaski Highway.

Between Pratt Street and Summerdale Avenue the assigned 1985 volumes on the Roosevelt Boulevard are significantly higher with Network E due to the attraction of traffic to the Pulaski Highway interchange at Summerdale Avenue. This increase indicates that traffic destined for the Betsy Ross Bridge and areas along I-95 south of the Pulaski Highway from the neighborhoods in the Northeast section of the city are rerouted from the arterial streets to the Roosevelt Boulevard and the Pulaski Highway. This rerouting is also indicated by the lower assigned volumes along I-95 across Screenline A, the lower assigned volumes on Harbison Avenue and Cottman Avenue and the lower I-95 interchange volumes at Cottman Avenue and Academy Road.

Between Summerdale Avenue and C Street, the assigned 1985 traffic volumes on the Boulevard are significantly higher with Network E due to the attraction of traffic to the Pulaski Highway interchange at Summerdale Avenue. Traffic from the Northwest section of the city which is destined for the Betsy Ross Bridge and areas along I-95 would be attracted to the Pulaski Highway from the local arterial streets. This traffic would approach the Pulaski Highway along Roosevelt Boulevard. This rerouting is indicated by the lower Network E traffic volumes along Orthodox Street, Adams Avenue and the sections of Castor Avenue not influenced by the local interchange at Wingohocking Street.

Between C Street and 9th Street, the 1985 traffic volumes along the Boulevard would be significantly higher with Network E than with the No-Build Network. This is due to the rerouting of circumferential type trips from the local arterial streets in the study area. This traffic is rerouted to approach the Pulaski Highway along Roosevelt Boulevard instead of travelling through the study area along Wyoming Avenue, Hunting Park Avenue and Erie Avenue. This rerouting is indicated by the reduced traffic volumes on those arterial streets with Network E. In addition, traffic along this section of the Boulevard is increased because of the 6100 additional river crossings that are attracted through the study area by the Pulaski Highway.

Traffic on Wyoming Avenue, Hunting Park Avenue and Erie Avenue is higher with Network E than with Network C because of the location of the Pulaski Highway interchange with Roosevelt Boulevard. With Network E, the interchange is located further to the east of Summerdale Avenue and less traffic from these arterial streets is rerouted to approach the Pulaski Highway along Roosevelt Boulevard.

i. Capacity Analysis of the Highway Network

(1) Arterial Street System

As previously discussed, the Pulaski Highway would result in lesser 1985 traffic volumes along the local arterial streets in the study area. These reductions would result in improved traffic flow throughout the study area. This improved traffic flow is indicated by the following comparison of Level of Service at the arterial street intersections in the study area.

The data above indicate that the construction of the Pulaski Highway would result in improved Levels of Service at twenty of the forty-five intersections studied, the same Level of Service at twenty-three of the intersections and a lower Level of Service at two intersections.

One of the two intersections where the Level of Service is lower due to the Pulaski Highway is Summerdale Avenue and Godfrey Avenue. The Level of Service is lowered from Level A (free flow) to Level D (tolerable delay). This lower Level of Service is due to increase volumes on Summerdale Avenue attracted to the Pulaski Highway at the interchange with Roosevelt Boulevard located at Summerdale Avenue. The second intersection where the Level of Service would be lower due to the Pulaski Highway is Adams Avenue and Wingohocking Street where a local interchange with the Pulaski Highway is planned.

(2) Roosevelt Boulevard

As previously discussed, the Pulaski Highway would result in the rerouting of traffic from the local arterial streets. This rerouting concentrates traffic along Roosevelt Boulevard, resulting in increased traffic along the Boulevard between 9th Street and Adams Avenue with Network C and between 9th Street and Pratt Street with Network E.

The increased traffic volume would result in the congestion of the Boulevard if no improvements are made to the capacity of the Boulevard. The 1985 Adopted Regional Transportation Plan for the Delaware Valley Region includes the proposed extension of the Roosevelt Expressway along Roosevelt Boulevard between 9th Street and the Pulaski Highway (Project 11, Plate 4). This proposed extension would consist of the grade separation of the existing six center lanes of the Boulevard. The Boulevard would become a combined arterial expressway facility with a six lane expressway in the center and three lane local service roads on each side.

The Level of Service comparisons along Roosevelt Boulevard in the study area are indicated below:

ROOSEVELT BOULEVARD
CAPACITY ANALYSES COMPARISON
ASSIGNED 1985 TRAFFIC VOLUMES

INTERSECTION	NO BUILD NETWORK EXISTING ROADWAY	BUILD NETWORK EXISTING ROAD	BUILD NETWORK IMPROVED ROADWAY
9th Street	F*	F*	C
5th Street	F*	F*	D
Mascher Street	F*	F*	B
Rising Sun Avenue	F*	F*	D
C Street	F*	F*	A
Whitaker Avenue (South)	F*	F*	A
Whitaker Avenue (North)	F*	F*	C
Adams Avenue	F*	F*	C
Summerdale Avenue	F*	F*	A
Pratt Street	D	F*	A

* intersection failure

The data above indicate a need for improvement of the capacity of the Roosevelt Boulevard. The intersection failures with the No-Build Network indicates that improvements would be needed even if the Pulaski Highway is not constructed. The congestion in 1985 would be more extensive if the Pulaski Highway is constructed and no improvements are made to Roosevelt Boulevard.

The data also indicats that the reconstruction of the center lanes of the Roosevelt Boulevard as express grade-separated lanes would greatly increase the capacity of this major highway. With this increased capacity, the Boulevard would operate at stable flow and free flow conditions even with the increased traffic volumes due to the Pulaski Highway.

(3) Delaware Expressway I-95

As previously discussed, the Pulaski Highway would result in lesser 1985 traffic volumes along the Delaware Expressway. These reductions would result in improved traffic flow along the Delaware Expressway as indicated by the following:

SECTION	NO-BUILD NETWORK NETWORK A 1985 ADT	DHV/CAPACITY (V/C)	BUILD NETWORK NETWORK E 1985 ADT	DHV/CAPACITY(V/C)
Academy-Cottman	184,400	1.08	165,600	0.97
Cottman-Bridge	188,300	1.10	168,800	0.99
Bridge-Aramingo	162,000	0.95	155,200	0.91
Aramingo-Betsy Ross	219,900	1.63	204,900	1.26
Betsy Ross-Castor	228,900	1.63	195,100	1.26
Castor-Allegheny	217,400	1.28	186,000	1.09

The data above indicate that the Pulaski Highway would improve traffic flow along the Delaware Expressway in 1985.

j. Effects of the Richmond Street Ramps

With the Pulaski Highway Build Network, 5600 trips per day in 1985 would utilize the Richmond Street Ramps to the Betsy Ross Bridge. If these ramps were closed to traffic the 5600 trips would redistribute to other bridge approach routes within the study area (See Plates 38 and 39). Approximately 3600 of these trips would reroute to I-95 and the remaining 2000 would reroute to the Castor-Wingohocking local interchanges of the Pulaski Highway.

Traffic on Richmond Street would be reduced by 3000 ADT, traffic along the Delaware Expressway would be increased by 2600 ADT, traffic along the Pulaski Highay would be increased by 2000 ADT and traffic along Castor Avenue would be increased by 800 ADT. These traffic changes would result in improved traffic flow along Richmond Street and increased congestion along Castor Avenue and Wingohocking Street in the vicinity of the local interchanges with the Pulaski Highway. The minor increase in traffic along the Delaware Expressway and the Pulaski Highway would not significantly affect traffic flow on these expressways.

k. Summary

In summary, traffic and congestion can generally be expected to be greater on local neighborhood streets due to the No-Build alternative as compared to conditions if the Pulaski Highway is built. Plate 76 indicates roads in the area which will experience more traffic with the No-Build Alternative than with the Pulaski Highway Build Alternative.

B. SECONDARY IMPACTS

1. General

Impacts associated with secondary actions may be significant due to their impacts on existing community facilities and activities, due to their induction of new facilities and activities, or due to changes in natural conditions. These impacts are discussed in Section II (Land Use Planning), Part A of this section, and Section IV (Alternatives).

The following paragraphs discuss specific secondary impacts on Roosevelt Boulevard.

2. Impacts on Roosevelt Boulevard

a. General

During the course of the Environmental Impact Statement studies, it became more evident that certain secondary impacts would result to Roosevelt Boulevard due to the proposed Pulaski Highway Build Alternates, as well as, to any No-Build decision. Several individuals suggested that the EIS study limits be extended to include Roosevelt Boulevard between 9th Street and the proposed Pulaski Highway.

The present EIS study limits (Delaware Expressway to Roosevelt Boulevard) are on extension of the previous limits (Leiper Street to Roosevelt Boulevard) based upon the reassessment process. The FHWA Federal-Aid Highway Program Manual (FHPM) Volume 7, Chapter 7, Section 2 states that the EIS should be written for the "total highway section". "Highway Section" is defined as "a highway development proposal between logical termini (population centers, major traffic generators, major crossroads, etc.) as normally included in a location study or multi-year highway improvement program." The Delaware

Expressway and Roosevelt Boulevard are "major crossroads" and are the limits of the combined EIS and design location study being performed for the Pulaski Highway. Prior to any improvement to Roosevelt Boulevard, corridor and design location studies and related environmental studies would be required. This highway development proposal is a separate highway section on both the Pennsylvania Department of Transportation and Delaware Valley Regional Planning Commission's Adopted Plans.

Based on the above facts, it was determined that the existing EIS limits should remain, but that secondary environmental effects upon Roosevelt Boulevard such as change in traffic volumes or patterns should be discussed. It was likewise determined that the EIS should include available information concerning long range possibilities for future improvements on the Boulevard and their likely effects upon the proposed Pulaski Highway. All alternatives within the Roosevelt Boulevard corridor are not unknowingly precluded by the Pulaski Highway.

The following discussion outlines the secondary effects on Roosevelt Boulevard.

b. Traffic Impact of Build and No-Build Alternates on Roosevelt Boulevard

This is discussed in detail previously in this section.

c. Noise Impact

Calculations of 1985 L_{10} noise levels were made for residences along Roosevelt Boulevard in the vicinity of Rising Sun Avenue for the year 1985 assuming the following design configurations and using the Transportation Systems Center (TSC) method of predicting noise levels.

(1) Roosevelt Boulevard as it exists today with two three-lane directional express (inner) roadways and two local (outer) roadways, one

with three lanes (peak travel direction) and one with two lanes (off peak travel direction). At-grade operation exists for both the express and local roadways. (No Pulaski Highway, ADT = 115,300).

(2) Same as 1 but with the Pulaski Highway assumed in operation (ADT = 138,900).

(3) The grade-separation and depression of the express roadways with the local (outer) roadways basically the same as presently exist. The Pulaski Highway is assumed in operation (ADT = 146,600).

Results of the noise analysis indicate that the exterior noise levels at homes along Roosevelt Boulevard in the vicinity of Rising Sun Avenue will be lowest if the express lanes and the Pulaski Highway are constructed (84 dBA). If the express lanes are not in operation in 1985 and the Pulaski Highway is in operation, the noise level will be 88 dBA. If neither the express lanes or the Pulaski Highway are in operation in 1985, the noise level will be 85 dBA.

d. <u>Air Quality Impacts</u>

Carbon monoxide (CO) concentrations were predicted for homes along Roosevelt Boulevard in the vicinity of Rising Sun Avenue for the year 1985 for the three (3) design configurations discussed in the "noise levels" section. These predictions assumed the same peak hour traffic conditions as those used in the noise analyses and "worst case" meteorological conditions (1 meter per second wind speed, stability Class F, wind a very slight angle with roadway). The California Line Source Diffusion Model was used.

Results of this analysis indicate that one-hour carbon monoxide concentrations would be lowest with no Pulaski Highway and no Roosevelt Boulevard express lanes (approximately 8 parts per million (ppm). With both the Pulaski Highway and the Roosevelt Boulevard express lanes in operation the carbon monoxide concentrations would be approximately 9 ppm. With the Pulaski Highway in operation, but with no express lanes, the carbon monoxide concentrations would be on the order of 11 ppm. These values are all peak one hour predictions of concentrations emitted by Rosoevelt Boulevard only. The one hour standard is 35 ppm.

e. Design Feasibility

The feasibility of construction of the six center lanes on the Roosevelt Boulevard as a grade separated expressway was investigated by the Pennsylvania Department of Transportation. The line and grade studies have led to the conclusion that the construction of this facility is feasible. Typical roadway sections along the Roosevelt Boulevard indicating this proposed expressway are shown on Plates 77 and 78. The facility was estimated to cost $52 million (1974 prices) and costs for this expressway were included in the highway costs of the road user benefits/cost economic analysis.

Detailed consideration was given to the intersection of Roosevelt Boulevard with Adams and Whitaker Avenues because the Pulaski Highway ramps would terminate near this location. The grade separation of the center lanes of the Boulevard through this intersection was investigated as shown on Plate 79. The high traffic volumes projected along these arterial streets would necessitate the grade separation of these series of intersections with or without the Pulaski Highway. If the Pulaski Highway is constructed special consideration should be given to the implementation of this improvement at the same time. The improvement would assure proper traffic flow through the interchange area and the implementation at the same time as the Pulaski Highway would minimize disruption in access and access related economic impacts to the commercial properties in this area. The improvement is estimated to cost approximately $5 million.

f. <u>Land-Use Impacts</u>

Improvements to the Roosevelt Boulevard can be accomplished within the existing 300 feet right-of-way and would require little, if any, additional right-of-way.

g. <u>Conclusions</u>

These analyses indicate that the proposed Roosevelt Boulevard Extension between 9th Street and the Pulaski Highway is a vital link in the highway system in Northeast Philadelphia. Its construction is economically and engineeringly feasible and would have minimal adverse effects because no additional properties would be required. It would amount to an improvement of an existing high volume transportation facility and would be compatible with the proposed extension of the Broad Street Subway. Construction of such a project is supported by six legislative leaders representing the area (See petition in the Appendix, page 1).

C. <u>MITIGATION</u>

The comprehensive regional development plan in itself is an attempt to improve, guide or minimize harm from development, consequently, the plan,which includes the proposed Pulaski Highway,provides regional guidelines for governmental investment in highways, public transportation, water supply, sewage disposal, conservation, and recreational facilities throughout the Delaware Valley over the next several years. The plan, therefore, attempts to minimize the cost to local tax payers of investments in major public facilities which will be needed to accommodate people by 1985. The plan also attempts to protect the environment from the polluting and blighting effects of rapid urban expansion.

Designs of the alternate alignments of the Pulaski Highway were prepared in a manner to avoid, as much as possible, adverse effects to the surrounding areas. Consequently, the highway design incorporates structures such as elevated viaducts and retaining walls over much of its length. Nevertheless, there are instances where adjacent properties will be adversely affected. Where possible, plantings and landscaping will be incorporated to provide a visual barrier between the highway and the adjacent land use. This can be more easily accomplished where the facility is depressed, however, the provision of visual barriers becomes very difficult and in many cases impossible with an elevated highway.

If the facility is built, various parts of the proposed facility would be constructed as an elevated bridge leaving open space under the highway. These areas can be used as small recreational facilities or as park and ride lots for people who will need parking in order to utilize area mass transit. Fringe area parking lots are not presently being considered for this area due to the limited amount of available open land in the area. A fringe area parking lot within the corridor, however, should not be foreclosed if in the future the practical use of such a facility is deemded necessary.

People and businesses required to relocate due to highway construction can suffer from the disruption of their daily routines and ways of life. The Department's relocation procedures and supplemental payment program are rated amongst the fairest in the country, and are aimed at ensuring that those relocated are not adversely affected from a financial aspect. The Pennsylvania Department of Transportation publication (Bulletin 47) has been distributed to many individuals. Included within this document is information regarding payment procedures for moving costs, replacement housing, mortgage interest rate differentials, closing costs and appeal procedures.

Northeast Catholic High School is also in the area of the proposed highway. School personnel have recently shown concern that a retaining wall, which protects their gymnasium from water seepage might be cracked during construction. In response to this potential problem, special provisions should be incorporated into the construction plans.

If ramps are connected to the proposed facility at Wingohocking Street a traffic hazard may occur as a result of the increased traffic entering and leaving the highway. Lower speed zones should be enforced on these approach or exit roads to ensure neighborhood safety. These same safety mechanisms should be employed near any playground, school, or nursing home in close proximity to a ramp.

The use of overpasses for people who must cross dangerous intersections are contemplated for this project. A pedestrian overpass can be provided specifically for people going to the synagogue, school and church on the west side of the Boulevard from the east if Alignment D is chosen. An overpass should be constructed in this area even though some children may find a quicker route. Pedestrian ramps will be provided in place of stairs where feasible to accommodate elderly and handicapped people.

Regarding air quality in the area, mitigation will be implemented by the Pennsylvania State Implementation Plan which was promulgated by the U.S. Environmental Protection Agency. All air quality violations predicted for 1980 will be reduced and finally eliminated in 1983 by the reduction in vehicular emissions proposed in the Plan. Administrative agreements with air pollution control agencies which would either limit the use of the highway during worst case meteorological conditions or delay the opening of the highway until all violations of the Ambient Air Quality Standards have ceased are also possible.

As previously explained, elevated viaducts and retaining walls are incorporated into much of the Build Alternatives. Extensive use of these structures lends itself to two types of noise abatement strategies, one for elevated sections and one for depressed sections. For the elevated section the strategy of constructing a six-foot high barrier* on top of the parapet was analyzed. Specific noise level reduction results as compared to no barrier can be found in the separate Noise Report. For the depressed section the combination of baffling the far side retaining wall and raising the near side retaining wall several feet was analyzed as an abatement strategy. The effectiveness of this abatement strategy is also illustrated in the Noise Report.

Where the Pulaski Highway is proposed to be constructed through Tacony Creek Park, noise berms (earth mounds) are feasible in many locations. Should Alternate D be selected as the recommended alignment, detailed design of these berms would be performed and their impacts upon other environmental factors weighed.

Tree screens may also be used for noise abatement, however, to be effective the trees must be dense and wide. Evergreens such as the douglas fir, hemlock and white pine are the best trees for noise abatement, however, these trees are relatively slow growing and the planting of large trees appears to be economically and physically unfeasible. Psychologically, however, the planting of trees has a significant effect in making the road's presence much more acceptable. In conclusion, if mitigation is not effective in reducing highway noise the specific receptor can be condemned for highway purposes. This type of action, however, would only be implemented after neighborhood consultation.

Construction noise abatement techniques will be implemented during the building of the Pulaski Highway. The most effective technique employed would

* Six foot was assumed as the maximum practicable extension height based on barriers discussed in Volume Two of the FHWA publication entitled "Fundamentals and Abatement of Highway Traffic Noise", April, 1974.

be the installation of muffling systems on construction equipment. Another method which should be employed is the phasing of construction operations and limiting the number of equipment operating at the same time. Construction phasing in or around sensitive receptors, such as at Northeast Catholic High School would also inhibit unnecessary noise. To supplement this abatement, on site noise monitoring of equipment should be undertaken in order to determine if FHWA recommended levels are being exceeded.

If the Park alignment is chosen, great care should be taken in order to minimize the impact on the Tacony Creek Park during construction. The Pennsylvania Department of Transportation erosion and sedimentation controls and procedures would be implemented. More specifically, these plans call for early seeding to stablize recently opened and contoured areas which are relatively devoid of vegetation. They also call for the use of sedimentation ponds and their periodic cleaning, hay bales and the development of specific erosion control plans aimed at controlling sedimentation discharges into any Creek. These controls would not be 100 percent effective, however, they should greatly reduce erosion and sedimintation impacts.

Additional plans to minimize harm to the park were developed for the original highway design by George E. Patton Inc., Landscape Architects. These plans were developed in order to mitigate the impact of the original alignment truncating the existing trail system in the park. The plan developed new access to those remaining sections by providing a trail relocation system. This new access, however, would result in the depletion of an additional 4.9 acres (5%) of land from the Tacony Creek Park.

Specific environmental recommendations to avoid or minimize harm caused by any alternates are as follows:

1. A vegetation screen along the right-of-way for any alternate will be considered in order to reduce the visual and acoustic effects in the remaining sections of any parklands.

2. If the Tacony Park alternate is chosen, and the trails in the Park must be relocated, care will be taken to insure that these trails are buffered from both the Pulaski and the surrounding urban area, and that remaining vegetation is not harmed.

3. The shielding of pole lighting will be implemented in order to reduce lamp light spillage into the adjacent wildlife habitats.

4. No fences will be erected to enclose the areas beneath elevated sections of any alternate in or near the Tacony-Frankford Creek. This will permit the continued movement of wildlife in the study area. However, in depressed areas fencing will be provided in order to minimize the likehood of wildlife-motor vehicle collisions.

5. If any of the alternates are chosen which traverses Greenwood Cemetery or the grounds of Friends Hospital, landscaping with native plant species will be undertaken in order to shield these areas from the immediate surroundings.

6. Excavated materials will be disposed of at an approved site where no damage to existing soils or vegetation will result. Excavated areas will immediately be seeded upon work completion in order to stabilize the soil.

7. All supportive construction activities will be prohibited from forest and scrub habitats. In felling trees, care will be taken to avoid injuring any surrounding vegetation. Plantings will be undertaken in all open space ares in order to stabilize the soils, to beautify the area and to provide useful wildlife food and cover.

8. Care will be taken during the installation of bridge supports in compliance with Department standards to avoid the inwash of sediment from entering the Tacony-Frankford Creek.

9. Care will also be taken during construction to avoid gasoline, oil and cement spillage.

10. Where possible, storm sewers will be designed to discharge into the stream where the grade, banks, and bottom are stable. Energy dissipators would be used to reduce the force of flow at points of discharge.

11. Storm drains used along viaduct sections that drain into the Frankford Creek may not prevent sediment, litter, and other debris from reaching the stream. Consequently, the feasibility and practicality of providing small catch basins will be explored in order to contain such materials.

12. The feasibility of providing lighting under the bridge to induce vegetative growth will also be explored before any implementation of the Build decision.

If the Pulaski Highway is built Archaeological or Paleontological remains may be uncovered. If these remains or artifacts are encountered, the construction in this locality will be temporarily discontinued. The Pennsylvania Historical and Museum Commission will then be contacted and a decision would be made as to these remains' or artifacts' final excavation and disposition.

SECTION IV

ALTERNATIVES

A. DESCRIPTION OF ALTERNATIVES

1. Alternate Highway Alignments

a. General

In the following discussion the alternate highway alignments are described in detail and various types and locations of interchanges are discussed. It is important to realize that the types and locations of interchanges shown with one alternate are compatible with other alternates. The elimination and/or addition of some interchanges is also possible.

The mass transit network considered with the Build Alternatives is the 1985 Adopted Regional Commuter Railroad Network and the 1985 Adopted Regional Subway-Elevated and Rapid Transit Network. These mass transit networks include the following planned facilities:

(1) The extensions of the Lindenwold High Speed Line in New Jersey.

(2) The Northeast Extension of the Broad Street Subway to Rhawn Street.

(3) The Commuter Rail Connection in Center City.

The highway traffic projections prepared for these Build Alternates considered ridership on the existing and proposed mass transit facilities in the region.

b. Interchange Locations and Types

The possible locations of interchanges along the Pulaski Highway were determined by the proposed functions that the highway is planned to serve.

High design type interchanges are planned at the Roosevelt Boulevard (U.S. Route 1) and at the Delaware Expressway (Interstate Route 95) to accommodate high volume traffic interchange movements at these major radial highway facilities that would be linked by the Pulaski Highway.

Three alternative types of interchanges at Roosevelt Boulevard were developed for four of the Build Alternates which meet the Boulevard in the vicinity of Summerdale Avenue. The first type of interchange is a double loop type which consists of two cloverleaf type loop ramps on the north side of Roosevelt Boulevard and two direct ramps on the south side of the Boulevard. The second type of interchange is a semi-directional type which consists of three direct ramps connecting to the Boulevard and one cloverleaf type loop ramp on the north side of Roosevelt Boulevard. The third type of interchange is a directional type which consists of four direct ramps connecting to the Roosevelt Boulevard. This directional type interchange limits or eliminates the acquisition of properties on the north side of Roosevelt Boulevard for the interchange ramps. Each of these Roosevelt Boulevard interchanges is discussed in conjunction with the descriptions of the Build Alternates to which they apply.

The high design type of interchange planned at the Delaware Expressway is presently under construction. Construction of the portion of the interchange providing ramp connections between the Betsy Ross Bridge and the Delaware Expressway will be completed by June, 1976. No alternative type of interchanges at this location were studied because of the physical constraints resulting from the present construction.

Low design type interchanges are planned at Aramingo Avenue and are possible in the Wingohocking Street-Castor Avenue vicinity to facilitate local travel demands in the area through which the Pulaski Highway passes. The planned interchange at Aramingo Avenue is located in the middle of a large tractor trailer truck terminal area as shown on Plate 75. This interchange would provide quick access for truck travel between Roosevelt Boulevard and these truck terminals. By providing this access at this location, tractor trailer truck volumes along the north-south arterial streets between Roosevelt Boulevard and Aramingo Avenue would be reduced. In addition, access to the industrial districts in the vicinity of these ramps would be greatly improved and many of the home to work trips presently made by employees in these districts on the north-south arterials connecting to Roosevelt Boulevard would be diverted to the Pulaski Highway.

An interchange in the Wingohocking Street-Castor Avenue vicinity would provide improved access to and from the Delaware Expressway and the Betsy Ross Bridge for the residents and employees in the local area. A large industrial area is located approximately 5000 feet to the west of this interchange area. Many of the home to work trips of the employees in this area would be attracted to this interchange and diverted from the north-south arterial streets connecting to Delaware Expressway interchanges. In addition, a large number of local area residents would use this interchange to gain quicker access to places of employment located along the Delaware Expressway and in New Jersey.

The local interchanges are proposed to make the places of employment in the study area more easily accessible for the large inflow of workers and to make other employment areas more easily accessible for study area residents. The locations of the industrial centers and truck terminal areas are indicated on Plate 51.

c. Description

The seven Build Alternate alignments developed by PennDOT engineers for this project are shown on Plate 7. Between the Delaware Expressway and Leiper Street only one Build Alternate was considered. The final design plans have been prepared based on formal approvals by the FHWA of the line grade and typical sections for this section of the Pulaski Highway (Section C). In addition, some right-of-way has already been acquired and some of the homes and commercial-manufacturing buildings have been demolished for the construction of this section of the highway. The Section C alignment joins the Section B Build Alternate alignments at Leiper Street, approximately 1000 feet north of Kensington Avenue. Between Leiper Street and Roosevelt Boulevard seven Build Alternate alignments were studied and evaluated in detail.

In addition to these seven Build Alternate alignments developed by PennDOT, four alternates for the entire project were suggested for evaluation by civic groups in the study area. All four of these proposed alternates were found to be infeasible to design and construct, therefore, they were not evaluated in as much detail. These four proposed alternates are discussed in part A3 of this section.

(1) Section Between Delaware Expressway and Leiper Street (Section C Common to All Build Alernates) (See Plates 80 through 90)

The Pulaski Highway Build Alternate for Section C begins at the Delaware Expressway in the vicinity of the Frankford Creek approximately one mile north of the Delaware River, and extends north to Leiper Street where it connects to the Build Alternates developed for Section B.

The alignment of Section C begins at the interchange with the Delaware Expresway, and continues north on an elevated bridge section (viaduct) for its entire length to Leiper Street. Section C passes over the piggy-back truck loading yard of the Penn Central Railroad and then over Aramingo Avenue. Local access to and from the Pulaski Highway north of Aramingo Avenue is provided via a local half-diamond interchange with ramps connecting to Aramingo Avenue.

The alignment continues north on viaduct passing over the freight yards of the Penn Central Railroad, the Frankford Creek and Frankford Avenue. Between Aramingo Avenue and Frankford Avenue the adjacent land uses are mainly industrial-manufacturing sites and railroad yards. (See Plates 57 and 58).

North of Frankford Avenue, the Pulaski Highway continues on viaduct passing over Torresdale Avenue, the Frankford Creek, Worrell Street, and Kensington Avenue. The highway is on a high viaduct through this area because it crosses over the Frankford Elevated rail mass transit line which itself is elevated on a viaduct over Kensington Avenue. During the design phase of the development of the plans for Section C, several alternative designs to accommodate the crossing of the Frankford Elevated were investigated in detail. The original proposal was to pass under the Frankford Elevated which would require the closing of Kensington Avenue between Hunting Park Avenue and Deal Street. In March of 1968, three alternative designs to cross the Frankford Elevated without closing Kensington Avenue were investigated in response to testimony received at the Public Hearing conducted in February, 1968. The studies considered splitting Kensington Avenue and lowering the grade of the the Frankford Elevated through the median area, the raising of the grade of the Pulaski Highway to pass over the Frankford Elevated at its existing grade, and the relocation of Kensington Avenue to pass over the Pulaski Highway along the north side of the Frankford Elevated. These studies resulted in the present design crossing over the existing grade of the Frankford Elevated because the schemes to relocate Kensington Avenue would require additional housing and business relocations, would be more expensive to construct, and would result in the disruption of service on the Frankford Elevated.

After crossing over the Frankford Elevated rail mass transit line the alignment begins to descend on a viaduct and crosses over the Frankford Creek, Deal Street, and Adams Avenue and then connects to the Section B Build Alternates at Leiper Street. Adams Avenue would be relocated under the viaduct between Penn Street and Leiper Street and a short connecting street between Adams Avenue and Deal Street is also planned to pass under the viaduct approximately 150 feet north of Penn Street.

The construction of Section C of the Pulaski Highway would not require the closing of any existing streets.

(2) <u>Section Between Leiper Street and Roosevelt Boulevard (Section B)</u>

(a) <u>Alternate A-1</u> (See Plates 91 through 101)

Beginning at Leiper Street, Alternate A-1 continues north to Roosevelt Boulevard along an alignment parallel and just to the west of Adams Avenue. This alternate was developed to represent the alternative route proposed by the City Planning Commission in 1966 and evaluated in previous alignment studies performed by Urban Engineers, Inc.

The alternate continues on viaduct north of Leiper Street and crosses over Adams Avenue, the Frankford Creek, and Wingohocking Street. Relocated Adams Avenue, under the viaduct, continues from Leiper Street to Ruan Street and a minor relocation of Frogmoor Street near O Street is required.

A local half diamond type interchange is shown at Wingohocking Street with this alternate. Access to and from the Pulaski Highway south of Wingohocking Street is provided via Ramp A from Wingohocking Street near Frogmoor Street and Ramp B to Adams Avenue at Wingohocking Street. Adams Avenue is split into two separate one way roadways between Ruan Street and Wingohocking Street to accommodate the traffic from Ramp B to Adams Avenue. The northbound traffic on Adams Avenue would utilize the existing street and the southbound traffic would utilize a new roadway.

The alternate continues north of Wingohocking Street on viaduct for approximately 400 feet and then changes to a section of embankment with a retaining wall on the east side and open slopes on the west side for approximately 200 feet. Following this short embankment section, the alignment continues below ground level in a section with retaining walls on both sides to Roosevelt Boulevard. The Pulaski Highway passes under Ramona Avenue which is kept open with bridges over the Pulaski Highway.

The Northwood Nursing Home is located adjacent to the Pulaski Highway as it passes under Castor Avenue and the highway passes through Greenwood Cemetery lands between Castor Avenue and Ramona Avenue. Access through Greenwood Cemetery over the Pulaski Highway is provided via a bridge along the alignment of the existing main road in the cemetery.

The interchange with Roosevelt Boulevard is in the area between Ramona Avenue and the Reading Railroad's Frankford Branch freight line in the vicinity of the intersection of Roosevelt Boulevard and Summerdale Avenue. A full interchange which provides for all movements between Roosevelt Boulevard and the Pulaski Highway is planned with the Pulaski Highway ramps passing under the Roosevelt Boulevard. The interchange indicated on the plans for this alternate is a double loop type interchange with two cloverleaf type ramps on the north side of Roosevelt Boulevard and two direct type ramps on the south side of the Boulevard as shown on Plate 94. The Pulaski Highway interchange ramps would pass through lands of Oakland Cemetery and Ramp C would require a small portion of the lands of Friends Hospital along Roosevelt Boulevard.

The construction of this alternate would not require the closing of any of the main arterial streets in the study area and access to the Roosevelt Boulevard from these main arterials would not be eliminated. Where main arterials streets are crossed they would be kept open by allowing sufficient openings under viaduct sections, by providing bridges over depressed sections or by relocating the arterial.

The construction of the double loop type of interchange requires the relocation of Adams Avenue and Summerdale Avenue between Ramona Avenue and the Reading Railroad and the relocation of the lanes of the Roosevelt

Boulevard. Alternate A-1 with the Roosevelt Boulevard interchange indicated on Plate 94 would also require the closing of Fillmore Terrace and the relocation of Foulkrod Street on the north side of Roosevelt Boulevard. Direct access on the south side of Roosevelt Boulevard from Ramona Avenue, Foulkrod Street, and Fillmore Street would be eliminated. Access to the Boulevard from Langdon Street would remain in both directions.

An alternate type of interchange for the Pulaski Highway Alternate A-1 at Roosevelt Boulevard is shown on Plate 102. This is a semi-direction type of interchange with one cloverleaf type loop ramp on the north side of Roosevelt Boulevard. With this interchange the northbound lanes of the Pulaski Highway would be elevated over Ramona Avenue and ramps from these lanes would connect directly to the Roosevelt Boulevard.

This alternate interchange would allow for continued direct access along the south side of Roosevelt Boulevard from Ramona Avenue, Foulkrod Street, and Fillmore Street. In addition, Fillmore Terrace and the apartment building located north of Roosevelt Boulevard would remain.

(b) <u>Alternate A-2</u> (See Plates 103 through 113)

Beginning at Leiper Street. Alternate A-2 continues north to Roosevelt Boulevard along the same horizontal alignment as Alternate A-1 parallel to and just west of Adams Avenue. This alternate, however, continues on a viaduct section for its entire length from Leiper Street to Roosevelt Boulevard. This alternate was developed to evaluate the differences in impacts between a depressed alignment and an elevated alignment for the Pulaski Highway.

The alternate continues on viaduct north of Leiper Street crossing over Adams Avenue, Frankford Creek, and Wingohocking Street. Relocated Adams Avenue, under the viaduct, continues from Leiper Street to Ruan Street. Alternate A-2 continues north on viaduct parallel to Adams Avenue crossing over Orthodox Street, Castor Avenue and Ramona Avenue.

The local interchange for this alternate is located in the section between Wingohocking Street and Orthodox Street. The interchange is a modified half diamond type which would provide access to and from the Pulaski Highway south of Orthodox Street. The interchange ramps connect to the existing three legged intersection of Castor Avenue and Wyoming Avenue. This intersection is presently a small traffic circle and would be converted to a normal four legged signalized intersection to accommodate the Pulaski Highway ramps.

This type of local interchange at Wyoming Avenue and Castor Avenue could also be applied to Alternate A-1 in place of the local interchange indicated at Wingohocking Street with that alternate. Conversely, the half diamond type interchange at Wingohocking Street could also be applied to Alternate A-2 in place of the interchange connecting to Wyoming Avenue and Castor Avenue.

North of Ramona Avenue, the Pulaski Highway interchanges with Roosevelt Boulevard in the area between Ramona Avenue and the Reading Railroad's Frankford Branch freight line in the vicinity of the intersection of Roosevelt Boulevard and Summerdale Avenue. A full interchange which provides for all movements between Roosevelt Boulevard and the Pulaski Highway is planned with the Pulaski Highway ramps passing over the Roosevelt Boulevard. The interchange indicated on the plans for this alternate is a double loop type interchange with two cloverleaf type ramps on the north side of Roosevelt Boulevard and two direct type ramps on the south side of the Boulevard as shown on Plate 106.

The construction of this alternate would not require the closing of any of the main arterial streets in the study area and access to the Roosevelt Boulevard from these main arterials would not be eliminated. Where main arterials are crossed they would be kept open by allowing sufficient openings under viaduct sections or by relocating the arterial.

The construction of the double loop type of interchange requires the relocation of Adams Avenue and Summerdale Avenue between Ramona Avenue and the Reading Railroad and the relocation of the lanes of the Roosevelt Boulevard. Access to the Roosevelt Boulevard from Ramona Avenue, Foulkrod Street, and Fillmore Street on the south side of the Boulevard would remain due to the ability to connect Ramp D into the interior lanes of the Boulevard. Alternate A-2 with this Roosevelt Boulevard interchange would also require the closing of Fillmore Terrace and the relocation of Foulkrod Street on the north side of Roosevelt Boulevard. Access to Roosevelt Boulevard from Langdon Street would remain in both directions.

An alternate type of interchange for the Pulaski Highway Alternate A-2 at Roosevelt Boulevard is shown on Plate 114. This is a directional type of interchange with all ramps connecting directly to the inner lanes of the Roosevelt Boulevard. With this type of interchange, Foulkrod Street and Fillmore Terrace and the homes and apartments along these streets north of Roosevelt Boulevard would remain.

(c) Alternate B (See Plates 115 through 125)

Beginning at Leiper Street, Alternate B continues north to Roosevelt Boulevard on an alignment generally parallel to Adams Avenue but more to the west of Adams Avenue than the A-1 and A-2 alternates. This alternate was developed as a modification of the A Alternates to avoid passing through the front sections of the Oakland and Greenwood Cemeteries.

The alternate continues on viaduct north of Leiper Street and crosses over Adams Avenue, the Frankford Creek, and Wingohocking Street in the same general area as the A Alternates. A minor relocation of Frogmoor Street near O Street is required in this area. North of Wingohocking Street, the alternate curves toward the northwest and continues on viaduct for approximately 500 feet. It then changes to a depressed section and continues below ground level with a retaining wall in the east side and open slopes in the west side to Castor Avenue.

A local half diamond type interchange is indicated at Castor Avenue with this alternate. Access to and from the Pulaski Highway south of Castor Avenue is provided via Ramps A and B which connect to Castor Avenue between Wyoming Avenue and Orthodox Street. The intersection of Castor Avenue and Wyoming Avenue would be modified to eliminate the present traffic circle and allow for left turns from Castor Avenue onto Ramp A. The half diamond type of local interchange connecting to Wingohocking Street described with Alternate A-1 could be applied to Alterante B in place of this local interchange connecting to Castor Avenue.

After passing under Castor Avenue, the alternate continues north in a depressed section below ground level between retaining walls. It passes through the middle of Greenwood Cemetery and then under Ramona Avenue. Ramona Avenue and Castor Avenue are kept open with bridges over the Pulaski Highway. North of Ramona Avenue, Alternate B separates and the northbound lanes gradually rise higher than the southbound lanes as the highway approaches the interchange with Roosevelt Boulevard. The alternate is contained between retaining walls as it passes through lands of Oakland Cemetery in the section between Ramona Avenue and the Roosevelt Boulevard.

The interchange with Roosevelt Boulevard is in the area between Ramona Avenue and the Reading Railroad's Frankford Branch freight line in the vicinity of the intersection of Roosevelt Boulevard and Summerdale Avenue.

The Pulaski Highway interchange ramps would pass through the lands of Oakland Cemetery and Ramp C would require a corner of the lands of Friends

Hospital and some frontage lands of the hospital along Roosevelt Boulevard.

A full interchange which provides for all movements between Roosevelt Boulevard and the Pulaski Highway is planned. The northbound ramps of the Pulaski Highway would pass over the Roosevelt Boulevard, while the southbound ramps would pass under the Boulevard. The interchange indicated on the plans for this alternate is a semi-directional type interchange with three ramps connecting directly to the Roosevelt Boulevard and one cloverleaf type loop ramp on the north side of Roosevelt Boulevard as shown on Plate 118.

The construction of this alternate would not require the closing of any of the main arterial streets in the study area and access to the Roosevelt Boulevard from these main arterials would not be eliminated. Where main arterials are crossed they are kept open by allowing sufficient openings under viaduct sections, by providing bridges over depressed sections or by relocating the arterial.

The construction of this type of interchange requires the relocation of Summerdale Avenue between Roosevelt Boulevard and the Reading Railroad and the relocation of the lanes of the Roosevelt Boulevard. Access to Roosevelt Boulevard from Ramona Avenue, Foulkrod Street, and Fillmore Street would remain due to the ability to connect Ramp D to the inner lanes of the Boulevard. On the north side of Roosevelt Boulevard, Foulkrod Street would be relocated and Fillmore Terrace would remain open and connected to both Summerdale Avenue and Roosevelt Boulevard.

Alternate B with the semi-directional type interchange indicated on Plate 118 would require the relocation of Foulkrod Street on the north side of Roosevelt Boulevard, however, direct access from Langdon Street to the Roosevelt Boulevard would remain in both directions.

An alternate type of interchange for the Pulaski Highway Alternate B at

Roosevelt Boulevard is shown on Plate 126. This is a double loop type interchange with two cloverleaf type loop ramps on the north side of Roosevelt Boulevard and two direct type ramps on the south side of the Boulevard. With this interchange the Pulaski Highway ramps would pass under the Boulevard. This interchange would require the closing of Fillmore Terrace and the relocation of Foulkrod Street on the north side of Roosevelt Boulevard.

A third type of interchange for the Pulaski Highway Alternate B at Roosevelt Boulevard is shown on Plate 127. This is a directional type of interchange with all ramps connecting directly to the inner lanes of the Roosevelt Boulevard. With this alternate interchange, the residences and apartment buildings along the north side of Roosevelt Boulevard would remain and Langdon Street, Foulkrod Street, and Fillmore Terrace would remain open at their present locations.

(d) Alternate C (See Plates 128 through 139)

Beginning at Leiper Street, Alternate C continues north to Roosevelt Boulevard along a looping alignment which passes through Greenwood Cemetery and then curves around the southern and western boundaries of Oakland Cemetery. This alternate was developed as a modification of the A Alternates in an attempt to minimize the impacts on the cemteries by passing through the back sections of Greenwood Cemetery and following the boundaries of Oakland Cemetary.

The alternate continues on viaduct north of Leiper Street and crosses over Adams Avenue, the Frankford Creek, and Wingohocking Street in the same general area as the A and B Alternates. A minor relocation Frogmoor Street near O Street is required in this area. North of Wingohocking Street, the alternate curves toward the west and continues on a viaduct for approximately

500 feet. It then changes to a depressed section and continues below ground level with a retaining wall on the east side and open slopes on the west side to Castor Avenue.

The local interchange planned for this alternate is split with one diamond type on-ramp at Wingohocking Street and one diamond type off-ramp at Castor Avenue. Access to and from the Pulaski Highway south of Castor Avenue would be provided by these ramps.

This split type of local interchange was developed to show that the locations of these local ramps are flexible. This split type of interchange could be applied to the A-1, A-2 and B Alternates also. In addition, any one of the local interchanges shown on the plans for those three alternates could be applied to Alternate C in place of this split type of local interchange.

After passing under Castor Avenue, the alternate continues west in a depressed section below ground level between retaining walls. It passes through the rear section of Greenwood Cemetery and then under Ramona Avenue. Ramona Avenue and Castor Avenue are kept open with bridges over the Pulaski Highway and Fishers Lane is relocated for a short distance at Ramona Avenue. North of Ramona Avenue, Alternate C continues in a depressed section between retaining walls and curves to the north as it passes along the southern and western boundaries of Oakland Cemetery through the Lands of Friends Hospital. As the alternate approaches Roosevelt Boulevard, the northbound lanes gradually rise higher than the southbound lanes.

The interchange with Roosevelt Boulevard is in the area between Ramona Avenue and the Roosevelt Boulevard in the vicinity of the intersection of Roosevelt Boulevard and Summerdale Avenue. A full interchange which provides for all movements between Roosevelt Boulevard and the Pulaski Highway is planned. The interchange indicated on the plans for this alternate is a directional type interchange with all ramps connecting to the inner lanes of the Roosevelt Boulevard as shown on Plate 131.

The Pulaski Highway interchange ramps would pass through lands of Friends Hospital and the northern corner of Oakland Cemetery. Access to Roosevelt Boulevard from Ramona Avenue, Foulkrod Street, and Fillmore Street would remain, due to the ability to connect Ramp D to the inner lanes of the Boulevard.

The construction of this alternate would not require the closing of any of the main arterial streets in the study area and access to the Roosevelt Boulevard from these main arterials would not be eliminated. Where the main arterials are crossed they are kept open by allowing sufficient openings under the viaduct sections, by providing bridges over depressed sections, or by relocating the arterial.

The construction of this type of interchange requires the relocation of the lanes of the Roosevelt Boulevard. Summerdale Avenue would be slightly relocated to line up with Adams Avenue at the Roosevelt Boulevard intersection. Alternate C with this Roosevelt Boulevard interchange would not require the closing of any of the local streets in the study area.

An alternate type of interchange for the Pulaski Highway Alternate C at Roosevelt Boulevard is shown on Plate 140. This is a double loop type interchange with two cloverleaf type loop ramps on the north side or Roosevelt Boulevard and two direct type ramps on the south side of the Boulevard. With this type of interchange, the Pulaski Highway ramps would pass under the Roosevelt Boulevard. This interchange would require the closing of Fillmore Terrace and the relocation of Foulkrod Street on the north side of Roosevelt Boulevard. Direct access to the Roosevelt Boulevard from

Langdon Street would remain in both directions.

A third type of interchange for the Pulaski Highway Alternate C at Roosevelt Boulevard is shown on Plate 141. This is a semi-directional type of interchange with three ramps connecting directly to the Roosevelt Boulevard and one cloverleaf type loop ramp on the north side of Roosevelt Boulevard. With this type of interchange the relocation of Foulkrod Street on the north side of Roosevelt Boulevard would be required. Direct access to the Roosevelt Boulevard from Langdon Street would remain in both directions.

(e) Alternate D (See Plates 142 through 150)

Beginning at Leiper Street, Alternate D continues northwest to Roosevelt Boulevard along an alignment through the Tacony Creek Park. This alternate was developed along the alignment of the originally planned route of the Pulaski Highway through the Tacony Creek Park to an interchange with Roosevelt Boulevard in the vicinity of "F" Street.

The alternate continues on viaduct north of Leiper Street and crosses over Adams Avenue, Frankford Creek, and Wingohocking Street in the same general area as the A, B, and C Alternates. A minor relocation of Frogmoor Street near O Street is required in this area. North of Wingohocking Street, the alternate curves toward the west and continues on viaduct for approximately 300 feet. It then changes to a depressed section and continues below ground level with a retaining wall on the east side and open slopes on the west side for approximately 600 feet. It then continues in a depressed section with open slopes on both sides to Castor Avenue.

Two local half diamond type interchanges are planned with this alternate to disperse the local interchange traffic and reduce concentration of the local interchange traffic at Castor Avenue. Access to and from the Pulaski Highway south of Castor Avenue is provided via Ramps A and B which connect to Wingohocking Street and Ramps C and D which connect to Castor Avenue. The local half diamond type interchange at Wingohocking Street is similar to the one described for Alternate A-1. The local half diamond interchange at Castor Avenue is similar to the one described for Alternate B. The application of two local interchanges, at these locations, to the A-1, A-2, B and C Alternates is also possible.

At the Castor Avenue local interchange the traffic volumes on the main line of the Pulaski Highway decrease to a point where one lane in each direction can be eliminated and the Pulaski Highway continues from Castor Avenue to the Boulevard as a six lane expressway. After passing under Castor Avenue, the alternate continues west in a depressed section below ground level between two retaining walls. It passes through the back portion of Greenwood Cemetery and then under Ramona Avenue. After passing under Ramona Avenue, Alternate D continues west and crosses over Fishers Lane approximately 300 feet south of its intersection with Ramona Avenue. Ramona Avenue and Castor Avenue are kept open with bridges over the Pulaski Highway, and Fishers Lane would be relocated between Ramona Avenue and the Tacony Creek bridge. The alternate passes through lands of Tacony Creek Park's Juniata Golf Course between Ramona Avenue and Fishers Lane and would require the realignment of the two fairways located in that section of the golf course north of Wyoming Avenue.

West of Fishers Lane, Alternate D enters Tacony Creek Park. The alternate changes to a viaduct section for approximately 700 feet as it rises across the valley formed by Tacony Creek and then enters the hillside north of Maple Lane. The alternate would be only a few feet below the existing ground level as it passes through the side slope of this hill and would be constructed in a section slightly depressed below the existing ground level with open slopes on both sides. After passing through the hillside, Alternate D descends and continues in an open slope section slightly below ground level. The alternate then curves to the north and passes under the Penn Central Railroad line and Whitaker Avenue in the valley beside Tacony Creek.

North of Whitaker Avenue, Alternate D interchanges with Roosevelt Boulevard in the lands of Tacony Creek Park. The interchange is in the area bounded by Ruscomb Street and Bingham Street between F Street and D Street along Roosevelt Boulevard. The interchange indicated on the plans for this alternate is a trumpet type interchange with two loop ramps on the north side of the Boulevard and two direct ramps on the south side of the Boulevard as shown on Plate 146.

The construction of this type of interchange would not require the reconstruction of the existing Roosevelt Boulevard bridge over Tacony Creek. The ramps on the north side of the Boulevard would pass through the existing archway of the bridge which presently contains the main channel of Tacony Creek. Tacony Creek would require relocation in the area of this interchange and would be re-routed through the middle arch of the existing Roosevelt Boulevard bridge. The roadway lanes of the Roosevelt Boulevard would be realigned as they cross over the bridge to accommodate the connection of the interchange ramps to the Boulevard.

No alternate type of interchange is proposed for this location due to the advantages the interchange shown has over the other types through the utilization of the existing archways for ramps passing under the Roosevelt Boulevard. This interchange is similar to the semi-directional type interchanges proposed for the A, B, and C Alternates. A double loop type interchange would require the complete reconstruction of the Boulevard and result in very steep grades for the ramps which would have to pass over the

Boulevard lanes and then under the Whitaker Avenue bridge.

The construction of Alternate D with the Roosevelt Boulevard interchange indicated on Plate 146 would not require the closing of any of the main arterial streets in the study area and access to the Roosevelt Boulevard from these main arterials would not be eliminated. Where the main arterial streets are crossed, they are kept open by allowing sufficient openings under the viaduct sections, by providing bridges over depressed sections or by relocating the arterial.

(f) Alternate E (See Plates 151 through 161)

Beginning at Leiper Street, Alternate E continues north to Roosevelt Boulevard on a viaduct along the route of the Reading Railroad's Frankford Branch freight line. This alternate was developed in response to the alignment proposed by the United Northeast Civic Association (UNCA). The UNCA proposed a split alternate with the northbound lanes located along the Reading Railroad line and the southbound lanes along the original alignment through Tacony Creek Park. The proposal was modified by PennDOT to accommodate both directions of Pulaski Highway traffic along the Reading Railroad route because the purpose of these investigations was to evaluate feasible and prudent alternatives to the original alignment through the park. The UNCA proposal is also discussed in part A.3.C of this section.

The existing freight line serves only one customer at its present terminus at Penn Street. Preliminary consultation with the Reading Railroad Company has indicated that the Reading would be willing to abandon the line for highway use (See Appendix page 122) The existing tracks would be removed and the highway would be constructed as a long bridge (viaduct) along the present alignment of the railroad.

The Alternate continues on viaduct north of Leiper Street and crosses over Adams Avenue and Frankford Creek. The alternate then curves toward the northeast and crosses over Adams Avenue again at its intersection with Wingohocking Street. A minor relocation of Frogmoor Street near O Street is required in this area. The alternate passes through the same general area as the other alternates in the section between Leiper Street and Adams Avenue.

A local half diamond type interchange is planned at Wingohocking Street with this alternate. This proposed interchange is similar to the local interchange shown for Alternates A-1 and D, and provides access to the Pulaski Highway south of Wingohocking Street. No alternative type or location of this local interchange is feasible along this alternate because of the restrictions imposed by the surrounding industrial buidings and residential areas.

North of Adams Avenue, the alternate continues on a viaduct passing over Wingohocking Street, Horrocks Street, and Unity Street. After crossing over Unity Street, Alternate E passes through the Haydon Bolts Manufacturing Plant and then joins the alignment of the Frankford Branch of the Reading Railroad in the open area behind the Degan Company truck showroom. Alternate E then continues on a viaduct along the route of this railroad line to Roosevelt Boulevard.

Between Unity Street and Orthodox Street the highway passes through manufacturing land uses. After crossing over Orthodox Street. Alternate E continues north on viaduct along the railroad line between the Action Manufacturing Company Plant and the residences fronting Naples Street and Overington Street. The alternate then crosses over Large Street.

North of Large Street the alternate continues on a viaduct along the rail line through the lands of the Simpson Memorial Park recreation center and over Arrott Street. Alternate E then passes through a residential area along the rail line and over Foulkrod Street. Herbert Street would be extended under the highway to Northwood Street to replace the closed section connecting to Foulkrod Street.

After crossing over Foulkrod Street, Alternate E curves to the northwest along the rail line and passes through the lands of Northwood Park between Foulkrod Street and Castor Avenue. North of Castor Avenue the alternate splits with the southbound lanes changing to a depressed section below ground level with open slopes and the northbound lanes continuing on a viaduct section. Between Castor Avenue and the Roosevelt Boulevard, Alternate E continues along the rail line in the area between Fillmore Street and Allengrove Street.

The interchange with Roosevelt Boulevard is in the area between Castor Avenue and Summerdale Avenue in the vicinity of the intersection of Ramona Avenue and Roosevelt Boulevard. A full interchange which provides for all movements between Roosevelt Boulevard and the Pulaski Highway is planned. The interchange indicated on the plans for this alternate is a semi-directional type interchange with three ramps connecting directly to the Roosevelt Boulevard and one cloverleaf type loop ramp on the north side of Roosevelt Boulevard as shown on Plate 154. The loop ramp would pass under the Boulevard through the arch of the existing bridge carrying the Boulevard over the Reading Railroad. In addition, one lane on and off ramps would pass under this bridge and connect directly to Summerdale Avenue.

The construction of Alternate E with the Roosevelt Boulevard interchange indicated on Plate 154 would not require the closing of any of the main arterial streets in the study area and access to the Roosevelt Boulevard from these main arterials would not be eliminated. Where the main arterials are crossed they are kept open by allowing sufficient openings under the viaduct sections.

The construction of the semi-directional type of interchange requires the closing of Fillmore Terrace on the north side of the Boulevard. The construction would also require the relocation of the lanes of Roosevelt Boulevard. Adams Avenue and Summerdale Avenue would be reconstructed to line up on opposite sides of the Boulevard. On the south side of the Boulevard, Ramona Avenue, Fillmore Street, and Allengrove Street would not have direct access to the Boulevard. A short connecting street between Fillmore Street and Ramona Avenue would be constructed beside Ramp C. This connector would provide access to the Boulevard from Fillmore Street via Ramona Avenue and Adams Avenue. A short connecting street between Allengrove Street and Wakeling Street would be constructed beside Ramp D to provide access to Roosevelt Boulevard from Allengrove Street.

No alternate type of interchange is proposed at this location due to the advantages the interchange shown has over the other types through the utilization of an existing bridge for ramps passing under Roosevelt Boulevard.

A double loop type interchange would require the acquisition of public recreational facilities at the Houseman Recreation Center and additional homes along the Boulevard. A directional type interchange would not require the homes and apartment buildings on the north side of the Boulevard, however, a substantially higher number of residences in the Northwood neighborhood between Herbert Street and Roosevelt Boulevard would be required.

(g) Alternate F (See Plates 162 through 171)

Beginning at Leiper Street, Alternate F continues north to Roosevelt Boulevard along an alignment parallel to Adams Avenue. The alignment proposed for Alternate F generally follows the alignment of Alternates A-1 and A-2 and is located just east of those alternates.

This alternate was developed in 1974 after review of the preliminary findings of the sociological, economic and ecological consultants serving on the Interdisciplinary Team. The alternate was developed to lessen the impacts of the project on the two cemeteries and Friends Hospital while avoiding the division of the Northwood neighborhood in the vicinity of Roosevelt Boulevard.

The alternate continues on viaduct north of Leiper Street and crosses over Adams Avenue, Frankford Creek, and Wingohocking Street in the same general area as the other alternates. A minor relocation of Frogmoor Street near O Street is required in this area. North of Wingohocking Street, the alternate continues north on viaduct for approximately 500 feet. It then changes to a depressed section and continues below the existing ground level with open slopes on both sides for approximately 700 feet. At this location between Wingohocking Street and Orthodox Street, a westward extension of Wyoming Avenue over the highway is proposed. This Wyoming Avenue extension would connect the Castor Avenue and Wyoming Avenue intersection with Adams Avenue at Large Steet. This extension would require the conversion of the Castor-Wyoming traffic circle into a normal four-legged type signalized intersection.

A local half diamond type interchange is planned to connect to the Wyoming Avenue extension. Access to and from the Pulaski Highway south of Wyoming Avenue would be provided by this interchange. The half diamond type interchanges indicated on the plans for Alternates A-1 or A-2 could be applied to Alternate F in place of the connection to the Wyoming Avenue extension.

After passing under the Wyoming Avenue Extension, the alternate continues north in a depressed section below ground level between retaining walls and crosses under Orthodox Street and Castor Avenue. Orthodox Street is realigned on a bridge over the alternate between Castor Avenue and Adams Avenue and Castor Avenue is kept open as a bridge over the alternate. The alternate then continues north in a depressed section below ground level between retaining walls. The northbound lanes begin to gradually rise as they approach the interchange with Roosevelt Boulevard. The alternate passes through the front section of Oakland Cemetery between Castor Avenue and Ramona Avenue. At Ramona Avenue the alternate would have its southbound lanes depressed below ground level. However, the rising northbound lanes would be approximately ten feet above ground level on an embankment contained between retaining walls.

Adams Avenue would be relocated between Castor Avenue and Ramona Avenue to be directly over the southbound lanes of the alternate which would be depressed below ground level. Adams Avenue would be constructed as a long bridge over the southbound lanes in this area. This construction is indicated in the cross section for the alternate shown on Plate 172.

The section of Ramona Avenue between Castor Avenue and Herbert Street would be closed by this alternate and the intersection of Adams Avenue and Arrott Street would be eliminated. Access to Adams Avenue from Arrott Street would require travel over Castor Avenue.

The interchange with Roosevelt Boulevard is located in the area bounded by Ramona Avenue, Adams Avenue, and Roosevelt Boulevard. A full interchange which provides for all movements between Roosevelt Boulevard and the Pulaski Highway is planned. The interchange indicated on the plans for Alternate F is a directional type interchange with all ramps connecting to the inner lanes of Roosevelt Boulevard as shown on Plate 16 4.

In conjunction with the development of the plans for Alternate F, the reconstruction of the inner six lanes of the Roosevelt Boulevard as express lanes over the Summerdale Avenue and Langdon Street intersections was investigated. The plans for Alternate F were then developed with these express Boulevard lanes included in the designs. The Boulevard express lanes are elevated over the Summerdale Avenue and Langdon Street intersections, the outer lanes of the Boulevard remain at ground level and Ramp F is elevated on a long viaduct section over the express Boulevard lanes.

The construction of this type of interchange would require the relocation of Adams Avenue between Ramona Avenue and Roosevelt Boulevard. The two northbound lanes of Adams Avenue are relocated to pass through the interchange area over Ramp C and under Ramp F while the two southbound lanes remain along the present roadway of Adams Avenue. Access to the Boulevard from Ramona Avenue, Foulkrod Street, Allengrove Street, and Fillmore Street would remain. The directional type interchange planned would, in itself, not require the acquisition of any residential properties on the north side of Roosevelt Boulevard.

The construction of this alternate with the Roosevelt Boulevard interchange indicated on Plate 164 would not require the closing of any of the main arterial streets in the study area and access to the Roosevelt Boulevard from these main arterials would not be eliminated. Where main arterial streets are crossed they are kept open by allowing sufficient openings under the viaduct sections and by providing bridges over the depressed sections.

A modification of the proposed directional type interchange at Roosevelt Boulevard was investigated. This interchange is generally the same as the one indicated on Plate 164, however, Ramps D and F are taken under the Boulevard instead of over the Boulevard. This interchange would require the construction of Ramp F in a tunnel as is indicated on Plate 173.

2. <u>No-Build Alternative</u>

The No-Build Alternative consists of all of the existing highway facilities in the study area, the Delaware Expressway completed through the Region, and the Betsy Ross Bridge with completed interchanges at the Delaware Expressway and at Richmond Street. This alternative is indicated on Plate 174.

The mass transit network considered with this No-Build Alternative is the Delaware Valley Regional Transportation Commission's (DVRPC) 1985 Adopted Regional Commuter Railroad Plan and 1985 Adopted Regional Subway-Elevated and Rapid Transit Plan. These mass transit networks included the following planned facilities:

a. The extensions of the Lindenwold Highway Speed Line in New Jersey

b. The Northeast Extension of the Broad Street Subway to Rhawn Street

c. The Commuter Rail Connection in Center City

The highway traffic projections prepared for this No-Build Alternative considered ridership on the existing and proposed mass transit facilities in the Region.

Possible improvements to existing streets in the No-Build Alternative were also investigated. Such improvements include the removal of parking and the physical widening of local roadways. The No-Build Alternative with improvements is discussed in detail in part B of this section.

3. <u>Other Highway Alternatives Investigated</u>

a. <u>General</u>

During the course of the numerous studies performed on this project, several concepts and schemes were proposed. This section describes the schemes which were investigated and found to be infeasible.

b. Lawncrest-Burholme Civic Association Schemes

(1) Scheme 1

(a) Description

This alternate is a scheme for the highway project between the Delaware River and a proposed terminus in the vicinity of Leiper Street as shown on Plate 175.

This alternate begins at the Betsy Ross Bridge over the Delaware River and includes a proposed extension of Delaware Avenue across the Frankford Creek. Movements to and from the bridge are provided via ramps connecting to the Delaware Avenue extension. A ramp connection to the northbound Pulaski Highway is also included at this location.

The alternate continues north crossing over Richmond Street. Past Richmond Street, the highway separates with the northbound roadways crossing over the Delaware Expressway and the southbound roadways passing under the Delaware Expressway. All movements between the Pulaski Highway and the Delaware Expressway are provided via a complex series of interchange ramps. Local access is also provided via a ramp from the Delaware Expressway southbound lanes to Thompson Street.

The alternate then proceeds north, passing over Aramingo Avenue and the Frankford Creek. Movements to the north are provided via ramps connecting to Aramingo Avenue. The alternate continues north crossing over the Penn-Central Railroad yards, Frankford Avenue, Frankford Creek, Torresdale Avenue, Kensington Avenue, and the Frankford Elevated mass transit line. Local access to the south is provided via ramps connecting to Kensington Avenue.

North of Kensington Avenue, the highway terminates with the northbound roadways connecting to the intersection of Adams Avenue and Leiper Street and the southbound roadways connecting to the intersection of D Street and

Hunting Park Avenue.

(b) Evaluation

This proposed alternate was evaluated by the Pennsylvania Department of Transportation and determined to be unacceptable. The alternate would terminate short of the Roosevelt Boulevard, thus failing to fulfill the main objective of the Pulaski Highway to provide a link in the circumferential highway system around the core area of the region.

The proposed northern terminus on the local arterial streets would result in severe congestion in that area. None of these streets are major arterial streets and they do not have adequate capacity to accommodate the traffic volumes attracted to a terminus of a major regional expressway. Travel along the local streets between Leiper Street and Roosevelt Boulevard would be required to complete the trip between Roosevelt Boulevard and the Delaware Expressway with this proposal. This proposal fails to fulfill the main objectives of the Pulaski Highway and therefore cannot be considered an alternative for this facility.

In addition to this inadequacy, the proposed designs are infeasible to construction and do not meet required Federal standards for highway design or operational safety. The specific areas where the proposed design is infeasible are as follows:

(i) The proposed design of the interchange with the Delaware Expressway is based on a design included in the 1958 feasibility study by Gannett-Fleming Inc. This design was determined to be inadequate to accommodate the projected traffic volumes and a higher type of interchange design was developed, approved, and is now under construction.

(ii) The northbound on-Ramps from Aramingo Avenue would be infeasible to construct as proposed. It would not be possible to cross over Aramingo Avenue and then under the present grade of the railroad Seashore Line as shown on the plan. Approximately one mile of the railroad line would have to be reconstructed at a higher elevation to accommodate the ramps as proposed.

(iii) The off-ramp to Kensington Avenue is not feasible due to the elevation of the Pulaski Highway. The Pulaski Highway crosses over the Frankford Elevated at Kensington Avenue and the grades required for a ramp at Kensington Avenue would be much greater than the maximum limit of the standards.

(iv) The on-ramp from Kensington Avenue is impossible to construct as proposed. The plan indicates the ramp crossing over Kensington Avenue and under the Frankford Elevated. This is not possible because there is not enough clearance between the grade of Kensington Avenue and the grade of the Frankford Elevated to accommodate this ramp. It would not be feasible to raise the grade of the Frankford Elevated because the main line of the Pulaski Highway would cross over it at this location with this proposal. The grade required for this ramp would be greater than the maximum limit of the standards as explained above.

In addition, the ramp entrance as proposed is located on the west side of Kensington Avenue. Traffic on the west side of Kensington Avenue operates in a southbound direction while traffic on the ramp at the entrance area operates in a northbound direction. This design would require vehicles entering the ramp to cross all southbound traffic on Kensington Avenue at a slight angle which would result in very hazardous vehicle movements at the ramp entrance.

(v) The expressway terminals at Adams Avenue and Hunting Park Avenue are not feasible to construction. These terminals are lcoated close to the high crossing over the Frankford Elevated and the roadway grades required to cross over the el and meet the existing streets would exceed the maximum limits of the standards.

The proposal also included a truck transfer terminal facility and an interchange connecting this facility with the Betsy Ross Bridge. These proposals are beyond the limits of the Pulaski Highway project. The Betsy Ross Bridge is presently constructed and is under the jurisdiction of the Delaware River Port Authority. Any proposal to interchange with the bridge must be accomplished through the Port Authority.

These aspects of the proposal were fully discussed with the architect who prepared the plan and an officer of the Lawncrest-Burholme Civic Association in 1972. After this discussion no further development of the proposal was recommended.

(2) Scheme 2

(a) Description

The second scheme proposed by the Lawncrest-Burholme Civic Association was a plan to eliminate the Pulaski Highway and provide connections to the Delaware Expressway and the Betsy Ross Bridge from Aramingo Avenue. This plan was presented in May, 1975 as shown on Plate 176.

The alternate begins at the Betsy Ross Bridge over the Delaware River and includes a proposed extension of Delaware Avenue across the Frankford Creek. Movements to and from the bridge are provided via ramps connecting to the Delaware Avenue extension. The alternate continues north across Richmond Street and then interchanges with the Delaware Expressway. At this interchange the alternate separates, with the northbound roadways crossing over the Delaware Expressway and the southbound roadways passing under the Delaware Expressway. All movements at the interchange are provided via a complex series of ramps similar to those proposed with Scheme 1. Local access to Thompson Street is also included at this interchange.

After interchanging with the Delaware Expressway the proposed alternate terminates at an at-grade intersection with Aramingo Avenue. Access to the Delaware Expressway is provided by connecting this terminus with the interchange ramps proposed at the Delaware Expressway.

(b) Modification

The designs proposed for this alternate are infeasible to construct because they are not compatible with presently constructed portions of the interchange between the Delaware Expressway and the Betsy Ross Bridge. Because of these constraints the proposed design was modified by PennDOT highway design engineers to reflect the objectives of this proposal and utilize the presently constructed portions of the interchange. The proposed design of the interchange between Delaware Avenue and the Betsy Ross Bridge was also modified to simplify the plan. The modified alternate is indicated on Plate 177.

(c) Evaluation

This proposed alternate was evaluated by the Pennsylvania Department of Transportation and determined to be unacceptable. The alternate would not provide a link in the circumferential highway system around the core area of the region. The alternate also would not provide a connection between the Roosevelt Boulevard and the Delaware Expressway. This proposal fails to fulfill the main objectives of thePulaski Highway and therefore cannot be considered an alternative for this facility. The proposal is a modification of the No-Build Alternative.

As previously noted the designs proposed are infeasble to construct and were therefore modified. The modified designs are feasible to construct, however, the at-grade connection to Aramingo Avenue would result in the elimination of rail access to the large Allied Chemical industrial complex and the Frankford Arsenal and the elimination of the truck-rail piggy-back loading facilities at that location.

The connections between the proposed extension of Delaware Avenue and the Betsy Ross Bridge are beyond the limits of the Pulaski Highway project. The Betsy Ross Bridge is presently constructed and is under the jurisdiction of the Delaware River Port Authority. Any proposals to interchange with the bridge must be accomplished through the Port Authority.

c. United Northeast Civic Association Scheme

(1) Description

This alternate is a scheme for the entire length of the project between the Delaware River and the Roosevelt Boulevard as shown on Plate 178.

The alternate begins at the Betsy Ross Bridge over the Delaware River as it passes over a proposed extension of the Delaware River. Access to the bridge is provided via ramps to the extension of Delaware Avenue.

The alternate then continues north, crossing over Richmond Street and the Delaware Expressway. No interchange is indicated at the Delaware Expressway, however, the originator of the scheme intended to provide for all movements between the Pulaski Highway and the Delaware Expressway.

North of the Delaware Expressway, the alternate crosses over Aramingo Avenue and then descends to pass under the Penn Central Railroad yards. Local access to the north is provided via ramps connecting to Aramingo Avenue. North of the railroad yards the alternate continues in a depressed section passing under Frankford Avenue and Kensington Avenue. Local access to the south is provided via an on-ramp from Frankford Avenue and an off-ramp to Kensington Avenue. Frankford Creek is relocated in this area. The alternate then continues in a northerly direction, crossing Adams Avenue, Frankford Creek, and Wingohocking Street.

North of Wingohocking Street, the alternate separates with the northbound roadways curving to the east and the southbound roadways curving to the west. The northbound roadways cross over Adams Avenue and then curve to the north before joining the alignment of the Reading Railroad's Frankford Branch freight line. These lanes continue along this railway alignment in a depressed section to the Roosevelt Boulevard. The northbound lanes then pass under the Roosevelt Boulevard through the existing railway opening and continue to Summerdale Avenue. At Summerdale Avenue the lanes turn to the west and follow the existing alignment of Summerdale Avenue to an at-grade intersection with Roosevelt Boulevard. Summerdale Avenue is closed between Roosevelt Boulevard and the railroad line to accommodate the northbound roadways of the alternate.

The southbound roadways continue to curve to the west passing under Castor Avenue, through the lands of Greenwood Cemetery, under Ramona Avenue, and then over Fishers Lane. Local access is provided via an on-ramp from Fishers Lane and a special northbound off-ramp to Fishers Lane. The roadways then continue over the Tacony Creek and through the Tacony Creek Park passing under the Penn Central Railroad and Whitaker Avenue. The southbound roadways then curve to the north and continue through park lands to the Roosevelt Boulevard. The roadways pass under the Roosevelt Boulevard through the existing structure over the Tacony Creek and then ascend to intersect at-grade with the Boulevard at the existing intersection with "F" Street.

The proposal was used as a basis to develop Alternate E as described previously. The proposal was modified by PennDOT highway design engineers to develop an alternate along the route of the Reading Railroad's Frankford Branch freight line as proposed by the United Northeast Civic Association.

(2) Evaluation

The alternate proposed by the United Northeast Civic Association was evaluated by the Pennsylvania Department of Transportation and determined to be unacceptable. The alternate would require lands from both the Tacony Creek Park and Northwood Park. The designs proposed are infeasible to construct and do not meet required Federal standards for highway design or operational safety.

The specific areas where the proposed design is infeasible are as follows:

(a) The proposed northbound on-ramp from Aramingo Avenue is located on the left side of the northbound lanes. This would require hazardous merging from the left onto the high speed inner lanes of the expressway. This merging area would be located directly opposite the right side merge onto the expressway from the Delaware Expressway ramps. This right side and left side merging in the same location would be hazardous.

(b) The proposed design includes a reverse curvature on the mainline section between Aramingo Avenue and Frankford Avenue. These reverse curvatures are not adequately spaced to permit safe driving transitions from curve to curve.

(c) The proposed southbound on-ramp from Frankford

Avenue would be located too close to the off-ramp to Aramingo Avenue to allow for safe weaving conditions between entering vehicles accelerating onto the Pulaski Highway and vehicles decelerating to exit the Pulaski Highway at Aramingo Avenue.

(d) The proposed railroad underpass just south of Frankford Avenue would result in the highway being constructed over the Frankford Creek at a level lower than the flood level of the Frankford Creek.

(e) The underpass at Kensington Avenue would require the closing of Deal Street between the Pulaski Highway and the present dead end. In addition, the relocation of Adams Avenue would require additional housing between Ruan Street and Penn Street.

(f) There would not be sufficient stacking distance at the proposed off-ramp to Kensington Avenue. The ramp would terminate at an existing traffic signal and the lack of storage distance would result in vehicles stopping on the travel lanes of the Pulaski Highway.

(g) The proposed design includes a reverse curvature in the vicinity of Wingohocking Street. These reverse curves are not adequately spaced to permit safe driving transitions from curve to curve. In addition, the 15° curvature on the northbound lanes is more than double the maximum 7° curvature allowed by the highway design standards. These reverse curvatures are quickly followed by another reverse curve on both the northbound and southbound roadways. The reverse curve on the northbound lanes is 12° and the reverse curve on the southbound lanes is 15°. It is not feasible to construct the proposed alignment in this area because the reversing curves with curvature exceeding the maximum allowed by the standards combined with less than adequate spacings would be unduly hazardous for even the best of drivers.

(h) The terminus of the northbound roadways at Summerdale Avenue and Roosevelt Boulevard would require the closing of Summerdale Avenue. Summerdale Avenue is a major arterial street in Northeast Philadelphia and closing its connection to Roosevelt Boulevard is not practical. Also the terminating of the four northbound lanes of the expressway at an intersection with Roosevelt Boulevard and Adams Avenue would result in severely congested traffic conditions.

In addition to these design inadequancies this proposed alternate would require more parklands than Alternate D. The southbound roadways would basically follow the route of Alternate D through the Tacony Creek Park between Fishers Lane and Roosevelt Boulevard. The alternate would require additional lands from the Juniata Golf Course between Ramona Avenue and Fishers Lane. The alignment passes through these lands and the proposed interchange ramps connecting to Fishers Lane would also pass through the

Golf Course.

The southbound lanes of the proposed alternate would require approximately four acres of Greenwood Cemetery and would pass directly behind Parkview Hospital. The northbound lanes would pass through the Northwood neighborhood resulting in impacts similar to Alternate E.

The proposal was determined to be unacceptable because it would result in the combination of adverse impacts on the parklands and cemeteries and adverse impacts on the Northwood neighborhood. The alternate would have slightly less impacts on noise and air quality because of the split roadways, however, the disadvantages of the proposal far outweigh these advantages.

d. Northeast Transportation Action Council (NETAC) Alternate

(1) Description (Also see Appendix pages 271 to 274)

This alternate is a proposal to connect the Delaware Expressway and Betsy Ross Bridge with the Schuylkill Expressway north of the Manayunk section of Philadelphia as shown on Plate 179. This proposal is an alternate for both the Pulaski Highway and the proposed extension of the Roosevelt Expressway.

The alternate begins at the Delaware Expressway and Betsy Ross Bridge interchange area and continues west along the alignment of the mainline of the Penn-Central Railroad to North Philadelphia. In the vicinity of Broad Street, the alternate turns to the northwest and follows the alignment of the Reading Railroad commuter rail lines to the Schuylkill River. The alternate then follows the alignment of the railroad along the north bank of the Schuylkill River through Manayunk and interchanges with the Schuylkill Expressway in the vicinity of the boundary with Montgomery County.

This alternate was proposed by Mr. Leon Raider during the study process leading to the preparation of this Environmental Impact Statement. Mr. Raider suggested that the alternate be constructed along some of the unused track along the railroad right-of-way. No intermediate interchange locations were specified.

(2) Evaluation

This proposed alternate was evaluated by the Pennsylvania Department of Transportation and found to be unacceptable. There is no possibility of abandonment of the Penn-Central or Reading Railroad freight and commuter rail lines therefore, the alternate would have to be constructed as a long bridge over the railroad tracks. The required clearances over electrified railroad tracks would result in the highway being constructed as a bridge thirty-five feet above the railroad for the entire 11.3 mile length of this alternate.

This proposed alternate was found to be extremely expensive to construct. The mainline bridge alone would would cost over $390,000,000. In addition to this $390 million, the cost of interchange facilities, the cost of relocating railroad sidings, the cost of relocating utilities, the cost of relocating the railroad electrification facilities, the cost of designing the alternate, and the cost of acquiring the right-of-way for its construction must be added to obtain the total construction cost for this alternate. The right-of-way acquisition cost along this alternate would be very substantial. The Penn-Central and Reading rail lines are lined with large industrial buildings, many of which would be required for the construction of this alternate. Construction through the North Philadelphia Station area near Broad Street would require many commercial and residential properties. The alternate would pass directly beside the Eastern Pennsylvania Psychiatric Institute and Woman's Medical College in the East Falls neighborhood and approximately 20 churches and schools would be located within one block of the alternate along its 11.3 mile length.

The Reading Railroad is presently constructed as a viaduct over Cresson Street through Manayunk. The alternate would have to be constructed at least fifty feet above Cresson Street and would require a substantial number of homes and businesses along the route through Manayunk.

This proposal would disrupt commuter rail mass transportation along the Penn-Central and Reading Railroads during construction.

The alternate fails to provide additional capacity in the north-south travel corridor between the Delaware Expressway and Roosevelt Boulevard, thus failing to fulfill one of the main objectives of the Pulaski Highway. The alternate is not consistent with the Adopted Freeway Plan for the Delaware Valley Region and is not located within the approved corridor of the Pulaski Highway project. Traffic in the main travel corridor which the Pulaski Highway is intended to serve would continue to travel over the local arterial streets.

This proposal was not recommended for further development because of the above mentioned considerations.

4. Other Transportation Alternatives

a. General

The alternative of improving the existing mass transportation system in Northeast Philadelphia to accommodate the travel demands assigned to the Pulaski Highway was evaluated as was the alternative of providing a rail mass transit line as a substitute for the proposed highway facility. In addition to these alternatives, mass transit applications along the proposed Pulaski Highway were studied by the DVRPC and PennDOT.

At the present time the Southeastern Pennsylvania Transportation Authority (SEPTA) operates a very extensive mass transportation system in the City of Philadelphia and the surrounding suburban areas. SEPTA operates an interconnected system of subway rapid rail transit lines, railroad commuter lines, and surface light rail and bus lines.

Mass transportation planning is conducted by the Delaware Valley Regional Planning Commission (DVRPC). The 1985 Adopted Subway Elevated and Rapid Transit Plan and 1985 Adopted Railroad Plan, as well as ridership projections, are discussed in Section I. Mass transit facilities and freeway facilities are planned to work together as parts of a total transportation system to fulfill the travel needs of the region.

The function of rail rapid transit in the overall transportation system is to serve high density person trip travel demand which would be physically impossible to accommodate fully by surface mass transit lines or freeway facilities. Due to the high costs of construction and operation of rail rapid transit facilities they are not economically feasible unless aligned along a high density travel corridor.

For rapid transit lines to divert trips from automobiles they must produce significant savings in travel time and travel costs for those who have the choice between automobile travel and mass transit travel. The additional travel time produced by longer walking distances, vehicle transfers, and standing at feeder bus stops and rapid transit stations must be significantly offset by the quicker traveling times of the vehicles. In addition, those who own automobiles are already paying for the capital costs and insurance and depreciation costs of their automobiles and the transit fares are usually perceived as an additional out of pocket cost to them. The transit fares must be perceived to be a significant savings over gasoline, tolls, and parking costs in order to divert a significant number of trips from automobiles. Additional considerations influencing the choice between transit travel and automobile travel are the advantages the automobile offers in terms of comfort and convenience.

The most important factors influencing regional mass transportation travel are population density, car ownership, households, employment, fares, and travel time savings over automobile trips. The current and expected trends in regional travel characteristics are discussed in Section I.

b. Mass Transportation System Improvement Alternative to the Pulaski Highway

(1) Existing Mass Transit Facilities

At the present time the City of Philadelphia possesses one of the most extensive mass transportation systems in the United States. Rapid transit lines include the Market-Frankford el, the Broad Street Subway, and the Lindenwold High Speed Line. Twelve railroad commuter lines are also operated throughout the city along both the Penn Central and Reading Railroads. In addition to these high volume trunk lines, there is a very extensive system of surface mass transit trolley (light rail) and bus lines operating throughout the city.

The rail transit lines presently serving the Northeast section are:

(a) The Frankford Elevated along Kensington Avenue and Frankford Avenue.

(b) The Broad Street Subway along Broad Street.

(c) The Penn Central Railroad Trenton Branch Commuter Rail Line.

(d) The Reading Railroad Fox Chase Branch Commuter Rail Line.

(e) The Reading Railroad West Trenton Branch Commuter Rail Line.

Two of these lines pass directly through the Pulaski Highway Study Area - The Frankford el and the Penn Central Commuter Rail Line. The other three lines pass through areas directly to the west and north of the study area (See Plate 54).

The mass transit surface lines in the study area are listed below and shown on Plate 54:

(a) Route 15 trolley line along Richmond Street

(b) Route 60 trolley line along Allegheny Avenue

(c) Route 56 trolley line along Erie and Torresdale Avenues

(d) Route 50 trolley line along Rising Sun Avenue

(e) Route 75 trackless trolley line along Wyoming Avenue and Orthodox Street

(f) Route 59 trackless trolley line along Castor Avenue and Oxford Avenue

(g) Route 66 trackless trolley line along Frankford Avenue

(h) Route 73 bus line along Richmond Street and Bridge Street

(i) Route 89 bus lines along Tioga Street and Venango Street

(j) Route J bus line along Lindley Avenue, Orthodox Street, Tacony Street, Cottman Avenue, Torresdale Avenue and Orthodox Street

(k) Route T bus line along Frankford Avenue, Orthodox Street, Tacony Street, Cottman Avenue, Torresdale Avenue and Rhawn Street

(l) Route 5 bus line along Frankford Avenue

(m) Route 3 bus line along Kensington and Frankford Avenue

(n) Route P bus line along G Street, Hunting Park Avenue, M Street, Wingohocking Street, Unity Street and Penn Street

(o) Route 57 bus lines along Front Street, Mascher Street, 2nd Street and Godfrey Avenue

(p) Route 47 bus line along 5th Street

(q) Route S and Route26 bus lines along Olney Avenue, Tabor Avenue, Levick Street, Magee Street, Harbison Avenue and Bridge Street

(r) Route K bus line along Godfrey Avenue, Champlost Avenue, Adams Avenue, Roosevelt Boulevard, Foulkrod Street and Arrott Street

(s) Route R bus line along Roosevelt Boulevard and Pratt Street

(t) Route N bus line along Central Avenue, Martin's Mill Road, Oxford Avenue and Cheltenham Avenue

(u) Route W bus line along Algon Avenue, Whitaker Avenue, Oxford Avenue and Cheltenham Avenue

(v) Route 88 bus line along Rowland Avenue, Hawthorne Avenue, Battersby Street, Devereaux Avenue and Bustleton Avenue

(w) Route Fox bus line along Tabor Avenue, C Street, Roosevelt Boulevard and Pratt Street

(x) Route 20 bus line along Holme Avenue, Roosevelt Boulevard, and Bustleton Avenue

(y) Route B bus line along Roosevelt Boulevard and Bustleton Avenue

(z) Route Y bus line along Godfrey Avenue, 5th Street, Oak Lane Road, Ashbourne Road, Ryers Avenue and Cottman Avenue

(aa) Route XO bus line along Godfrey Avenue, Champlost Avenue, Cheltenham Avenue and 2nd Street

Almost all of these surface transit lines function as feeder lines to the Broad Street Subway and Frankford Elevated Rapid Transit Lines.

The surface transit lines feeding the Frankford Elevated are Routes 3, 5, 20, 56, 57, 59, 60, 66, 73, 75, 88, 89, B, J, K, N, P, R, T, W, and Fox. All of these lines either cross the Frankford Elevated line at transit stations or have terminals at transit stations.

The surface transit lines feeding the Broad Street Subway are Routes 15, 56, 60, 75, J, R, Y, XO, and Fox. All of these lines either cross the Broad Street Subway at transit stations or have terminals at transit stations.

Several of the surface transit lines are observed to act as feeder routes to both the Frankford el and the Broad Street Subway since they connect to both of these rapid transit lines. These dual feeder routes are Routes 15, 26, S, 56, 60, 75, J, R, and Fox. The Route Fox is a direct bus line connection between the two rapid transit lines with its terminals at Olney Station and Bridge Street. Route P has both of its terminals at Frankford Elevated Stations and primarily acts as a feeder to that line from the industrial areas on G Street and the Juniata Park residential neighborhood.

The surface transit lines which do not act as feeder lines to the Broad Street Subway and Frankford Elevated are routes 47 and 50. Route 50 is a trolley line operating parallel to the Broad Street Subway along 5th Street and then Rising Sun Avenue and Route 47 is a bus line also operating parallel to the Broad Street Subway.

Transfers of passengers among the surface routes are possible at all route crossings allowing surface mass transit travel to practically any location within the Pulaski Highway Study Area.

In addition to feeding the rapid transit lines several of the surface transit routes connect the commuter railroad stations and act as feeder routes to those lines. Routes 57, 75, K, N, R, S and 26, T, W, XO, Y and Fox connect with stations along the Reading Railroad commuter rail lines and Routes 5, 20, 56, 73, S and 26, and T connect with stations along the Penn Central commuter rail line.

Travel from the Northeast to the CBD along the Penn Central Railroad commuter line is not very large because the Frankford Elevated provides quicker and more reliable service. Travel along the Reading Railroad commuter rail lines to the CBD includes many riders attracted to the line at the Wayne Junction and North Philadelphia Stations indicating that this rail line provides significant service to commuters within the city limits.

Travel to the CBD along the Frankford Elevated as measured in the 1973 travel time study conducted by DVRPC indicates that the major ridership attraction point is the Bridge Street Terminal. The ridership attracted to this station amounts to 24,000 daily trips. This is good indication that the feeder surface transit system with terminals for twelve routes at this station is performing its function effectively. The next largest ridership attraction points are Allegheny Avenue (7,300 daily trips), Margaret-Orthodox

(7,500 daily trips) and Erie-Torresdale (5,200 daily trips). These figures are also indications of the importance of the feeder surface transit system's ability to collect transit trips and deliver them to this rapid transit line. Much lower ridership attraction takes place at stations without feeder lines (Church Street - 1440, Tioga-2410).

(2) Proposed Mass Transit System Improvements

Many proposals to improve rail transit service between Northeast Philadelphia and the CBD have been studied by the city and their consultants, by DVRPC and by transportation consultants to the Northeast Federation of Community Councils and the Northeast Transportation Action Council. These proposals include: extension of the Broad Street Subway, extension of the Frankford Elevated, connection of the Reading Railroad West Trenton and Newtown Commuter Rail Lines with electrification of the Newtown Line, the activation of the Reading Railroad Short Line for commuter rail travel, and various surface transit route changes and extensions.

(a) The Extension of the Broad Street Subway

The extension of the Broad Street Subway into Northeast Philadelphia has been the subject of numerous studies over the last two decades. In 1948, a preliminary location survey was prepared for the city by engineering consultants. In 1950, the 1948 study was re-evaluated by Louis T. Klauder and Associates for the city. In 1961, the Department of Public Property prepared a study of the extension.

It was not until explicit origin and destination zonal trip data was obtained from the Penn-Jersey Transportation Study, however, that conjectures about the flows of trips and behavior of people in their trip making were removed from the evaluations of this line.

In September of 1964, a two year engineering study of two alternative routes and riderships was completed by Turnpike Engineers Incorporated and their economic consultants, Robert R. Nathan Associates, for the City of Philadelphia. These consultants prepared engineering designs and cost evaluations for comparison of two alternative routes of the Broad Street Subway Extension. In addition, a very extensive analysis of ridership on the Broad Street Subway was prepared by Robert R. Nathan Associates which included research studies prepared by Edson L. Tennyson, the City Transit Engineer; evaluations of the Penn-Jersey Transportation Study zonal trip origin and destination data; special population and economic activity studies prepared by Joseph Oberman and by Dr. J. V. Mowll; evaluations of the existing transit facilities and schedules; and evaluations of existing and proposed highways.

Conclusions produced by all of these studies were contained in the report detailing the studies which was published by Turnpike Engineers Incorporated in September, 1964. This extensive study concluded that the extension of the Broad Street Subway to Rhawn Street was economically justifiable and that the best route for the Broad Street Subway extension would be a surface facility in the median of the Northeast Freeway. The Boulevard Route attracted 6% more transit riders, however, this was offset by the additional cost of subway construction along the Boulevard, the extreme traffic congestion of the Boulevard during the long construction period, and the overwhelming construction difficulties in extending the Roosevelt Boulevard line past Rhawn Street.

The extension of the Broad Street Subway into Northeast Philadelphia was subsequently approved by the City of Philadelphia and construction plans were prepared for the first section between Broad Street and Rising Sun Avenue. The sale of bonds to finance the first section was approved by the voters of Philadelphia and the project was let for bidding. All bids were rejected, however, when they substantially exceeded the engineering cost estimates and the plans are presently being re-evaluated.

The extension of the Broad Street Subway into Northeast Philadelphia was included in the 1985 Adopted Subway Elevated and Rapid Transit Plan for the Delaware Valley Region. The basic transit test network included the extension to Rhawn Street (this basic network became part of the 1985 Adopted Regional Transportation Plan) and the maximum test network included the extension to Grant Avenue.

(b) The Extension of The Frankford Elevated

The extension of the Frankford Elevated Rapid Transit Line has been studied by DVRPC, consultants for the City of Philadelphia, and by consultants for the Northeast Transportation Action Council.

The Frankford Elevated extension was evaluated in the early 1948 study of transit in Northeast Philadelphia by engineering consultants and additional evaluations were included in the Turnpike Engineers Incorporated 1964 study. Based on the economic and potential ridership estimates, only one public tranist line extension in Northeast Philadelphia is economically feasible. The extension of the Broad Street Subway was recommended because it would provide a better overall service to Northeast Philadelphia than an extension of the Frankford Elevated.

The Frankford Elevated extension to Rhawn Street along Frankford Avenue was included in the DVRPC intermediate and maximum Subway Elevated and Rapid Transit test networks in conjunction with the Northeast extension of the Broad Street Subway. This extension was not recommended by DVRPC as a result of their test network evaluations.

The ridership volumes indicate that the Frankford Elevated draws most of its ridership from the surface transit feeder routes. Since these feeder routes mainly service Northeast Philadelphia it becomes apparant that almost all of the trips made along the Frankford Elevated have trip ends located in Northeast Philadelphia.

A review of the mass transportation facilities already operating in Northeast Philadelphia indicates that the Frankford Elevated line is the major rapid transit trunk line servicing the area and that this line is presently operating in coordination with an extensive surface mass transit system which collects and distributes the transit trips over a wide area. This coordination of surface lines and trunk lines is the most efficient method of accommodating mass transportation travel demand and the present system represents the application of sound operational practices by the operating authority - SEPTA.

(c) The Connection Between the West Trenton and Newtown Commuter Rail Lines

The connection between the Reading Railroad's West Trenton and Newtown Commuter Rail Lines at Huntingdon Valley was studied by the DVRPC. The connection also included electrification of the Newtown Line between Huntingdon Valley and Newtown and the abandonment of passenger service along the Newtown Line between Fox Chase and Huntingdon Valley. This proposal was included as part of the basic transit test network and later was included as a part of the 1985 Adopted Railroad Plan for the Delaware Valley Region.

This connection would provide quicker service between Philadelphia and the sections along the Newtown Line between Huntingdon Valley and Newtown. This project is presently being implemented.

(d) Activation of the Short Line

The Northeast Transportation Action Council (NETAC) recommended in 1971 that the Reading Railroad Short Line be activated for rail commuter travel as a demonstration project. This activation of an already existing rail line for commuter rail travel was considered by NETAC to be an easily and quickly implemented supplemental transit facility which would serve Northeast Philadelphia with stations at Rhawn Street, Welsh Road, and Woodhaven Road.

This proposal was thoroughly reviewed by the technical staff of DVRPC and was the subject of a special report published by DVRPC in January, 1972. The conclusion was that the activation of the Reading Short Line was not justified due to the capactiy restraints and high volume of existing freight traffic through the two track section between Wayne Junction and Newtown Junction.

This DVRPC report also included staff investigations of the additional transit facility improvements proposed by the NETAC transportation consultant, Mr. Albert J. Derr, in conjunction with the activation of the Short Line.

Mr. Derr proposed the extension of the Frankford Elevated and the extension of the Broad Street Subway along the Roosevelt Boulevard in conjunction with the activation of the Reading Short Line. However, these proposals were not supported by detailed technical travel studies or engineering feasibility studies as were the evaluations of the Broad Street Subway and the Frankford Elevated previously prepared by consultants for the city and by Dr. Anthony R. Tomazinis for the Northeast Federation of Community Councils. The technical travel studies indicated, as previsouly mentioned, that only one rapid transit extension is economically feasible. Mr. Derr proposed three additional rapid transit lines; the Short Line, the Broad Street Subway Extension and the Frankford Elevated extension.

(e) Surface Transit Route Improvements

The operation and routing of the surface transit system in Northeast Philadelphia is the responsibility of the Southeastern Pennsylvania Transportation Authority (SEPTA). Many changes in routings and services of these lines have been carried out by this agency over recent years in response to travel demands.

Extensive routing plans have not been studied by DVRPC or PennDOT because SEPTA has this responsibility.

Changes to the surface transit system in Northeast Philadelphia were included with the NETAC proposal to activate the Reading Short Line. Mr. Derr suggested restructuring of the surface routes to serve as cross district feeder lines between the proposed subway in the Boulevard, the Short Line and the Frankford Elevated.

In addition,Mr. Derr proposed the restoration of the Route 59 trolley line along Rising Sun Avenue and the construction of a light rail spur line along the Pennway Street corridor to Rhawn Street. He also proposed an express bus connection between the proposed rail rapid transit facilities and the North Philadelphia Airport to accommodate air commuters, visitors, and airport employees. Mr. Derr's proposals were not supported with technical travel data as previously indicated.

As previously discussed, the surface mass transit system is currently operating as a feeder-distributor system in conjunction with the existing rail mass transit facilities in Northeast Philadelphia as suggested by Mr. Derr. The Route 50 trolley line was cut back from the area indicated by Mr. Derr by SEPTA because of declining ridership. The light rail service along the Pennway Street route would probably not attract sufficient ridership due to its closeness to Mr. Derr's proposed Broad Street Subway Extension along the route of Roosevelt Boulevard. Also this route is the intended route of the Broad Street Subway Extension proposed by the City of Philadelphia.

Express bus connections to North Philadelphia Airport probably would not attract sufficient ridership because they would be less convenient and less reliable for most air commuters and airport employees than their own private automobiles and they would also be in competition with existing bus lines. SEPTA currently operates an express bus between the Philadelphia CBD and Philadelphia International Airport at a fare of $1.00. A similar fare would be necessary along Mr. Derr's proposed routes because of Public Utility Commission regulations. However, ridership would be substantially less. The high fare would discourage use especially since the same trip can be made on existing bus lines for the existing 35¢ fare.

(f) Reactivation of the Reading Railroad Frankford Branch for Passenger Service

During the course of the present PennDOT studies for the Pulaski Highway, the reactivation of the Reading Railroad Frankford Branch freight line for passenger service to the CBD was investigated. The line has a terminal area at Orthodox Street and Oakland Street in the Northwood neighborhood and was once used for passenger service.

Because of the nearby location of the Margaret-Orthodox station of the Frankford Elevated and its connection to feeder bus Route J along Orthodox Street this reactivation was not considered justifiable. The Frankford Elevated would provide quicker service to the CBD and the proposed rail line reactivation could not attract enough ridership to make the passenger service operation along this line worthwhile.

(3) Considerations in the Traffic Projections

Some of the above improvements to the mass transit system in North-east Philadelphia were considered in operation for the traffic projection analysis prepared for the proposed Pulaski Highway. The facilities which DVRPC considered to be in operation for the 1985 traffic projects were the extension of the Broad Street Subway to Rhawn Street and the connection between the West Trenton and Newtown commuter railroad lines. The remainder of the above proposed mass transit improvements were not considered for the reasons discussed with their description.

A full description of the mass transportation system and projected mass transit ridership levels on the subways, commuter railroad lines and surface transit lines used in the projection and assignment of 1985 trips to the Pulaski Highway is contained in Section I. The highway traffic projections prepared for the Pulaski Highway were based on a transportation system which considered the Broad Street Subway extension in operation. The traffic projections,therefore,definitely did consider the diversion of trips, oriented between the CBD and the Northeast Section of the city, from the highways onto improved mass transit.

The Northeast Philadelphia area through which the Pulaski Highway is planned has very dispersed travel patterns. The Penn-Jersey Transportation Study data indicate that only 5.1% of all daily person trips in this section of the region are destined for the CBD. In addition, the data indicate that 69% of the daily person trips destined for the CBD are already made by mass transit facilities. The high utilization of mass transit for these trips is due to the existing rail trunk lines and surface feeder lines already servicing this area.

The traffic projections prepared by DVRPC for the Pulaski Highway were developed with considerations of the existing and proposed mass transit facilities serving Northeast Philadelphia and also accounted for the high percentage of CBD oriented transit use in this area. These considerations can be observed in the results of the selected link analyses of traffic on the Pulaski Highway which indicate that only 17% of the trips originated in Northeast Philadelphia.

Because of these transit usage considerations in the traffic projection processes no significant additional diversion of traffic projected to travel along the Pulaski Highway to mass transportation facilities can be expected. High usage of existing rail transit for CBD travel and an additional rail rapid transit facility (the Broad Street Subway Extension) were considered in the traffic projections.

Non-CBD oriented travel is already served by an extensive system of surface mass transit light rail and bus lines which are interconnected throughout Northeast Philadelphia. In addition, the Penn Central Trenton Branch Commuter rail line is presently operating along a route generally parallel to the Pulaski Highway and Roosevelt Boulevard links of the planned circumferential freeway system. This existing rail commuter line is also connected to the extensive surface transit system in the area.

Because these transit facilities serving non-CBD oriented travel were also considered in the traffic projection process, no significant additional diversion of traffic projected for the Pulaski Highway to mass transportation facilities can be expected. An evaluation of transit ridership in Northeast Philadelphia was prepared in August of 1964 by Dr. Anthony R. Tomazinis for the Northeast Federation of Community Councils. Dr. Tomazinis reviewed data files of the Penn-Jersey Study and the Philadelphia City Planning Commission and concluded that new rapid transit lines would not reduce the need for additional highway facilities in Northeast Philadelphia. He noted that transit lines would serve to reduce the peak hour demand loads on major radial freeway facilities, however, new highway facilities would be needed regardless of the particular and required service which the proposed Broad Street Subway Extension would render to the area.

In summary, the section of Philadelphia through which the Pulaski

Highway is presently planned is already serviced by both radial and circumferential rail mass transit lines and by a very extensive system of surface mass transit trolley and bus lines, all of which are interconnected. Additionally, because this extensive mass transportation system is already in existence, a higher than average percentage of person trips in Northeast Philadelphia are presently being made by mass transit. Improvements to the mass transit system were considered in the traffic projection and additional mass transit facilities, surface or rail lines, cannot be expected to divert a significant amount of additional ridership from the highway system in this area nor eliminate the need for the Pulaski Highway.

c. Mass Transportation Alternative in place of the Pulaski Highway

The Pulaski Highway is proposed to function as a link in a freeway beltway system around the core areas of the City of Philadelphia. It is planned to serve the dual purpose of linking a number of main radial feeder routes from areas outside the core and serving as a link in the beltway bypass around the core. If the Pulaski Highway is not constructed, the beltway around the core area of Philadelphia will be eliminated. Through traffic would not have a bypass route around the core area of the region and would continue to travel in a radial manner into the core area and then out again along existing radially oriented expressways to reach destinations on opposite sides of the core area. In addition, an alternative route for the already objectionably high volumes of heavy trucks along the arterial streets in the Pulaski Highway corridor would not be provided.

The provision of a mass transit rail facility in place of the proposed Pulaski Highway, therefore, would not provide a means to accomplish the goals and objectives of this proposed highway. The provision of a mass transit line along the route of the proposed Pulaski Highway thus is not a viable alternative. Mass transit facilities and freeways work together as parts of a total transportation system to fulfill the travel demands of a region, however, a mass transit facility cannot effectively fulfill the functions of a freeway beltway.

d. Mass Transportation Applications Along the Pulaski Highway

(1) Bus-Carpool Lanes

The implementation of exclusive lanes for buses and carpools along the proposed Pulaski Highway has been investigated by DVRPC and PennDOT.

The results of these analyses indicate that 127 carpools and 10 buses would use the exclusive lane during the peak hour of operation in 1980. These volumes are not high enough to justify setting aside one lane on the Pulaski Highway for this purpose in 1980.

The establishment of the exclusive lanes on the Pulaski Highway is feasible and these lanes could serve as a connection between similar exclusive lanes proposed for Roosevelt Boulevard and the Delaware Expressway. They could thus be easily implemented if the demand for this service ever reaches a point where the establishment of exclusive lanes would result in substantial benefits to the public.

(2) Fringe Parking Lots

The application of fringe parking lots in the vicinity of the Pulaski Highway was investigated by PennDOT transportation planners. The investigation concluded that this type of parking facility was not feasible in the Pulaski Highway corridor because there is insufficient open land available for their construction. (See Appendix page 182)

(3) Park and Ride Lots

The application of park and ride lots along the Pulaski Highway was investigated.

The highway as presently planned would pass over the Frankford

Elevated on Kensington Avenue near Worrell Street. Park and ride lots under the viaduct sections in the vicinity of Kensington Avenue would be reasonably close to the Erie-Torresdale Station (1500 feet) and could serve to relieve the need to expand the existing SEPTA park and ride lots at the Bridge Street Terminal.

Park and ride lots in the vicinity of the proposed interchange at Roosevelt Boulevard to serve the proposed Broad Street Subway Extension are generally not feasible due to the depressed design of the Pulaski Highway. There are the possibilities of utilizing the infield area of the Alternate E interchange or the areas under the viaduct sections of Alternate A-2 for this purpose if the subway extension continues along Roosevelt Boulevard.

5. Other Actions

a. Postponing the Decision

The proposal to postpone the decision to build or not build the Pulaski Highway is not acceptable. The need for this project was identified in the 1947 traffic survey and since that time numerous studies and plans have been developed. The project has been stopped and then started again a number of times over the years resulting in confusion and uncertainty among the local residents. The residents in the vicinity of the project are reluctant to maintain and repair their homes because of the uncertainty over the highway. These residents are also "locked" into their present homes and unable to move away because buyers must be informed of the highway project and are not willing to purchase homes which may be condemned for the highway right-of-way. These factors have contributed to the decline of some sections of the residential areas in the vicinity of the project. In addition to these factors, many homes have already been purchased for the highway right-of-way. Some of these homes have already been demolished and many of those left standing have been vandalized and made uninhabitable.

These conditions and the determination of area residents and businessmen to know, once and for all, whether or not the Pulaski Highway is to be built have been thoroughly documented in the Economic and Sociologic Impact Studies and in the recent Pennsylvania Senate and House of Representatives investigations into the delays in completing the project. This decision should be made as soon as possible because of the detrimental effects the uncertainty would continue to have on the area residents and businesses.

b. Postponing the Construction

Postponing the construction of the Pulaski Highway, if the decision is made to build the project, is not practicle, The cost of constructing this project has risen substantially over the years and postponing the project would result in further increases. In 1958 the project was estimated to cost $49.8 million for 4.98 miles, while at the present time the project is estimated to cost $140 million for the 2.4 miles between the Delaware Expressway and Roosevelt Boulevard. With inflation assumed at 10 percent per year, each year of delay increases the cost of the project by approximately $14 million. Each year of delay would also result in increased traffic volumes along the local arterial streets and traffic congestion would occur more frequently and for longer periods.

The implementation of the Pulaski Highway would result in improved air quality on a regional basis. The postponement of the construction would therefore postpone related improvements in air quality in the CBD and would be contrary to the goals of the State Implementation Plan and the regional Transportation Control Strategies.

The postponement of the project until 1983 would eliminate all violations of the eight-hour carbon monoxide air quality standards in the areas immediately adjacent to the Pulaski Highway. These violations would only occur at sites immediately adjacent to the project during "worst case" conditions during the period between the opening date of the highway and 1983. These "worst case" conditions could be expected during four periods containing morning peak traffic hours and three periods containing afternoon peak traffic hours each of those years.

The postponement of the construction of the Pulaski Highway would also result in the continued presence of vacant homes and lots in the residential areas along the highway right-of-way. These conditions would result in undesirable aesthetic effects in the surrounding neighborhoods.

c. Providing a Reduced Facility

(1) Reduction of Number of Lanes

The reduction of the number of lanes for the Pulaski Highway was proposed by the City of Philadelphia Planning Commission. This proposal was evaluated by the Pennsylvania Department of Transportation and determined to be infeasible.

Once the Pulaski Highway becomes operational, the travel link between the Roosevelt Boulevard and the Delaware Expressway and Betsy Ross Bridge will be established. Travel desires would be attracted to this new link from the surrounding arterial streets. If the Pulaski Highway is not constructed with sufficient capacity to accommodate the attracted travel desires, congestion along the highway and the surrounding arterial streets would result.

The presently proposed design for an eight lane freeway facility would operate at stable flow conditions, Level of Service D, in the 1995 design year. Level of Service D is the minimum acceptable design level and the reduction of the number of lanes would result in designing to produce traffic congestion. A six lane Pulaski Highway would operate at capacity conditions -

Level of Service E, at the opening date in 1980. The unaccommodated travel demand along the corridor would utilize the local arterial streets causing congestion along the local facilities. The net savings in right-of-way requirements would only amount to one twelve-foot lane in each direction (a total of 24 feet in an approximate width of over 200 feet) and the resultant traffic congestion would likely increase air quality and noise pollution impacts in the corridor.

(2) Reduction of Design

The concept of providing a reduced facility with regards to highway design features was considered in the presently proposed designs. Urban Design Criteria was utilized in the preparation of the design plans. This criteria allows for sharper curvature and steeper grades along the alignment to reduce right-of-way requirements. The normally included safety recovery areas extending thirty feet from the inner and outer edges of the travel lanes was eliminated to reduce right-of-way requirements. In addition to these considerations, the designs included the use of viaduct sections to permit construction along the alignment of the Frankford Creek and to allow for continued service along the railroads, streets, and the Frankford Elevated under the highway. The viaduct section also reduces the barrier effects of the highway. Where feasible, the highway was designed in a depressed section below ground level with retaining walls at the edge of the roadway shoulders. These design considerations have already minimized right-of-way requirements and reduced the detrimental impacts in residential areas.

d. Elimination of Local Interchanges

As the result of concerns expressed by citizen representatives on the Interdisciplinary Team regarding the effects of the local interchanges presently proposed at Aramingo Avenue and at Castor-Wingohocking, DVRPC conducted an analysis of local interchange elimination. This analysis is included in its entirety in the Appendix (See pages 500 to 507).

This analysis concluded that, while traffic would be reduced on the Pulaski Highway due to local interchange elimination, parallel local roads in the area would experience increased traffic. Traffic increases would also result on the Delaware Expressway and on Roosevelt Boulevard due to local access elimination.

Construction of the Pulaski Highway without local access would subject the communities within the study area to the disadvantages of both the build and no-build alternatives, without the benefits provided via access. The only advantages of the access elimination would be the reduction of traffic on some arterials in the immediate vicinity of the local interchanges and the possibility of the reduction of the Pulaski Highway from eight to six lanes.

The effect of lane reduction on right-of-way is insignificant (as discussed previously) and the disadvantages of increased traffic on most local roads outweigh the advantages of decreased traffic at isolated locations. For these reasons, local interchange elimination was deemed infeasible.

6. <u>Summary</u>

This section has indicated which highway alternate alignment concepts are feasible and reasonable. While a new mass transit facility was not found to be a feasible alternative to the Pulaski Highway, certain mass transit opportunities are possible in conjunction with the Pulaski Highway.

It was determined that the elimination of local interchanges and the reduction of the number of lanes is not reasonable.

The next part of this section addresses the impact of the reasonable alternates identified, including the No-Build Alternative.

B. PROBABLE BENEFICIAL AND ADVERSE EFFECTS AND COSTS OF REASONABLE ALTERNATIVES

1. General

This section discusses the various beneficial and adverse effects due to the possible construction of any of the reasonable alternate highway alignments and due to the possible adoption of the No-Build alternative. The following paragraphs detail these effects in the appropriate social, economic, environmental, and engineering categories.

2. Sociological Impact

a. Common Section-Delaware Expressway to Leiper Street - (Section C)

In this section of the highway, families and individuals will be displaced from their homes and in many instances from their friendship circles. Approximately 33 dwelling units have yet to be acquired in this area. For older persons particularly this may involve considerable personal cost. The proportion of persons 65 years of age or older in the Lower Frankford area (14.5% in Tract 293) is higher than the proportion in the micro area (13.5%), the macro area (13.4%), and in the city (11.7%). Those remaining in Deni near the highway but not on its right-of-way may find the neighborhood a less desirable place in which to live. Community leaders cited their fears of noise, air pollution, dirt, the ugliness of an overshadowing highway, and the abandoned cars and refuse beneath such highways*. More severe problems of noise, dirt and safety were anticipated by these people while the highway is under construction. They expressed a concern that homes near the highway would be unwanted except by welfare families and very poor people with lower behavioral standards. While this might happen to a greater degree than is true in the neighborhood at present, it also seems possible that an abandoned house problem such as is emerging in East Frankford could result from the

* See appropriate part of this Section for actual analysis of these effects.

highway. The working class neighborhood of Deni is likely to gain sociologically from the No-Build Alternative than it would from the construction of the highway.

Population decline in some tracts was great and decline in income relative to that of the SMSA was great in Frankford Valley. (New residential construction in some tracts may now be reversing or reducing these losses). The eastern section of Frankford was affected about a decade earlier by the construction of Aramingo Avenue. The Frankford Elevated serves as an eyesore, a generator of noise and a social barrier, however familiar and needed the el may be. The Pulaski Highway, running along one side of Frankford and penetrating the Deni section, could accelerate the deterioration of the area. In an interview, a civic leader described serious problems of Frankford and the steps taken to meet them, and then when asked how the Pulaski Highway would affect the ara, he said that it might undermine the morale of people working to improve Frankford. Any social deterioration which the highway might cause in Frankford would affect adjacent neighborhoods also.

b. Alternates A-1 and A-2

These two alignments were treated as one alternate in the Social-Cultural Impact Study since both routes follow the same general path and ramp configurations are assumed to be interchangable, the only difference between the two alternates being the elevated status of the highway versus the depressed design of the highway as it passes through Greenwood and Oakland Cemeteries. The social-cultural impact is not likely to differ because of the difference in elevation.

A sizeable number of residential units are affected by the A-1 and A-2 alignments. These residences, however, are nearly all on the west side of Roosevelt Boulevard in the Summerdale section of the study area, and with alternative ramp configurations the number of residences affected could be reduced. (See Relocation part of this section and tables 55 and 56).

The A-1 and A-2 Alternates, however, do affect the east side of the Boulevard. The alignments pass through the front part of Oakland Cemetery and through a substantial section of Greenwood Cemetery. Their passage along Adams and Castor Avenues runs very close to housing in the Northwood neighborhood and is likely to affect the residents along this road. It should be noted, however, that the A-1 and A-2 alignments affect another side of the Northwood neighborhood, namely the residents are among those who have been most vocal in their opposition to the heavy truck traffic now inundating these streets. It is not probable that the construction of a limited access highway, designed to alleviate much of that truck traffic, equally close to their houses, will eliminate this complaint.

The most important focus of the social-cultural impact assessment must be upon the social consequences for the two cemeteries, Oakland and Greenwood. In both cemeteries, the A-1 and A-2 alignments would necessitate a substantial number of reinterments and relocation of grave sites. Further, the administration buildings in both cemeteries would be razed as a result of construction of these alignments. The Oakland Cemetery building may have the potential for certification on the National Register of Historic Places. (See Section VIII).

From a sociological point of view, the most serious social-cultural consequences do not lie in the facts of reinterments as such, nor in the destruction of possible historic sites or in potential business losses by the cemeteries (although such facts have legal, historic and economic importance), but in the potentially negative effects on individuals in the immediate or wider community who use or plan to use these facilities. Consequently, these individuals reactions and expectations are of greater social importance than the views of the cemetery administrators who, in the case of Greenwood Cemetery, favor the construction of the highway or in the case of Oakland Cemetery oppose all but Alternate D.

To the extent that the disruption of the cemeteries affects the local surrounding community in any negative way, the A-1 and A-2 alternatives should be reconsidered. There are several ways in which this may happen. If many of the interments are ancestors of local residents, the cemeteries may be viewed as a community institution and therefore a part of the community's social structure. Interviews performed by the Sociologists indicate, however, that neither of the two cemeteries have a substantial number of interments who are relatives of community residents. Thus, the social effects on community cohesiveness are likely to be non-existent or negligible.

Cemeteries may also serve community residents as a place to congregate for recreational purposes. Although the overgrown state of Greenwood Cemetery does not lend itself to walks and bicycle rides and, in fact, is considered a community eyesore and a harbinger of illicit activity, the Oakland Cemetery, with its park like appearance, is used to some extent for this purpose by community residents. The appearance of a concrete structure through part of this cemetery would probably discourage such recreational activity unless proper landscaping would be implemented. Such landscaping would not be possible with the elevated Alternate A-2.

Finally, there are potential negative social consequences to non-residents, namely those who have relatives buried in the two cemeteries. The psychological effects of reinterment on surviving relatives should not be underestimated, especially in the case of the older graves sites where reinterment is a "dirty business," as one of the administrators put it. The grave sites in Oakland Cemetery which would have to be relocated if either

Alternate A-1 or A-2 were adopted are some of the more prestigious and expensive sites along the front part of the cemetery.

c. Alternate B

The social costs of Alternate B from Castor Avenue to Section C would be approximately the same as the two Alternate A routes it parallels. The notable distinction for this route is its pathway through the two cemeteries and the proposed location of a system of ramps, one of which (Ramp E) is on the west side of the Boulevard. The impact of this route is relative to housing units immediately affected as indicated by the fact that of the total of 191 units affected, 141 units are on the west side of Roosevelt Boulevard. Certainly an ameliorating factor in lowering the social costs of this route would be an entry system into the Boulevard terminus similar to the proposed ramps for Alternate Route C. Inasmuch as an evaluation has already been made relative to the effects of passage through Greenwood and Oakland Cemeteries, it is not necessary to repeat the same observations, except to note that this route would have the greatest impact on the cemeteries of any proposed route as this is indicated in terms of required land and grave reinterments.

It is generally believed that the Oakland Cemetery is one of the best maintained properties along the Boulevard. The aesthetic value of such a property bears no simple economic cost. It is no doubt possible to alleviate a measure of the negative impact of such a proposed route through landscaping that would create a park like effect. One might also suggest that Greenwood Cemetery team up with Oakland Cemetery in a joint venture of future development. Barring this, officials from Greenwood Cemetery might be willing to sell to Oakland Cemetery an equivalent number of acres lost by the latter by Alternate B.

All of the alternate routes have similar effects at the eastern terminus relative to the displacement of homes and proximity to neighborhood institutions. The Deni Playground has been previously mentioned in this report as being very close to the proposed right-of-way of all routes.

d. Alternate C

In relation to the other proposed routes, the largest issue relative to the pros and cons of Alternate C is the impact of this route on Friends Hospital. This institution would lose a little over eleven acres of land and four buildings.

In comparison to the other routes, it is tied for last place in the number of residential units immediately affected, 92 units. It joins the Boulevard with no proposed ramps on the west side of this street. This route preserves the territorial intergrity of Oakland Cemtery while cutting through Greenwood Cemetery.

Any ameliorative steps to offset the adoption of Alternate C are difficult to state. Perhaps the one that gets the highest priority is the relocation of Friends Hospital to another part of the city or to a suburban area. As it is a national landmark in the field of psychiatric medicine, any attempt to veto the already expressed opinion of the hospital administrators would mean a series of legal skirmishes to preserve the status quo. It should also be restated that the Northeast Community Mental Health Center is also located on the grounds of Friends Hospital. As this is a community institution, its availability is directly associated with the complexity of traffic patterns in the immediate vicinity of the hospital. Of course it is true that the center could be relocated to another part of the northeast. Some might infer that the Boulevard area is already confusing enough to justify relocating an agency that works with a significant number of out-patients.

Officials of Greenwood Cemetery do not think of the Pulaski Highway as a threat to its integrity. Officials from Parkview Hospital also have no strong objections to its rather close proximity to either Alternate C or D.

e. Alternate D

The route through Tacony Park, Alternate D has quite obvious advantages, low number of families and individuals displaced and relatively low cost. It has the salient disadvantage of taking park land which has present and future recreational value to the neighborhoods nearby. Some of the park land involved is rather undeveloped and some is used often by area residents. The highway would skirt the majority of the golf course and, where it passed near the creek, it would be encroaching in a distrubing way on a principal focus of the park. In the narrow part of the park between Ruscomb Street and Bingham Street, the highway right-of-way would be taking the center part of a narrow band of park. On the far side of Roosevelt Boulevard the interchanges for the highway would, as presently drawn, take additional park land. Proponents of the highway and of the park route argue that the park is poorly developed and little used so it is the "least cost" alternative. Opponents of Alternate D stress the use and value of the park at present for picnics, horseback riding, and other relaxed, non-competitive recreation and they stress the need for the park in the future. While the park would continue to exist after the highway was built through it and replacement parkland provided, it's recreational value as a rather quiet escape from the noise and pace of the city would be diminished considerably.

It has been pointed out by the economics study team that one criteria for deciding on alternate routes is the number of families and individuals who would live near but not on the right-of-way since these families may endure a loss of livability in their homes and neighborhoods but will not be compensated for this. Alternate D leaves the largest number of persons and families in close proximity to the highway once it is completed. In this important aspect it places a far higher number of people in the immediate vicinity of the highway than does any other route except Alternate E which cuts through Northwood. From this standpoint, this route is undesirable.

Alternate D passes very close to Parkview Hospital. Possible noise and air* effect of the highway did not, however, seem to be perceived as a significant threat to the patients, perhaps because the hospital keeps windows closed and filters its air. On the other hand, Alternate D passes farther from the Northwood Nursing Home than the other routes except Alternate E.

The impact of the exit ramps for Alternate D, as for the other alternatives, cannot be clearly assessed since the placements of the ramps is flexible and the ramps shown on the maps are only one option. Still the flow of traffic on and off the Pulaski Highway and along the streets which form the normal approaches to it pose substantial problems for the people and institutions in the area. Most obviously the ramps depicted are along the path many adults and children take to reach Saint Ambrose Church and School and Brith Israel Synagogue. The planned pedestrian overpasses of the Pulaski Highway ramps and Roosevelt Boulevard would alleviate this potential hazard. There are also a number of other schools in the area whose pupils might well face additional hazards from traffic approaching the highway. (See part 5 of this section for complete discussion of traffic effects of the Build and No-Build Alternatives).

f. <u>Alternate E</u>

This alignment along the Reading Railroad spur passes through the Northwood neighborhood and its varied ramp configurations also affect a segment of Summerdale. The route has the distinct advantage of utilizing the railroad

* See appropriate part of this section for actual effects.

tracts for almost the entire route from Leiper Street to Roosevelt Boulevard, thus avoiding substantial razing of housing in the Northwood community. Further, the housing demolition required along the right-of-way, which extends on both sides of the existing railroad tracks, affects single and semi-detached homes which, although these are some of the most visually attractive houses in the micro area, the owners would receive rather generous compensation. This compensation, coupled with the relatively higher income of the residents in this area, should ease the problems of relocation.

However, the apparent advantages of this route seem to be heavily outweighed by its social-cultural disadvantages. It appears from both the analysis of census materials and from interviews with Northwood residents and civic leaders that the Northwood community is one of the most cohesive and stable neighborhoods in the study area. This fact is manifested by the following social indicators:

-- The area had a negligible change in population size between 1960 and 1970 registering a small net gain during this period of approximately two percent.

-- The area has the highest percentage of older residents in the study area.

-- The population is racially homogeneous with the black population constituting less than one percent and residential segregation along racial lines seems to be firmly established.

-- Although residential stability is not as noticeable in the Northwood community as in the total macro area, it still parallels residential stability for the city as a whole and higher than stability for the SMSA.

-- In the upper section (Tract 302) of the area, home ownership exceeds that of the city and the SMSA. However, home ownership in the lower section

(Tract 301) is lower than the city and the SMSA and the lowest for the study area.

-- Similar relationships hold with respect to vacancy rates, these rates being lower than the city and the SMSA in the upper section but higher than the city and the SMSA in the lower section.

-- Median income in 1970 was higher than the city and compared favorably to the median income for the SMSA.

-- The percentage of families below poverty level was substantially lower than the city and also lower then the SMSA.

-- Occupationally, the Northwood area had the highest percentages of workers in the upper occupational status categories.

-- Educationally, the Northwood area had the highest number of individuals with high school educations (12.0 for Tract 301 and 11.2 for Tract 302).

-- The lower section of Northwood was the only tract in the area with an above average socio-economic status score and the upper section matched the average for the study area.

-- The civic organization representing the neighborhood is one of the most active in the area and has ongoing activities for the residents indicating a strong commitment for community improvement.

There are also some signs, however, of incipient deterioration of the Northwood community. Although the population size has remained stable and civic leaders assured us of the continued desirability of the area for residents,as manifested by the infrequent use of advertising for housing sales, it is apparent that the younger population is moving out of the neighborhood after marriage and thus threatens the continuity of stability in the future. Further, the Shevky-Bell index of familism shows that Tract 301, the lower section of the Northwood community, is the only segment of the study area receiving a "below average" rating indicating the higher incidence of apartment dwellers in this area with greater potential for residential mobility and thus decreasing the stability of the area. Finally, although the civic organization representing the area is highly active and operates as a cohesive force in the community, interviews indicated that the commitment to community improvement is not equally shared among the residents, those in the higher income and occupational brackets taking little or no interest in the community's preservation.

In summary, the current stability and cohesiveness of the Northwood community may be interpreted as a rather desperate attempt to hold on to what the community once was, and to a degree still is, with the probability of deterioration looming in the not too distant future.

It should be noted initially that the absence or presence of the highway may make very little or no difference in the future of this community-- thus, have neither positive nor negative effect. Urban deterioration seems to have a dynamic of its own which is related more to the general social-cultural trends in our society than the introduction of an innovation into an urban sub-area. However, there are some specific effects in the case of the E route which are likely to have negative social-cultural consequences.

First of all, it is apparent that the construction of Alternate E will directly affect 210 dwelling units and 64 apartment units,144 of which are located on the Northwood side of Roosevelt Boulevard. The demolition of these dwellings will result in a direct loss of population to the community of at least a comparable number of households (since most of these homes appear from inspection to be owner-occupied, the number of households affected is likely to be about the same). It was not possible to know whether these particular residents are significant mainstays in the social organization of the community, but interviews suggest that these residents do belong to the civic association and actively use its services. It is highly likely therefore that the morale and effectiveness of indigenous community leaders will be negatively affected. Further, many of the affected residents are likely to be in the older age groups and will find relocation a severely disturbing experience being removed from neighbors and friends with whom they have had relationships for a substantial period of time.

Secondly, the construction of Alternate E would detrimentally effect the sense of community which strongly characterizes this section of Northwood through the residents' perception of splitting the community in half. It is of course true that the current railroad line serves substantially the same purpose but interviews indicate that the highway will be perceived as a greater barrier to interaction, although it may not in fact be so physically and thus will negatively affect social organization patterns of neighborliness.

Third, the right-of-way of Alternate E would take a section of Northwood Park which observation and interviews indicate is the focus of much community activity at present. Children utilize this park regularly and various recreational activities take place there. To the extent that the park is utilized and perceived as a center for community action, the construction of Alternate E could be a serious blow to the cohesiveness and stability of the area. Further, the access ramps planned in the vicinity of the Houseman Recreation Center in Summerdale on the west side of the Boulevard could represent a special safety hazard to children unless design specifically takes this into consideration.

g. Alternate F

Alternate F was proposed to the Interdisciplinary Team including community representatives, in an attempt to reduce certain negative consequences foreseen by the various expert consultants and community leaders of the construction of the other proposed alternates. It has been discussed in meetings of the Interdisciplinary Team and the present statement represents the conclusions of the sociological research team based upon these discussions and interviews with the civic leaders representing the most directly affected community, Northwood Civic Association.

There are some distinct advantages of Alternate F in comparison with the other six alternates previously proposed. Alternate F avoids the detrimental environmental impact of the Alternate D by being located even farther away from the Tacony Creek Park area with its wildlife and natural recreational facilities. It also avoids the negative social-cultural impact of Alternates C, B, A-1 and A-2 on either Friends Hospital or Oakland Cemetery. It does not cut the Northwood Community in half, nor affect the neighborhood's recreational opportunities and physical attractiveness as Alternate E would. Finally, the new ramp configuration reduces the demolition of housing on the westernside of Roosevelt Boulevard.

There are a number of distinct disadvantages to Alternate F however. The community most directly affected by this route is Northwood. In the discussion of Alternate E the fact that the Northwood community is one of the most cohesive and stable neighborhoods in the study area was stressed. Further, the indicators of incipient deterioration discussed in the consideration of Alternate E as applicable to the Northwood census tracts apply less to the segments of the community affected by Alternate F. Specifically, our interviews indicate that the homes along Adams Avenue and Ramona Avenue constitute the most stable section of Northwood. The residents of these homes appear to be long-term residents with a strong commitment to the community and very active in the civic association.

In other words, while the social-cultural impact of Alternate F closely parallels that of Alternate E, there are some additional features of Alternate F that aggravate the negative consequences. The loss of population through the demolition of houses on the right-of-way would seem to affect significant mainstays in the social organization of the community even more than Alternate E. The morale and effectiveness of community leaders will be negatively affected and may interrupt the continuity of current efforts toward community improvement. Further, the Northwood Nursing Home would be eliminated completely through the construction of the new alignment. An early interview between the Sociologist and the administration of that institution, as well as information from civic leaders, indicated that a relocation of that institution would represent a serious financial problem as well as affect many of the aged patients in the nursing home detrimentally through the up-rooting process which would be an accompaniment of relocation. However, based upon further analysis, the management of the Northwood Nursing Home has indicated that relocation can be accomplished without undue burden to the patients and their families. The official position of the nursing home is that they prefer to be acquired rather than to remain in proximity to the highway. (See Appendix page 388).

Northwood is a rather small neighborhood, one which is valued by its residents and highly regarded by others in the general area. It offers a rather satisfactory environment for living close to center city -- near the Frankford Elevated for people whose employment requires that they live in the city and for older persons who lived there for many years. Cutting into the southern part of the neighborhood, Alternate F, more than Alternate A but less than Alternate E, seems to have a negative impact on the livability of Northwood.

The unresolved dilemma remains. Any projected route that would link the Betsy Ross Bridge with Roosevelt Boulevard must uproot some people, while arousing the fears of many others who would continue to live in the vicinity of the proposed route. Whatever the proposed benefits of such a highway it will be perceived somewhat differently within the micro area. The proposed variety of alternate routes has resulted in raising the general level of anxiety and concern among the various community groups at the western end of the proposed Pulaski Highway. Frequent meetings of the community groups has tended to solidify opposition by the groups at the western end to all proposed alternate routes, exclusive of the No-Build Alternative. In view of the changing climate of opinion, it was impossible to obtain any fruitful discussion relative to ameliorative actions that might be taken to make Alternate F more acceptable to the community in closest proximity to the proposed new route.

h. No-Build Alternative

The No-Build Alternative has the advantage of minimizing, if not avoiding further damage to neighborhoods, families and individuals on or near a proposed route of the highway. The proposed highway follows the boundaries of neighborhoods rather well, since it goes along the Frankford Creek, but it does cut into Lower Frankford or Deni and Alternate E splits the Northwood neighborhood.

On a larger scale, the No-Build Alternative would avert the potential blighting effect on Frankford of an elevated highway built along its southern border. Frankford has been considerably affected by the building of I-95. Examination of the income and population statistics for the tracts in Frankford and Richmond along I-95 seems to indicate that these neighborhoods made a substantial "contribution to the common good", although the figures are mixed enough to support arguments to the contrary.

The No-Build Alternative would not subject residents to the sociological effects due to traffic increases on roads leading to the Pulaski Highway. However, the traffic analyses indicate that the study area roadways in general will experience increased traffic and congestion with the No-Build Alternative. Thus, the adverse sociological effects related to increased traffic are likely to be increased by the No-Build Alternative. (See part 5 of this section for traffic congestion discussion).

The No-Build Alternative would have the additional disadvantage of eliminating a large number of jobs and business profits in the Philadelphia area; jobs and sales which would have been created by the construction of the highway during the next several years. At a time when employment and under-employment are serious problems in the Philadelphia area, the loss of these potential jobs and sales is obviously a matter of some importance. (See part 4 of this section).

If the No-Build Alternative is adopted, some ameliorative steps will be needed. These steps are complicated by the fact that action has already been taken, acquisition and demolition had begun and has been stopped pending completion of this EIS. If the No-Build Alternative is chosen, the homes in possession of PennDOT should, in the opinion of the Sociologist, be made available to their former owners or to the people now living in them and homes standing empty should be rehabilitated and returned to private ownership. Reluctance of people to buy on or near the route of the highway and to invest money in major repairs on their homes will not abate unless it is clear that the highway will not be revived and built later. The inhibiting effect of the highway on homes purchased and major repairs will probably not be greatly reduced by the choice of the No-Build Alternative if this decision seems less than final. PennDOT should, in the opinion of the Sociologist, consult with citizens' groups and appropriate city agencies about the best use to which land already cleared for the highway could be put to stabilize the neighborhoods involved, to improve the quality of life there, and to meet the social and economic needs of the city.

Certainly the adoption of the No-Build Alternative in no way guarantees that the neighborhoods near the proposed highway will not undergo further blight. The aging process which affects American urban neighborhoods, the relative neglect of the needs of these neighborhoods by government in recent years, and the social ills affecting American cities make further deterioration likely unless the leaders of the neighborhoods which have been in the path of the proposed highway look over the area, determine the industrial, commercial, residential, social service and other social challenges that face them, and work together to meet these needs. This cooperation would have to bring together constructively the adults and youth of the white, black and Spanish-speaking groups in the area; the leaders of the different neighborhoods, since, with or without the Pulaski Highway, their futures are interdependent; and the leaders of citizen and business groups with those of city and private agencies.

3. Relocation

a. General

Relocation is an aspect of the social impact of the highway of critical importance for those on the right-of-way of the proposed routes. Research on the human consequences of urban renewal have indicated that relocation has been an area of substantial uncompensated monetary costs, e.g., families who move on their own after the project is announced without waiting for the start of the period when they are eligible for reimbursement, or move after that time without contacting the agency, and an area of even more serious non-monetary personal and social cost, e.g. grief for a lost home and a lost network of friends.

At some points on the proposed routes, PennDOT already has acquired the properties and has either demolished them, rented them to their present occupants, or boarded them up. The relocation process is already underway. Once the highway plans are know, informal processes as well as the formal relocation procedures were evidenced. Tenants and sometimes owners on or near the right-of-way may move, on the perceived theory that properties soon will be taken and the area subjected to noisy, dirty, and perhaps dangerous construction process. Homes on the right-of-way become difficult to sell, except to PennDOT, when the owners wish to move. Some owners may stay in their properties longer than they would have stayed in the normal course of events and wait for a better settlement from PennDOT than they would get from a private buyer. Many people on or near the right-of-way simply stay and hope that the highway will not be built or stay and actively oppose it. Relocation in both the Deni and Northwood areas would appear to involve a relatively large proportion of older persons and families.

In the Deni area there are some higher-cost homes into which people from less costly homes might relocate. This may leave them with increased mortgage payments or mortgage paymentswhere they did not have them before and with increased costs for taxes, heat, and utilities. PennDOT's relocation policy allows for mortgage supplements as well as other benefits. However, increased taxes and operating costs are not covered. (See next sub-Section). If they move out of the neighborhood, it may also leave them with increased transportation costs. Many of the homes in Tract 293, which includes Deni, are occupied by renters rather than by owners. The hardship and windfalls which can be involved in payments to tenants and owners, e.g., the loss of a tenant after the highway plans are announced and the difficulty of securing a new one, are only imperfectly understood. The renter-occupied category may contain families buying their homes on lease-purchase agreement. In working with these lease-purchase buyers, special consideration may have to be given to avoid injustice in settlement and relocation payments, legal justice and equity may be two different things in this matter.

At the start of this study, the consultants were told that homes were not available through normal channels in many of these neighborhoods including Deni, and that homes were sold or sales agreed to over the kitchen table. It developed from talking to a realtor and looking at his listing book that there were houses listed in the area though not many. Walking through the neighborhood, one saw few "for sale" signs. These may have been the same properties seen in the realtor's book since it was a multiple listing covering properties available through several realtors. At least some of the displaced families who wished to could probably stay in the neighborhood. Whether with a score or more families being moved at the same time, most or all of those wanting to remain could do so is problematic. While there is a concentration of Italians in the area east of Frankford Avenue which persons from Deni could move into, a community leader questioned about this possibility said that those displaced by the highway in Deni would not cross Frankford Avenue to relocate. This leader also expressed his confusion about what could equitably be done with the old people in Deni who were in the path of the highway.

In the Northwood section the assumption was made that if they failed to stop Alternates A, E and F the residents would be much better equipped to cope with relocation with minimal pain. This assumption may be generally correct, but it calls for qualifications. First it is unlikely that many would be able to relocate in Northwood. Housing is said to turn over very slowly there. This might change if any of these routes are chosen especially in the immediate vicinity of the highway. Second, a high proportion of the people in Northwood are 65 and over and for them relocation would generally prove more difficult socially, economically and emotionally. These older persons and families would have to be wary of the higher taxes and perhaps higher operating costs that the new housing might bring since they are or will soon be living on retirement incomes and are already probably pressed by inflation. For some, apart from social and emotional ties to neighborhoods and the home, relocation could mean an opportunity to move into less spacious and less expensive housing. Third, people whose property would not all be taken, just part of a back yard or front yard, whether these people be in Northwood, Deni or elsewhere, might have a strongly felt need to relocate but find their homes harder to sell, particularly at a price which would permit replacement with a similar home elsewhere and might receive no relocation adjustment.

The sociologists know far less about the desires and prospect of residents of the Summerdale and East Olney section which may be affected by ramps from one alternate or another. One block west of the Boulevard had been substantially acquired by PennDOT. It was reported to one of the sociologists that hardly any of the families relocated from there had stayed in the city of Philadelphia.

In discussing the relocation process with realtors and others, the sociological consultants were told of area families who had no mortgage before they were displaced by I-95 or urban renewal but did have one afterwards. In some cases this may occur because a family wants to substantially upgrade their housing and this is their relatively free choice. Where it happens to older persons or families who would have preferred to stay where they were, it can be a serious hardship and indeed injustice. However, as previously stated, mortgage supplements are aimed at eliminating this problem.

The above analysis prompted PennDOT to investigate in greater detail the actual availability of replacement housing in the area. The following sub-section addresses this subject.

b. Pulaski Highway Relocations and Availability of Replacement Housing

The construction of the Pulaski Highway would require acquisition of many residential properties and the relocation of the residents and tenants.

The data in Table 55 indicates that the number of residential relocations required for the construction of the Pulaski Highway would range between 58 relocations and 279 relocations depending upon which alternate and which interchange scheme at Roosevelt Boulevard is considered.

The residential home relocations required were categorized according to market price ranges for each of the Build Alternates as shown in Table 56. The values shown are for the Roosevelt Boulevard interchange scheme indicated on the plan sheets for each alternate.

A conceptual relocation housing survey for this project was conducted by PennDOT right-of-way personnel and is included in the Appendix. The study was conducted using housing availability data supplied by the Northeast Philadelphia Board of Realtors. (See Plate 180). The study indicates that there will be sufficient homes available in all price ranges in the Northeast Philadelphia area. No person living on a fixed income would be forced to relocate to a higher priced home and thus pay higher taxes and maintenance costs. Present PennDOT relocation policies require that PennDOT personnel determine that the home displaced people relocate to is decent, safe, and

TABLE 55

DWELLING UNITS AFFECTED **

ALTERNATE	A-1	A-2	B	C	D	E	F[2]
Section C*	33	33	33	33	33	33	33
Section B[1]							
a) Direct	50	38	25	32	N.A.[3]	N.A.[3]	110
b) Semi Direct	196	182	134	239	32	215	N.A.
c) Loop	246	234	218	225	N.A.[3]	N.A.[3]	N.A.[3]
Range	83-279	71-267	58-251	65-258	65	248	143

* 28 residences along Section C have already been demolished and their owners and tenants relocated (33 residences remain to be acquired)

1 Direct, Semi-Direct and Loop refer to alternative interchange schemes at Roosevelt Boulevard

2 Figures for Alternate F do not include Northwood Nursing Home residents

3 Interchange configurations not possible because of land constraints.

** Two State-owned properties at Langdon Street and Roosevelt Boulevard have been demolished at the request of residents and State Representative Alvin Katz.

Source: PennDOT Highway Engineering Report (Vol. I, II and III), Dec- March, 1974-75.

TABLE 56*

DWELLING UNITS AFFECTED BY PRICE RANGE**

HOUSING D.U. PRICE RANGE	A-1	A-2	B	C	D	E	F
$ 5,000-$10,000	26	19	19	24	26	34	19
$10,000-$15,000	30	28	26	29	30	46	26
$15,000-$20,000	73	73	69	0	0	9	4
$20,000-$25,000	6	6	2	1	0	2	15
$25,000-$30,000	42	42	20	4	2	29	5
$30,000-$35,000	6	3	1	1	1	1	28
$35,000-$40,000	3	3	1	1	0	0	16
$40,000-$50,000	0	0	0	0	0	46	0
$50,000-$60,000	0	0	0	0	0	5	0
$60,000-$70,000	0	0	0	0	0	8	0
$70,000-$80,000	0	0	0	0	0	4	0
>$80,000	0	0	0	0	1	0	0
TOTAL	186	175	138	60	60	184	114

* Based on 1975 data

** Does not include rental units

Source: PennDOT Highway Engineering Report (Vol. I, II and III) Dec- March, 1974-75 sanitary before relocation occurs. No person would be required to relocate to an unsuitable home.

Residents whose mortgage rates would be increased by relocation would be paid the difference between the new mortgage rate and their existing mortgage rate.

Present PennDOT relocation policies allow for relocation costs and supplemental payments to home owners and tenants if they cannot find suitable housing in the same price range as their existing residence. These policies are explained in detail in the PennDOT publication "Relocation Assistance Information" which is contained in the Appendix of this report.

PennDOT obtains three property appraisals from different realtors for each property required. The median value determined from these appraisals is then submitted to the home owner for consideration. The home owner has the opportunity to negotiate the property value with PennDOT and if a suitable agreement is not reached, the property owner can appeal to the courts. The property value would then be determined through a jury of view procedure. The arterial street widenings necessary with the No-Build Alternative would require the condemnation of three residences located along Adams Avenue.

4. Economic Impact

a. General

In most, if not all, situations where a change in the status quo occurs, one or more groups of people are likely to benefit, explicitly or implicitly, relative to one or more other groups. Shifts in circumstances and conditions are an essential component of a society's activities. Such changes invariably are accompanied by slight changes in the economic welfare of social groups. The basis principle of welfare economics is that economic welfare can be said to improve only if the benefit which accrues to one group as the result of a change can be used to compensate those who are economically disadvantaged and still leave the group as a whole economically better off than before. In other words, if some people can be made better off after adequately compensating others adversely affected, economic welfare is improved. If this cannot be done, welfare of the social group deteriorates.

Thus the central economic issue, around which the choice between the Build and No-Build Alternative revolves is which alternative will lead to greater economic welfare for the social groups affected. If the highway is built some groups will experience economic benefits, while others will incur explicit and implicit costs which will deteriorate their economic welfare prior to compensation. If the highway is not built, some groups will be better off, relative to a Build decision, and thus benefit, while others will be made worse off than they would be relative to a Build decision, and thus incur costs. Therefore, this section of the economic impact study is essentially an attempt to assess the relative benefit and costs potentially occuring if the Build Alternates or if the No-Build Alternative is decided upon. The alternative which maximizes the net gain (benefit minus costs) to the affected groups must be, from an economic perspective, the preferrable one.

Analysis of benefits and costs associated with an action can be approached at two levels. At one level the analysis attempts to measure in dollar terms the value of identifiable and measurable benefits and add them to obtain an annual aggregate benefit over some period of time, possibly the anticipated life of the project. These annual benefits are discounted to their present value at some designated interest rate and summed. The same procedure is followed for costs. The ratio of benefits to costs is calculated. In evaluating two or more courses of action with this methodology the alternative with the highest ratio is the preferable one. This approach to benefit cost analysis, if it is to be accurate, must confine itself to those benefits and costs which can reasonably be estimated in dollar terms. Of necessity other benefits and costs which cannot be monetized fairly accurately must be excluded.

The second approach to the analysis of benefits and costs is considerably broader in perspective although less amenable to quantification than the first approach in that it attempts to assess both those benefits and costs which can be monetized and those which cannot. Although this approach suffers from lack of quantitative precision, it does permit the decision maker, conceptually at least, to evaluate a broader range of benefits and costs. It is the second approach which was utilized in this economic impact study. While considerable effort has been expended on quantification of the major variables involved, the analysis has not been restricted simply to quantifiable variables. The analysis has embraced both those variables which have been quantified and those which have been dealt with at a conceptual level. Hopefully this will point to a decision which will maximize the net economic welfare of all the groups affected by the highway decision.

b. Effect on Dwelling Units

The number of residential units (houses and apartment units) which would be directly affected are shown on Table 57. The data covers both Section C and Section B. Thus, the total number of dwelling units for the entire length of the highway varies from 92 for Alternates C and D to about 300 for Alternates A-1 and A-2. Assessed values of the properties are also listed. These values were obtained from the official assessment records of the City of Philadelphia.

Clearly, the families who presently live in the dwelling units directly affected would bear a major part of the costs of the Pulaski Highway. However, these families will receive compensatory monetary benefits which are

TABLE 57
RESIDENTIAL UNITS DIRECTLY AFFECTED*

Alternate	Houses	Apartments	Total	Assessed Values ($)
A-1	215	88	303	1,700,300
A-2	207	88	295	1,692,500
B	167	24	191	1,213,400
C	92	-	92	645,100
D	92	-	92	529,200
E	210	64	274	1,721,900
F	136	-	136	996,600

* Includes residences already acquired and/or demolished to date. Values are based on the particular Roosevelt Boulevard interchange indicated on the plan sheets.

Source: Economic Impact Study For the Proposed Pulaski Highway, Legislative Route 1078, Dr. Mooney, Aug, 1974.

fair. Since PennDOT's relocation policy includes a lump sum payment to compensate for higher mortgage interest rates, it seems reasonable to conclude that these families will be adequately compensated for any economic loss.

As the data indicate, Alternate A-1 and A-2 affect the greatest number of dwelling units. The majority of the units affected on these alternatives are in the vicinity of the Roosevelt Boulevard. In the cases of Alternate A-1 and A-2, 114 houses and 88 apartment units would be in this area. Thus, 202 dwellings units out of a total of about 300 are in this section of the highway. Of these, 198 are on the west side of Roosevelt Boulevard and are affected because of the ramp configurations proposed for Alternate A-1 and A-2. If these ramp configurations are changed, the number of units would reduce to 105 and 97 respectively. Similarly, in the case of Alternate E, there are 144 units near the Boulevard, 88 are on the west side. Again a change in ramp configuration would significantly reduce the number of units which would be condemned. Also, Alternate B involves 191 units of which 114 are on the west side, so that the number could be reduced to 77 units. Alternate F would require the demolition of about 136 dwelling units less than the other alternates except for Alternates C and D.

c. Effects on Residential Housing Near the Pulaski Highway Right-of-Way

This section deals with the economic impact on residential housing located within several blocks of the right-of-way. Although there is considerable experience with highway construction in urban areas, it is impossible to predict the exact effect on residential properties which border a major highway. Studies have been conducted dealing with the effect of new highway construction on property values adjacent to, or within given degrees of proximity of, the right-of-way. In general such studies, conducted some years after the construction, conclude that properties appreciate in value, sometimes by several hundred percent. None of the studies reviewed, however, constitutes a close parallel to the urban context for which the Pulaski Highway has been proposed. Most of the existing studies refer to highway construction in suburban and rural areas where the land is generally underdeveloped at the time the highway is built. A few studies do, however, deal with urban highway construction. For example, an evaluation of the impact of Atlanta's expressway network indicates, generally, a very positive effect on land values although in some sections land values did decline relatively.

In attempting to assess a highway's impact on property value several guidelines may be useful. First, highways do create externalities which spillover to affect adjacent property values. Second, the correct measure of the highway spillover is on property value which is the net value of both land and structures. Land and structure values need not move in the same direction for a given property. Third, improved accessibility tends to increase land value. However, and finally, the highway is only one factor influencing property values. Other social and neighborhood factors are also important.

What can be anticipated with respect to the Pulaski Highway's effect on property values along the right-of-way? Several projections are possible and none can be made with certainty. The following appears at this time to have the highest probability of occurrence. Adjacent residential properties in highway Section C (Delaware Expressway to Leiper Street) are located in a predominantly industrial-residential area . (Housing in the Northwood area along Alternate E's right-of-way is a notable exception). Given the residential-industrial mix of the area and given that most of the houses are older and lower valued structures, their value is likely to rise less with the highway than they would if the No-Build Alternative is chosen. Land values, however, should appreciate with respect to non-residential use. Such sites should become more desirable for industrial use given the existing industrial base of the area and given the increased access to transportation. It is likely that after a brief period of relative depression, the market value of property should increase over its value if the No-Build Alternative is chosen. The relative decline in residential property values has been in progress for several years, as pointed out previously. In the absence of specific programs to reverse this trend under a No-Build decision, it can reasonably be expected to continue.

On the other hand, there is almost no question that existing industrial property and presently undeveloped tracts will enhanced in value. Improved access to transportation should first attract new industry into the area, especially transportation-oriented, though not necessarily transport firms. Further, all firms should find the area a convenient one for drawing on the entire metropolitan area labor force since, in addition to existing public transportation, the limited access highway will link the area with most sections of Philadelphia and the surrounding counties both in Pennsylvania and New Jersey.

At present, there is considerable traffic congestion which would be relieved by the highway. Thus, families who remain in the area will receive the benefit of reduced traffic. Although this effect cannot be measured in monetary terms, it is a significant benefit which should not be overlooked.

It is worth noting that the number of dwelling units located within two or three blocks of the proposed highway varies considerably, depending on the alternative. Table 58 shows the number of dwelling units and the population located on or adjacent to the right-of-way, within two or three blocks on either side. The data was obtained from block data in the 1970 census.

In the case of Alternates A-1, A-2 and B, the population living adjacent

TABLE 58
ESTIMATED POPULATION AND HOUSING ON OR ADJACENT TO RIGHT-OF-WAY 1970 AND AFTER CONSTRUCTION

Alternate	Population		Dwelling Units	
	1970	After Construction	1970	After Construction
A-1	5,221	4,220	1,578	1,275
A-2	5,221	4,194	1,578	1,267
B	4,795	4,161	1,433	1,242
C	4,795	4,161	1,433	1,242
D	7,548	7,245	2,294	2,202
E	7,868	7,034	2,543	2,269
F	5,000	4,200	1,500	1,250

TABLE 59
BUSINESS PROPERTIES AND FIRMS AFFECTED

Alternate	Number of Properties	Number of Firms
A-1	40	44
A-2	37	42
B	36	40
C	41	45
D	41	45
E	45	46
F	36	38

TABLE 60
ASSESSED VALUE OF BUSINESS PROPERTIES SIGNIFICANTLY AFFECTED

Alternate	(Thousands of $)
A-1	3,225.9
A-2	3,183.2
B	3,067.7
C	3,260.9
D	3,121.9
E	2,928.7
F	2,940.4

Source: Economic Impact Study For the Proposed Pulaski Highway, Legislative Route 1078, Dr. Mooney, Aug. 1974.

to the highway is about 4,200. This is 3.3% of the macro-area 1970 population and 6.5% of the micro-area 1970 population. For Alternate D, the population after construction would be 5.7% of the macro-area 1970 population and 11.3% of the micro-area. The percentage for Alternate E would be about 5.5% and 10.9% respectively. One could argue that these relatively low percentages indicate that the benefits of the highway to the total population of both the macro and micro areas would more than offset the costs to the relatively few who would be most adversely affected. This point is strengthend by the fact that those living adjacent to the highway would also obtain some benefits.

d. Effects on Business Firms

Table 59 shows the number of business properties and business firms which would be affected by the different alternates. Since some properties are used by more than one firm, the number of firms exceeds the number of properties. There are also a few properties which are not currently being used by any firm.

The assessed value of business properties which would be significantly affected by the highway is shown in Table 60. "Significantly affected" refers to busines properties which would be either condemned, or if partially condemned, then the assessed value is likely to be affected. Thus, some properties included in Table 59 are not included in Table 60, particularly some large companies which are only slightly affected. For example, part of Harbison's Dairy is on the right-of-way but the main plant is not affected at all and the facility on the right-of-way would be able to continue operations after the highway is built. As a result, it is probable that the assessed value of the firm will not be affected.

e. Employment Effects

Table 61 shows the maximum possible loss of jobs to the city if the highway is built. The "maximum possible loss" means the number of jobs which would be lost if all of the firms significantly affected either relocated out of the city or closed down. Of the 51 firms contacted, only two indicated that they would probably close. Eight indicated that they would probably relocated outside the city.* Of the remaining 41, 8 can continue to operate in their present locations and 33 would be likely to relocate in the city.

Included in Table 61 is an estimate of the "probable loss of jobs." This term is used to refer to the loss of jobs to the city as a result of the probable closing or relocation outside the city of the ten firms who indicated that this was likely. It is important to emphasize that this does not mean that the employees involved would become unemployed, unless relocation made it impossible to continue their present employment. Based on the economists' interviews, it is estimated that unemployment as a result of relocation or closing down would affect no more than 33 jobs.

It is worth noting that of the 33 firms which would prefer to remain in the city, 12 indicated that an important factor in their decision is the availability of skilled labor in the Frankford-Kensington area. These twelve firms are manufacturing firms and their particular labor requirements are an important element in their planning decisions. Their desire to remain is evidence of the attractiveness of the area to business.

The most important fact about the possible employment effects is that the maximum possible loss of jobs is roughly the same for all alternates except Alternate E. On this alternate, there is one relatively large firm which employs over 200 people. However, this firm has indicated that it

* The names of the firms are listed in the Appendix of the Economic Report

TABLE 61

EFFECTS ON EMPLOYMENT IN PHILADELPHIA

Alternate	Maximum Possible Loss of Jobs	Probable Loss of Jobs	Percentage of Macro Area Employment
A-1	767	299	0.36%
A-2	756	293	0.35%
B	690	247	0.30%
C	789	299	0.36%
D	764	299	0.36%
E	1,048	333	0.40%
F	700	242	0.30%

TABLE 62

MAXIMUM POSSIBLE LOSS OF CITY TAX REVENUE

Alternate	Real Estate Taxes	Wage & Business Taxes	Total (A)
A-1	$220,600	$334,100	$554,700
A-2	218,300	323,600	541,900
B	191,700	292,600	484,300
C	175,000	338,600	513,600
D	163,600	337,100	500,700
E	208,300	434,000	642,300
F	176,100	316,600	492,700

(A) In 1973, total city tax revenue was about $500 million. Thus, the "Maximum possible tax loss" is about 0.1% of total city tax revenue.

TABLE 63

PROBABLE LOSS OF CITY TAX REVENUE

Alternate	Real Estate Tax	Wage and Business Taxes	Total (A)
A-1	$ 164,900	$ 141,400	$ 306,300
A-2	162,500	140,900	303,400
B	136,000	111,400	247,400
C	119,300	145,900	265,200
D	107,900	144,400	252,300
E	151,400	151,900	303,300
F	120,300	112,900	233,200

(A) The "Probable Loss" of City tax revenues is about 0.06% of Total tax revenues.

Source: Economic Impact Study For the Proposed Pulaski Highway, Legislative Route 1078, Dr. Mooney, Aug. 1974.

would relocate in the area. As a result, the "probable job loss" is about the same for all alternates, including Alternate E. The numbers vary from 247 for Alternate B to 333 for Alternate E, with most of the alternates at about 300. From the point of view of employment, there is little reason for choosing one alternate over another.

f. Impact on Tax Revenue of the City of Philadelphia

An important consideration in urban highway construction is the possible loss of tax revenue to local government. Table 62 shows the "maximum possible loss of city tax revenue." The table provides a breakdown between real estate tax revenue and wage and business taxes. As in the case of employment effects, the "maximum loss" was calculated by assuming that all business firms significantly affected would relocated outside the city. In addition, the tax revenue from all residential properties is included even though some residential properties would not be completely condemned. Thus, if on a particular residential property, some land would be condemned but the house would remain intact, then the assessed value of the entire property is included in the estimated total assessed value which would be lost from the tax rolls. This was done because of the difficulty of determining the change in assessed value and also to avoid underestimating the maximum tax loss. As a result, the "maximum possible tax loss" is somewhat overstated but this is not significant since there are not very many such properties.

The "probable loss of city tax revenue" is shown in Table 63 and was calculated by adding the property taxes of all residential properties to the property taxes of all business firms which would require relocation. This total probable loss of property tax revenue was then added to wage and business taxes of firms which are likely to relocate outside the city or to close.

As in the case of the employment effects, the most striking point about Table 63 is that the probable tax loss is not significantly different for all the alternates. In addition, it seems that the amount of the tax loss is not significant in any case. Construction of the highway will probably increase the assessed values of existing residential properties in the micro and macro areas. In addition, it is likely that some presently unused land will become available for business development and increase in value. Thus, there is a good possibility that the tax loss would eventually be offset.

The same point can be made about the probable loss of wage and business tax revenue. The highest figure is for Alternate E. Most of this amount is related to the probable loss of wage tax revenue. As noted in Table 61, Alternate E would mean the probable loss of 333 jobs. If one assumes that all of the loss of $152,000 is wage tax revenue, then this would be offset by creating new jobs with a payroll of about $4.6 million. Since it is likely that the highway will promote the economic development of the macro-area, then the probable loss of wage taxes will be reduced, if not completely offset.

g. Economic Effects of the No-Build Alternative

Arguments have been advanced both in favor of and against the Build Alternates. Essentially the pro arguments are advanced on behalf of social groups who would benefit from the particular decision, and the con arguments are advanced on behalf of social groups which would bear the social costs of the particular decision. Since either decision will improve the welfare of one or more social groups and worsen the welfare of one or more other social groups, ideally that choice should be made which will maximize the benefit to society and minimize welfare deterioration. And, it should be noted emphatically, the welfare deterioration of some groups cannot be avoided by deciding not to build the highway, for that decision reduces the relative welfare of those who would benefit from the highway's existence. Once the highway becomes a feasible possibility, as it now is, and once the question is raised, "Should the highway be built?", there is no way to avoid reducing the relative welfare of a segment of the community. The best choice will be that which maximizes the gain and minimizes the loss of the collective groups involved.

It is from this perspective that any economic decision in choosing among two or more alternative courses of action must be made. Theoretically it is possible to monetize the benefits and costs involved and to make the decision which brings about the maximum net improvement in society's welare. In practice, monetization is difficult and in many cases impossible. The decision-maker must, nevertheless, attempt to weigh the gain and losses for each alternate and choose that alternate which benefits the most people and reduces the welfare of the fewest people.

The economic dimensions of both the Build and No-Build Alternatives should be approached from this perspective. The benefits and costs of the Build Alternative have been developed in the previous section. What are the gains and costs of the No-Build Alternative? This is, what groups are likely to benefit and what groups are likely to experience a relative welfare deterioration if the highway is not built?

The primary beneficiaries of the No-Build Alternative will be residents in and adjacent to the right-of-way. First, residents in the right-of-way would not be required to relocate. Some who might prefer a monetary payment and relocation, would be made worse off by the No-Build choice. Others who value their present residence more highly than the monetary payment for relocation would benefit from the No-Build decision. Second, with the No-Build alternative residents whose dwelling units are immediately adjacent to the right-of-way would not experience increased air and noise pollution among other highway-induced externalities. Their welfare, too, would be enhanced by the no-action alternative.

This is not, however, a complete picture. The construction of the Pulaski Highway would result in attracting vehicles from other streets and roads. For example, many of the vehicles which use the Tacony-Palmyra Bridge would be diverted to the Betsy Ross Bridge via the Pulaski Highway. Thus traffic and the associated pollution on access roads to the Tacony-Palmyra Bridge, such as Levick Street and Robbins Avenue, would be significantly reduced and the welfare of residents in those areas would be enhanced. The effective truck routes, between the industrial area along the Delaware River and destinations west of Roosevelt Boulevard involve residential streets such as Margaret Street, Orthodox Street, Castor Avenue, and Adams Avenue. Substantial through truck and car traffic would be diverted from these local streets to the Pulaski Highway improving the welfare of residents along these streets. The no-action alternative would enhance the welfare of the Pulaski Highway corridor residents through reduced pollution and related problems, but at the expense of residents immediately adjacent to the Pulaski Highway.

The DVRPC traffic analysis finds that if the Pulaski is built, the pollution levels along its right-of-way will increase, but the total pollution levels for the entire Pulaski corridor area will be reduced. The highway would thus bring about a net reduction in the level of pollution. Thus it would seem preferable, from a pollution point of view, to build the highway since, although the burden of pollution would be increased for some residents, for the larger group of citizens there would be a net reduction of pollution and thus a net improvement of the community's welfare.

The existing traffic congestion imposes certain direct economic costs on the residents and business firms of the area. Higher operating costs of both automobiles and trucks are one example. Retail businesses are adversely affected by poor accessibility which discourages some potential customers from shopping in the area. Other business firms have to pay higher costs for transporting materials and finished products.

Most of these effects cannot be measured. Nevertheless, higher transportation costs, the loss of time, and the loss of potential business are all important results of the existing congestion. There seems little doubt that the highway will result in important savings to both businesses and residents.

The direct savings of cars and trucks would be a positive effect of the highway. But there is another important factor related to the problem of transportation which involves avoiding a negative effect of the "do-nothing" alternative. This is the critical problem facing trucking firms operating in the Frankford-Kensington area. As noted previously, there are about 54 truck companies in the general area. There are two areas of concentration of these firms; one is in the vicinity of Castor Avenue and Aramino Avenue, and the other is near Front Street and Hunting Park Avenue.

At present, these firms must contend with both traffic congestion and, even more important, severe restrictions on the flow of truck traffic. Most streets in the area are closed to truck traffic and there is growing commu-ity pressure to close the few remaining streets still open, such as Castor Avenue, Margaret Street, and Orthodox Street. If the highway is not built, it is likely that some trucking firms will have to relocate outside the city. Whatever truck traffic remains in the area will continue to use streets which are partly residential such as Castor Avenue, with adverse effects on the people and houses on these streets. In short, one of the critical needs of the area is a truck corridor from I-95 to the Roosevelt Boulevard. This would not only help to retain trucking firms in the area but would probably lead to growth of some of these firms. It would also help to reduce traffic congestion, particularly on Castor Avenue, Adams Avenue, Margaret Street, and Orthodox Street. Transportation costs for both cars and trucks would also be lower.

Another important benefit of the highway would be a reduction of operating costs for trucks coming into Philadelphia from New Jersey. Many of these trucks use the Tacony-Palmyra Bridge. The majority of these trucks used Levick Street to get to the Boulevard but protests of residents led to the closing of this street to truck traffic. Trucking firms agreed to funnel truck traffic to the Boulevard by using State Road and Harbison Avenue. However, this is an inefficient route and many trucks began using other streets, such as Margaret, Arrott, and Orthodox, for trips to and from the Boulevard and the bridge. Residents on these streets have initiated action to close these streets. But the main point is that trucks travelling to and from New Jersey could use the Pulaski Highway and the Betsy Ross Bridge and realize considerable savings. This would also benefit the residents of the streets which are experiencing a significant amount of truck traffic.

It was previously noted that the total employment of the macro-area exceeds the total population. This is one indicator of the concentration of business in the area and it is evidence of a desirable business environment. In addition, 33 out of 41 firms which might require relocation if the highway is built, would prefer to relocate in the area. Thus, it seems clear that the area is generally desirable for business, in spite of the existing traffic congestion. Nevertheless, most firms interviewed in the survey indicated that a reduction in traffic congestion would, in the opinion of most businessmen, provide a much needed stimulus to business growth.

Construction of the highway would also make it possible to develop some of the unused land in the area. There are about 178 acres unused at present. Some of this land could be developed for manufacturing or commercial use. If the "do-nothing" alternative is chosen it is unlikely that any future development will occur. In fact, the opposite is likely to be the case. On the other hand, construction of the highway will not only make it possible to stop the economic deterioration which has begun but will also provide a stimulus to future growth.

5. Fast, Safe, and Efficient Transportation

a. Build Alternate Effects

The DVRPC traffic projections and intersection capacity analysis indicate that stable flow conditions can be obtained throughout the study area with the Build Alternates. At all locations where congestion would exists with the Built Alternates, improvements can be accomplished which would result in stable flow conditions.

To obtain stable flow conditions, removal of parking would be necessary along sections of Adams Avenue, Castor Avenue, Rising Sun Avenue, Levick Street, Summerdale Avenue, Wyoming Avenue, Hunting Park Avenue, G Street, Wingohocking Street, Frankford Avenue and Oxford Avenue. In addition widening of Wingohocking Street, Summerdale Avenue, Oxford Avenue, Levick Street and Tabor Road would be required. With these improvements and the upgrading of the Roosevelt Bouelvard to a combined expressway and arterial facility all arterial streets in the study area would operate under stable flow conditions in the design year.

With stable flow conditions, drivers would not need to divert to local neighborhood streets to get around congested areas, and traffic would not increase along the local neighborhood residential streets.

The Build Alternates would provide an alternate route for the heavy truck traffic on the north-south arterial streets between Roosevelt Boulevard and the truck terminal and industrial areas located along the Delaware Expressway which would be more direct and non-stop. The heavy truck volumes along Castor Avenue, Orthodox Street and Harbison Avenue would be reduced because truckers would use the faster route provided by the Pulaski Highway. In addition, the Build Alternates would result in reduced travel times for truck deliveries.

The overall highway system performance would be improved with the Build Alternates. As shown in Tables 64 and 65, which were prepared by the DVRPC, the Pulaski Highway would result in higher than existing average daily travel speeds in the study area and in the Pulaski Highway corridor. Peak hour speeds would be increased over existing levels in the corridor.

The accident analyses prepared by PennDOT indicates that the Pulaski Highway Build Alternates would result in 8% fewer accidents than the No-Build Alternative.

The Pulaski Highway traffic projections considered increased mass transit usage by residents and workers in the study area due to the extension of the Broad Street Subway through the area. With the Build Alternates, congestion along the arterial street system can be alleviated thereby allowing for quicker service by the surface mass transit bus lines and trolley lines in the study area. The quicker service times for feeder bus routes to the rail transit facilities would result in improved mass transit services and would offset any diversion of mass transit usage due to the Pulaski Highway.

TABLE 64
COMPARISION OF SYSTEM OPERATING
AND PERFORMANCE CHARACTERISTICS
(TOTAL STUDY AREA)

Characteristics	Network 1 (1972 Existing)	Network 2 (1985 Do-Nothing)	Network 3 (1985-Pulaski)
Peak Hour VMT	320,300	577,600	583,700
Daily VMT	3,124,700	5,787,700	5,897,900
Avg. Peak Hour Speed (MPH)	20.8	12.1	18.9
Avg. Daily Speed (MPH)	23.8	20.3	25.3

TABLE 65
COMPARISION OF SYSTEM OPERATING
AND PERFORMANCE CHARACTERISTICS
(PULASKI CORRIDOR)

Characteristics	Network 1 (1972 Existing)	Network 2 (1985 Do-Nothing)	Network 3 (1985-Pulaski)
Peak Hour	35,700	70,000	97,400
Daily VMT	351,600	704,100	1,015,900
Avg. Peak Hour Speed (MPH)	20.1	14.2	23.4
Avg. Daily Speed (MPH)	23.3	21.3	29.5

Source: (Traffic) Analysis of the Proposed Pulaski Expressway Alternatives, D.V.R.P.C., October, 1974.

The overall result of the Pulaski Highway Build Alternates would be improved transportation system performance for all facilities, highways and mass transit, in the study area.

Because the Pulaski Highway is planned through an area with an extensive surface mass transportation system, some minor changes in bus line routings may be needed due to street closings required by the construction of the Pulaski Highway in the vicinity of Roosevelt Boulevard. The construction of Alternates A-1 and E would require the re-routing of the Route K bus line in the vicinity of Roosevelt Boulevard and Foulkrod Street. The interchange configurations of these alternates would require the elimination of the intersection of Roosevelt Boulevard and Foulkrod Street. Route K can be easily re-routed along Adams Avenue to Ramona Avenue and the along Ramona Avenue to Foulkrod Street and it's present route.

The construction of Alternate F would require a minor re-routing of Route K in the vicinity of Castor Avenue and Arrott Street. The construction of Alternate F will require the closing of Arrott Street between Castor Avenue and Adams Avenue. Route K can be easily re-routed along Castor Avenue to Adams Avenue and then along Adams Avenue to Roosevelt Boulevard and its present route.

No other changes in the present surface mass transit lines will be required by the construction of the Pulaski Highway.

b. <u>No-Build Alternative Effects</u>

The DVRPC traffic volume projections and the capacity analyses along the existing arterial street system indicate that severe congestion would occur throughout the study area with the No-Build Alternative.

The traffic projections indicate that a majority of the arterial streets would experience increased traffic volumes. The existing arterial street system consists of many old and narrow streets and it is fractured due to the changing course of the channel of the Tacony Creek and the meshing of four major street grid systems with four different orientations. These conditions place the existing arterial street system at a particular disadvantage of accommodate high volumes of traffic. The system is already overloaded because of these unsymmetrical conditions.

The No-Build Alternative would result in forced flow conditions Level of Service F, throughout the study area due to increased traffic volumes on the already overloaded arterial street system. The removal of parking would be necessary along sections of Adams Avenue, Castor Avenue, Rising Sun Avenue, Levick Street, Summerdale Avenue, Oxford Avenue, Wyoming Avenue, Whitaker Avenue, Hunting Park Avenue, G Street, Erie Avenue, C Street, Orthodox Street, Frankford Avenue, Bridge Street, Torresdale Avenue, and Richmond Street. In addition, major widenings of Roosevelt Boulevard, Adams Avenue, Tabor Road, Levick Street, Oxford Avenue, and Wyoming Avenue would be necessary. Even with these major improvements, congestion would remain at many locations in the study area.

As the capacity of the arterial streets is reached, and then exceeded, diversion of traffic to local residential streets through the study area neighborhoods would occur as drivers attempt to find faster routes for their journeys. The increased and continuous congestion along the arterial street system and the resultant diversion of trips onto local residential streets would lead to the erosion of both residential and non-residential areas.

The locations where congestion would occur with the No-Build Alternative and the necessary improvements to the arterial street system are indicated on the following page.

STREET (SECTION)	IMPROVEMENT	RESULTS
1) Adams Avenue (Blvd.-Rising Sun)**	Remove parking Widen 20'	Congestion Stable Flow
2) Castor Avenue		
(Wingohocking-Kensington)	Remove parking	Stable Flow
(Richmond Street)	Remove parking	Congestion
3) Rising Sun Avenue		
(Blvd.-Adams)	Widen 24'*	Congestion
(Adams-Levick)**	Remove parking	Congestion
4) Tabor Road		
(Rising Sun-Adams)	Widen 12'	Congestion
(Adams-Levick)	Widen 20'	Congestion
5) Levick Street		
(Martin's Mill-Summerdale)	Widen 20'*	Stable Flow
(Summerdale-Blvd.)	Widen 20'*	Congestion
6) Summerdale Avenue		
(Oxford-Levick)	Remove parking	Congestion
7) Oxford Avenue		
(Summerdale-Blvd.)	Widen 10'	Stable Flow
(at Frankford)**	Remove Parking	Congestion
8) Wyoming Avenue		
(C-Whitaker)	Remove parking	Stable Flow
(Whitaker-Ramona)	Widen 10'	Congestion
9) Whitaker Avenue		
(Blvd. Wyoming)	Remove parking	Stable Flow
10) Hunting Park Avenue		
(at Castor)	Remove parking	Stable Flow
11) "C" Street		
(at Boulevard)	Remove parking	Stable Flow
12) Erie Avenue		
(at Castor)	Remove parking	Stable Flow
13) G Street		
(Wyoming-Erie)	Remove parking	Stable Flow

* indicates improvements that were studied but are not feasible
** indicates location where street widening is not feasible

Source: PennDOT Highway Engineering Report (Vol. I, II, and III) Dec- March, 1974-75.

STREET (SECTION)	IMPROVEMENT	RESULTS
14) Orthodox Street		
(at Castor)	Remove parking	Stable Flow
(at Frankford)	Remove parking	Stable Flow
15) Margaret Street		
(at Frankford)**	No improvement	Congestion
16) Frankford Avenue		
(Kensington-Orthodox)**	Remove parking*	Stable Flow
(Orthodox-Oxford)**	Remove parking*	Congestion
17) Bridge Street		
(at Torresdale)	Remove parking	Stable Flow
18) Torresdale Avenue		
(at Bridge)	Remove parking	Stable Flow
19) Richmond Street		
(at Castor)**	Remove parking	Congestion
20) Roosevelt Boulevard		
(9th-C)	Add two traffic lanes	Stable Flow
(C-Adams)	Add two traffic lanes	Stable Flow
(at Summerdale)	Add four traffic lanes (or grade separate)	Stable Flow

* indicates improvements that were studied but are not feasible
** indicates location where street widening is not feasible

The traffic analyses indicate that the No-Build Alternative even with major improvements to the arterial streets could not provide stable flow conditions and traffic congestion in the study area would result.

The No-Build Alternative would result in the continued use of the arterial streets for heavy truck travel between Roosevelt Boulevard and the terminal, port and industrial areas along the Delaware Expressway. The continued congestion would be further aggravated by use of the local arterials for this truck traffic. Present and proposed restrictions to truck travel along most of the north-south arterial streets have resulted in a concentration of the truck traffic along Harbison Avenue and Castor Avenue. The congestion resulting with the No-Build Alternative will increase time and costs for truck deliveries adding to the transportation costs for products delivered by trucks.

The overall highway system performance would be negatively influenced with the No-Build Alternative. As indicated in tables 64 and 65, the No-Build Alternative would result in lower average daily speeds and significantly lower peak hour speeds in the total study area and in the Pulaski Highway corridor.

An accident analysis was performed for this study using average accident rates per year per 100 million vehicle miles. Arterial streets and expressways in the study area were delineated according to length, type, and average daily traffic. The vehicle miles traveled were then calculated for each street section. From these volumes the number of accidents which could be expected per year in 1985 with the No-Build Alternative were determined. The expected numbers of accidents are 2,748 on the arterial street, 1,248 on the Roosevelt Boulevard, and 924 on the Delaware Expressway. The number of accidents in the study area with the No-Build Alternative would be 8% higher than with the Build Alternates.

The No-Build Alternative traffic projections have considered increased mass transit usage in the study area due to the extension of the Broad Street Subway through the area. The traffic congestion along the arterial street system would also cause delays to surface mass transportation bus lines and trolley routes. These delays would result in inconvenience and increased travel times for transit riders.

The overall result of the No-Build Alterantive would be the decline and breakdown of the combined transportation system in the study area.

c. Transportation Conclusions

The conclusions reached from the analyses performed during the Highway

Engineering Study are:

(1) There is no viable mass transportation alternative to the Pulaski Highway.

(2) The seven Build Alternates investigated in detail (A-1 through F) are feasible to construct and would operate at stable flow conditions in 1995.

(3) The No-Build Alternative would result in continued and additional future traffic congestion in the study area even with parking removal and major widening of the arterial streets.

(4) The Pulaski Highway Build Alternates would provide stable traffic flow conditions on the arterial street system in the study area with improvements to several arterial streets.

(5) The No-Build Alternative would require the addition of traffic lanes to the 12 lane Roosevelt Boulevard between 9th Street and Adams Avenue and the grade separation of the intersection of Roosevelt Boulevard and Summderdale Avenue. With the Build Alternates, the Boulevard was considered as an combined expressway arterial street facility and stable flow conditions would occur between 9th Street and Pratt Street.

6. National Defense

a. Build Alternate Effects

The Pulaski Highway would result in improved access to the Frankford Arsenal and the related supporting industries in the area.

In the event of a major flood, the Pulaski Highway would remain open to traffic providing for quick access to the study area for civil defense and emergency vehicles.

b. No-Build Alternative Effects

With the No-Build Alternative, emergency vehicles would be required to use the existing circuitous roadway network. This network is much more susceptable to flooding than the systems including the Build Alternates.

7. Recreation and Parks

a. Build Alternate Effects

(1) General

The Pulaski Highway Alternates D and E would require the use of existing parklands. The other Build Alternates were developed to find alternative routings which avoided the use of parklands. No park or recreation lands would be required for these alternates, however, the double loop interchange scheme at Roosevelt Boulevard would have minor impact on the Houseman Recreation Center with Alternates A-1, A-2, B and C. A screen to block direct visual contact between the ramps and the swimming pool area would be needed to secure the required amount of privacy for people using the pool and to prevent distraction of drivers.

(2) Alternate D Effects

Alternate D would require approximately 28 acres of land of the Tacony Creek Park. Between Wingohocking Street and Castor Avenue less than one half acre of undeveloped parkland is required. Adjacent to Fishers Lane, approximately one acre of Tacony Creek Park's Juniata Gold Course is required. It is expected that this acquisition would require realignment of one golf course hole.

Between Fishers Lane and the Penn Central Railroad, Alternate D is designed to set as much as possible in the side hill. This technique has the advantage of concealing the roadway and following existing topography without creating a visual barrier. In this section, approximately 8.5 acres of Tacony Creek Park are required. From the railroad to Whitaker Avenue, approximately 1.2 acres of park are required.

Between Whitaker Avenue and Roosevelt Boulevard approximately 8.7 acres of park are required and approximately 8.4 acres of park are required north of Roosevelt Boulevard.

Where possible, the extensive park trail system would be maintained. A suggested manner of maintaining the system is shown on Plates 145 and 146. Generally two (2) separate longitudinal trail systems are provided with interconnection of these systems provided under the viaduct at Station 53+50. The cost of the proposals required to maintain the park trail system is estimated to be approximately $450,000.

It is proposed that additional lands, contiguous with the park, be acquired to replace acreage of park which would be required should Alternate D be selected as the recommended alignment. Such replacement parkland, however, cannot be condemned outside the needed right-of-way. As a result, special agreements would have to be developed whereby remuneration given to the Park Commission would be utilized to acquire and develop additional parkland. Alternate D requires approximately 28 acres of Tacony Creek Park. The areas described below and shown on Plate 181 are suggested for consideration as replacement park lands.

(a) Area 1: This land is presently a residential property. The house on the property would require demolition due to Alternate D, leaving a three-quarter acre plot remaining. This land could be utilized as part of Juniata Golf Course, replacing one-third acre of golf course taken by Alternate D.

(b) Area 2: This land consists of approximately 21 acres of Friends Hospital property. Steep slopes in this area could be developed for such uses as hiking and sleding. The areas adjacent to Tacony Creek could be improved and become an important section of the park.

(c) Area 3: This 2.1 acre section of land is suggested for acquisition as replacement park land. This acquisition would assure that access to the park would remain via Maple Lane.

(d) Area 4: This 4.6 acre section of land is bounded by the Tacony Creek, Ruscomb Street, and Ashdale Street. Topography in the area is rugged, but some relatively level sections exist, making this section suitable for a variety of recreational activities.

This data below summarizes the amount of replacement park land suggested for consideration. Should additional replacement park land be desired, additional Friends Hospital property and the Ross Nursery property would be areas worthy of consideration.

SUMMARY OF REPLACEMENT PARK LANDS

Park Land required by Alternate D	28.2 acres
Total suggested replacement park land	28.4 acres

Where the Pulaski Highway traverses Tacony Creek Park, all possible steps would be taken to minimize adverse impact to lands adjacent to the roadways. In the design of Alternate D, techniques were used to allow the new facility to blend as much as possible into the adjacent topography. Where possible the facility has been designed to traverse in a side hill (slope) of the park, thus eliminating a deep trench or high embankment. The viaduct over Tacony Creek was lengthened to enable the usage of the land beneath for recreation and the park trail system.

Channel changes of Tacony Creek have been minimized. The major change occurs in the vicinity of Roosevelt Boulevard, where the Creek's location passing under the Boulevard would be changed to an adjacent arch opening. Only minor creek adjustments would be required elsewhere. Where creek relocations are required, the new creek bed would be reconstructed in naturalistic manner using boulders and stones found within the existing park and avoiding straight ditch-like sections.

New plantings would be provided along the highway to supplement existing vegetation and to minimize the visual intrusion of the highway. All efforts would be made to save existing trees both during and after construction. The contractors of the highway would be required to erect substantial temporary fence around areas designated to remain parkland. The protection of these natural areas from damage during the construction period is essential to the remaining plant and animal life. The contractors would be prohibited from parking vehicles or storing equipment within these areas.

Because of the woodland scale of the park and the fleeting glimpse which a fast moving motorist has of the landscape, the plants would for the most part be arranged in broad, large scale masses. Appropriate plantings would be used on steep ramps. Bayberry and winterberry holly would be useful for streambank planting. These plantings can be expected to attract birds to the park (See Table 66 for potential suggestions).

The highway contractor would be made responsible for saving all existing trees within the areas designated to remain parkland. The protection of these areas must be insured by the erection of substantial temporary fences, by boxing or other suitable means. The existing grades under the spread of the branches of the trees which are to remain would not be disturbed. Grading machinery and construction equipment would not be driven or parked under trees. No fires would be permitted under trees.

If a highway contractor accidentally kills or mutilates area trees he will be required as per the Department of Transportation 408 standards to pay damages or to replace the tree in size, quantity and type as designated by the Department of Transportation.

All trees and brush, not designated to remain would be completely removed from the park. The creek bed would be protected from any construction material that may pollute the creek and erosion and sedimentation control practices would be implemented to minimize impacts to the creek.

(3) Alternate E

Alternate E, which follows the route of the Reading Railroad's Frankford Branch freight line, would pass through lands of the Simpson Memorial Park and Northwood Park in the Northwood residential neighborhood. In addition, the interchange at Roosevelt Boulevard would have a visual impact on the Houseman Recreation Center.

TABLE 66

SUGGESTED REVEGETATION FOR THE STUDY AREA

Scientific Name Trees	Common Name
Acer ruburm	Red Maple
Acer saccharium	Sugar Maple
Cornus florida	White Flowering Dogwood
Crataegus phaenopyrum	Washington Hawthorn
Fagus grandiflora	American Beech
Gleditsia triacanthos	Honeylocust
Gymnocladus dioicus	Kentucky Coffeetree
Liriodendron tulipifera	Tuliptree
Magnolia virginiana	Sweetbay Magnolia
Malus sargenti	Sargent Crabapple
Metasequoia glyptostroibes	Dawn Redwood
Pinus strobus	White Pine
Pinus thunbergi	Japanese Black Pine
Quercus borealis	Northern Red Oak
Quercus coccinea	Scarlet Oak
Sophora japonica	Chinese Scholar Tree
Shrubs	
Forsythia intermedia	Border Forsythia
Hamamelis virginiana	Common Witchhazel
Ilex verticillata	Winterberry Holly
Ligustrum ovalifolium	California Privet
Myrica pensylvanica	Northern Bayberry
Rosa multiflora	Multiflora Rose
Groundcover	Common Name
Lonicera japonica halliana	Hall Japanese Honeysuckle
Caroilla varia	Crown Vetch

Reference: George E. Patton "A study of the Effects on Tacony Creek Park by the Proposed Pulaski Highway Construction,"April, 1971

The alternate would require 0.45 acres of land from the Simpson Memorial Park at the corner of Large Street and Arrott Street. The alternate would be constructed as an elevated bridge through this area and the lands under the viaduct could be used for recreation purposes. If the present railroad embankment is removed and the land under the viaduct is used for recreation the Pulaski Highway would result in additional land for this recreation facility. The existing ball fields would require reorientation to prevent fly balls from landing on the highway.

The alternate would also require 0.91 acres of lands of the Northwood Park. The alternate would be constructed as a bridge through this park and the areas under the viaduct could remain usable for recreational purposes. If the existing railroad embankment is removed and the area under the viaduct is used for recreation purposes the Pulaski Highway would result in additional land for this park area.

Alternate E would have a visual impact on the Houseman Recreation Center and some type of screening would be needed to avoid visual contact between the roadways and the swimming pool area.

b. <u>No-Build Alternative Effects</u>

The No-Build Alternative would have little effect on park and recreation areas. The necessary widening of Wyoming Avenue in the vicinity of Tacony Creek Park could be accomplished within existing highway right-of-way areas. The widening would have little effect on the park.

8. <u>Fire Protection</u>

a. <u>Build Alternate Effects</u>

The Build Alternates would result in stable flow conditions, thus reducing delays to emergency fire vehicles in the study area. In addition, in the event of a major conflagration in the study area, access to the site from other areas would be improved with the Pulaski Highway.

In general, mobility in the area will be improved by the Pulaski Highway itself and by the relief it provides to currently congested streets, thus allowing faster access by fire equipment. An emergency communications system will be provided on the Pulaski Highway to aid in reporting fire and other emergencies. The system will be connected to a fire dispatch center at City Hall.

A City of Philadelphia firehouse is located adjacent to the end of the project at Foulkrod and Langdon Streets. After construction of the Pulaski Highway access to and from the firehouse would be provided in the existing manner (via Langdon Street to Roosevelt Bouelvard) with all alternates and also via relocated Foulkrod Street to Summerdale Avenue with Alternates A-1, A-2 and B. Access to and from the firehouse must and will be provided during all phases of construction.

b. No-Build Alternative Effects

The No-Build Alternative with its associated arterial street congestion, would result in delays in emergency vehicles and loss of critical time in reaching their destinations.

9. Aesthetics

a. Build Alternate Effects

Where feasible, the Pulaski Highway would be designed below grade in and adjacent to residential areas to reduce the visual and acoustical impact on nearby communities. Consideration will be given to special architectural treatment for all bridges and retaining walls especially through the cemetery and developed areas. Where economically feasible, recommendations of the Philadelphia Art Commission would be incorporated in the final design. In-field areas and other suitable portions of the highway right-of-way would be graded and landscaped.

Special plans for landscaping along the highway and at interchange areas would be developed in the final design stage. These plans as well as the overall highway designs would be reviewed by landscape architects presently working for PennDOT. All feasible landscape developments would be incorporated in the design plans. (See Plate 172)

b. No-Build Alternative Effects

The continued and increased traffic congestion which would result along the arterial streets in the study area with the No-Build Alternative would produce visual effects in the area. The congestion and travel delays and increased travel costs would influence businesses and residents in the study area. Many people would tend to relocate to areas where easier access is available and less congestion would exist. This tendency would contribute to the aging process of these neighborhoods and would likely result in deterioration of the neighborhoods.

10. Public Utilities

a. Build Alternate Effects

As with any major public works project in a highly urbanized area, this project would require extensive adjustment and relocation of public utilities. The major impact on existing utilities is in the Roosevelt Boulevard area.

Alternates A-1, B and F would cross under Roosevelt Boulevard and interchange with the Boulevard in the Adams Avenue-Summerdale Avenue area, causing major utility relocation. Homes in the 4800 block on the north side of Roosevelt Boulevard would not be required for the construction of Alternate F itself, however, their acquisition is recommended for utility relocation, maintenance of traffic, aesthetic, and environmental reasons. Alternates A-2 and C would cause less disruption by passing over Roosevelt Boulevard.

Alternate E passes under the Boulevard through an existing bridge minimizing the amount of utility relocations.

With Alternate D, movements between the Boulevard and the Pulaski Highway are provided between "D" and "F" Streets, with Alternate D passing under the Boulevard through an existing opening of the bridge carrying the Boulevard over Tacony Creek. Major utility relocation is minimized by the use of the exising opening. Alternate D requires relocation of one Philadelphia Electric Company tower in the vicinity of the Penn-Central Railroad.

The relocation and adjustment of utility facilities would be closely coordinated with the final highway design. Stage construction would be scheduled so as to minimize disruption of service to customers.

b. No-Build Alternative Effects

The No-Build Alternative would have little impact on public utilities except at locations where arterial street widening would occur. The effects on utilities would depend upon the facility relocations required by the street widenings, however, no major utility facilities would be affected.

11. Public Health and Safety
(Also see Air Quality, Noise, and Water Quality Sections)

a. Build Alternate Effects

The Pulaski Highway would provide increased safety to the motorists when compared to travel on existing roads, since a limited access highway eliminates many of the traffic crossing conflicts that exist on the present arterial street network. With the Pulaski Highway, traffic would be concentrated on the expressway and the major feeder roads while other roads would carry less traffic as compared to the No-Build Alternative.

The reduced traffic on most of the arterial streets would result in less traffic accidents. The accident study data indicate that in 1985, the Pulaski Highway would result in 400 less accidents per year in the study area as compared to the No-Build Alternative.

By affording stable flow conditions throughout the study area, the Pulaski Highway would result in the arterial highway traffic remaining on the arterial streets. Drivers would not have the same tendency to divert to local residential streets to avoid congested areas. Thus, less diversion to local residential streets would provide safer conditions for children playing in the study area neighborhoods.

The local interchange proposed at Wingohocking Street with Alternates A-1,C, D and E would result in increased traffic along Castor Avenue, Wingohocking Street and Adams Avenue. The ramp leading on to the expressway is located near Frogmoor Street and traffic entering the ramp would be operating at low speeds because of the turning movements required. At these low speeds safe crossing of the ramp can be accomplished. At night the interchange area would be well lit to increase safety at the ramp entrance.

The ramp coming off of the expressway would connect to the signalized intersection at Adams Avenue and Wingohocking Street. The signal would provide for safe pedestrian crossings of this ramp for children walking to and from the Deni playground.

The major effects on pedestrian access are encountered in the vicinity of the Roosevelt Boulevard interchanges of each Pulaski Highway alternate. Proposed walkways and pedestrian overpasses for all Build Alternates are indicated on the design plan plates. The costs associated with these particular pedestrian schemes are as follows:

Alternate	Estimated Roosevelt Boulevard Pedestrian Access Costs
A-1	$170,100
A-2	$186,700
B	$204,200
C	$ 71,400
D	$225,300
E	$296,300
F	$ 58,000

All schemes provide pedestrian access along and across Roosevelt Boulevard. As indicated above, the cost of pedestrian access facilities for Alternates C and F are considerably lower due to the direct type of interchange with Roosevelt Boulevard. Alternate D is costly from a pedestrian access standpoint because all ramps are crossed with pedestrian overpass structures.

Either stairs or ramps are possible leading to pedestrian overpasses. While stairs are less expensive and require less space, ramps allow for use by bicycles, wheel chairs, and strollers, and provide an easier path for the elderly and disabled. The final types of pedestrian facilities would be determined in later design phases and would consider the needs and desires of the local residents. It is recommended that overpasses, rather than underpasses be constructed due to the safety (crime aspect) and drainage problems associated with pedestrian underpasses. Pedestrian overpass structures can also be utilized to support lighting hardware and directional signs.

The Pulaski Highway would result in less traffic on a majority of the arterial streets in the study area as compared to the No-Build Alternative. Because of this less traffic stable flow conditions can be achieved throughout the study area. With the stable flow conditions delays to emergency vehicles would be minimized.

The Build Alternates would have no effect on the operations of Parkview Hospital, Frankford Hospital, or J. F. Kennedy Hospital or their facilities and services. Alternates C and D would pass close to the Parkview Hospital, however, they would be depressed in this area and no hospital lands would be required.

The Build Alternates would have various effects on Friends Hospital. The Roosevelt Boulevard semi-direct and double loop type interchange schemes would result in the closing of the Langdon Street entrance of the hospital with Alternates A-1, A-2 and B. Improved access would be provided from both directions of the Boulevard at the hospital's other Boulevard entrance near Adams Avenue with these interchange shcemes.

Alternates A-1 and A-2 would require approximately 0.42 acres of Friends Hospital frontage lands along the Roosevelt Boulevard. With the direct interchange schemes no Friends Hospital lands would be required and the entrance at Langdon Street would remain open.

Alternate C would have the greatest effect on Friends Hospital. The alternate would pass through the hospital's famed azalea gardens located beside the Oakland Cemetery. Alternate C would require approximately 11.3 acres of Friends Hospital lands and four staff residence buildings. The effects of this alternate on the Friends Hospital facilities and services would be significant. The loss of several staff residences, portions of the azalea gardens and the increased noise levels would have signficant adverse effects on this health facility.

Alternate D would require approximately 2.61 acres of Friends Hospital lands and two residences located in the rear portion of the hospital along the Tacony Creek. The loss of these lands would not have a significant effect on the operations of the hospital and the residences could be relocated in the immediate area.

Alternates E and F would not require any lands of Friends Hospital and would not require the closing of the Langdon Street entrance.

These effects are indicated below:

EFFECT ON FRIENDS HOSPITAL

	Alternate						
	A-1	A-2	B	C	D	E	F
Buildings Required	0	0	1	4	2	0	0
Acres Required	0.42	0.41	2.88	11.33	2.61	0	0
Azalea Gardens Affected?	No	No	No	Yes	No	No	No

The Pulaski Highway would provide an alternative route for heavy truck traffic along the north-south arterial streets in the study area. This alternate route would be quicker for travel between the Roosevelt Boulevard and areas located along the Delaware Expressway. By providing a quicker route for this traffic, heavy truck volumes along Castor Avenue, Harbison Avenue, and Orthodox Street would be lower than with the No-Build Alternative.

The immediate area through which the Pulaski Highway passes would experience increased noise over that which currently exists. However, streets a block or more away from the project in most cases would have less traffic and less noise, with the Pulaski Highway than with the No-Build Alternative. Noise abatement measures will be incorporated in the design of the Pulaski Highway wherever feasible to reduce the impact on the surrounding areas.

The impact of the Build Alternate on air quality in the study area was the subject of a separate study by Scott Environmental Technology, Inc. The study concluded that air quality in the study area with the Pulaski Highway would not exceed established standards at any location after 1983.

Some existing public health hazards in the study area could be eliminated by construction of the Pulaski Highway. Portions of the Tacony Creek Park, Greenwood Cemetery, and other parcels of land through which the highway passes are presently unkept and used for dumping of trash and abandonment of junk and stolen vehicles. Rats are also common in the area. Construction would enable some of these areas to be cleared and eliminated as a health hazard.

b. No-Build Alternative Effects

The continued and increased traffic congestion along the arterial street system with the No-Build Alternative would result in higher incidences of traffic accidents. Many drivers trying to overcome traffic signal delays would run through the clearance and red phases or start out before the green phases causing higher accident rates in the study area. In addition, lane changes to avoid left turn delays at intersections would increase sideswipe accident occurrences. Continual stop and go conditions would result in increased rear-end type accidents.

Because of increased volume on the arterial streets accidents would increase over present yearly rates. The accident analyses performed also indicates that because traffic growth would remain on the arterial streets with the No-Build Alternative this alternate would result in 8 percent more traffic accidents in the study area than the Build Alternates.

The congestion at intersections would make street crossings by elderly people and children hazardous. Increased traffic volumes on local neighborhood streets which would result from congestion along the main arterial streets would increase hazards to children playing in the study area neighborhoods.

The continued and increased traffic congestion along the arterial street system would result in longer travel times for emergency vehicles destined for Parkview Hospital, Frankford Hospital, and J. F. Kennedy Hospital which are located in the study area. No effects on the operations of these hospitals or their facilities and services would result with the No-Build Alternative.

The No-Build Alternative would have no effect on the operations and services of Friends Hospital and the Northeast Community Health Center. Access to these health facilities would not be significantly affected with with the No-Build Alternative.

The No-Build Alternative would not provide an alternative routing for truck travel along the north-south arterial streets in study area.

Present and proposed restrictions to truck travel along most of the north-south arterial streets would concentrate truck travel along Castor Avenue and Harbison Avenue. The increased traffic volumes and increased truck volumes along these streets would produce higher than existing noise levels and would influence residents living along these streets in the Juniata Park, Northwood and Wissinoming neighborhoods. Higher than existing traffic produced noise levels would be experienced throughout the study area due to the increase in traffic volumes.

Noise abatement measures are not feasible with the No-Build Alternative. Noise is primarily attenuated by barriers and distance and it is not feasible to erect solid barriers along the sides of the arterial streets between vehicle noise sources and residential receptors.

Continued and increased traffic congestion along the arterial street system would result in vehicle produced air pollution spread throughout the study area. While future carbon monoxide levels would be less than present levels due to vehicle emission controls, more air pollution would result with traffic congestion than with stable flow conditions. With the No-Build Alternative,congestion would occur along most of the arterial streets in the study area.

12. Conservation

a. Build Alternate Effects

The effects of the Build Alternate on wildlife and soil conservation were the subject of a separate study by Jack McCormick and Associates. The effects are discussed in detail in that report and incorporated within this document.

In general, special soil erosion and sedimentation control plans would be developed for the Pulaski Highway during the final design stage. The plan would incorporate the control measures discussed in Volume II of the Highway Engineering report. Every feasible effort would be made to minimize soil erosion and sedimentation during the construction of the Pulaski Highway.

The soil studies performed noted that the soil in the project area is the residual soil of the underlying mica schist. The soil is generally fine grained and extremely sensitive to moisture content during placement and compaction.

b. <u>No-Build Alternative Effects</u>

The No-Build Alternative would not have an impact on soil erosion conditions, animal feeding grounds, or trails. No flood plain areas of the Tacony Creek would be affected.

13. <u>Multiple Use of Space</u>

a. <u>Build Alternate Effects</u>

Several applications of multiple use of space concepts can be incorporated into the planning of the Pulaski Highway.

Along Section C, which would be constructed as a long bridge, the area under the viaduct could be used for various purposes. Between I-95 and Aramingo Avenue, the railroad yards could remain in use under the viaduct. Between Aramingo Avenue and Frankford Avenue the highway would be located over the Frankford Creek and over the large Penn Central Railroad freight yard. Between Aramingo Avenue and the railroad, truck parking under the viaduct could be provided. Many trucking firms are located in this area and space under the viaduct could be leased for their use. The railroad freight yard would remain in use under the viaduct. Between the railroad and Frankford Avenue, the area under the viaduct could be used for employee parking for the industrial firms located adjacent to the highway and for parking by students of Northeast Catholic High School (See Plate 84).

Between Frankford Avenue and Kensington Avenue, the areas under the viaduct could be utilized for parking areas. Employees of the industrial buildings adjacent to the highway and students at North Catholic High School would utilize these areas. In addition, these areas could be designated as park and ride lots for the Frankford Elevated rail commuter line along Kensington Avenue. These areas would reduce the need to expand SEPTA's existing lots at Bridge Street.

Between Kensington Avenue and Deal Street, the area under the viaduct could be developed as a tot lot and playground for the children in this residential area. Between Deal Street and Leiper Street, the area under the viaduct could be used for parking for residents and employees of the large industrial plant located at Adams Avenue and Leiper Street (See Plate 84).

Along Section B, several applications of multiple use of space can be incorporated into the Pulaski Highway plans. Between Leiper Street and Ruan Street, the area under the viaduct would be utilized for the relocation of Adams Avenue with all alternates. Between Ruan Street and Wingohocking Street, the highway would be located over the Frankford Creek and areas under the viaduct adjacent to the creek could be utilized as parking areas. At Cayuga Street, the area under the viaduct behind the Potter Street residences could be developed as a tot lot, handball court, or some other recreational use. Between Wingohocking Street and Unity Street, the areas under the viaduct could be utilized for parking areas or leased for vehicle storage by the Degan Company which presently stores vehicles in a lot at Wingohocking Street near the creek. These above mentioned uses of the highway right-of-way areas could be applied to all of the Build Alternates.

Between Unity Street and the Roosevelt Boulevard, Alternates A-1, B, C and F are depressed below ground level and multiple use of space is not feasible along this section with these alternates.

Alternate A-2 would remain elevated on a bridge over the existing ground between Unity Street and the Roosevelt Boulevard. Areas under the viaduct could be utilized for various purposes along this alternate between Unity Street and the Roosevelt Boulevard. Between Unity Street and Orthodox Street the alternate would pass through mainly open lands, however, the proposed local interchange with Castor Avenue would be located in this area making most of the land unsuitable for multiple use of space applications (See Plate 105). At the corner of the Orthodox Street and Castor Avenue interchange area, the land under the viaduct could be developed as an open space and recreational area for residents in the vicinity and for residents of the Northwood Nursing Home. Between Castor Avenue and Roosevelt Boulevard, the alternate would pass through cemetery lands. The use of the areas under the viaduct could possibly remain under the control of the cemeteries and could possibly be used for burial purposes.

Alternate D would be depressed between Unity Street and Fishers Lane and multiple use of space along this section of the alternate is not feasible. After crossing Fishers Lane, the alternate crosses over the valley of Tacony Creek on a long bridge. The area under this bridge in Tacony Creek Park could be utilized for recreation purposes. Tacony Creek and the relocated park trail system would pass under this section of viaduct. Between this bridge and Roosevelt Boulevard, the alternate would be constructed at or just below existing ground level and no applications of multiple use of space would be feasible.

Alternate E would be constructed as a long elevated bridge between Unity Street and the Roosevelt Boulevard. Between Wingohocking Street and Orthodox Street the areas under the viaduct could be utilized for parking by employees of the large manufacturing plants located adjacent to the alternate or leased for vehicle storage by the Degan Company. Between Orthodox Street and Large Street the existing railroad embankment could be leveled and the area under the viaduct could be utilized for parking areas for employees of the large manufacturing plants located along the alternate. At the corner of Large Street and Arrott Street the railroad embankment could be leveled and the area under the viaduct utilized as additional recreation lands for the Simpson Memorial Park. Between Arrott Street and Foulkrod Street the areas under the viaduct could be developed as a tot lot, tennis courts, or other recreational facilities for residents. Between Foulkrod Street and Castor avenue the existing railroad embankment could be leveled and the area under the viaduct used as additional lands for Northwood Park. Between Castor Avenue and the Boulevard, the interchange precludes the application of multiple use of space.

Alternate F is depressed between Unity Street and Castor Avenue and multiple use of space is not applicable. Between Castor Avenue and Ramona Avenue, Adams Avenue would be constructed over the southbound lanes of Alternate F. This overhanging of Adams Avenue minimizes the amount of cemetery lands required.

Following the selection of a possible build alternative, the subject of multiple use will be more thoroughly pursued among all involved agencies for specific applications.

b. No-Build Alternative Effect

The No-Build Alternative would present no opportunities for the application of multiple use of highway right-of-way areas.

14. Cemeteries

a. Build Alternate Effects

Greenwood Cemetery is affected by all of the Build Alternates except

Alternate E and Oakland Cemetery is affected by Alternates A-1, A-2, B and C. Table 67 indicates the acreage and the approximate number of reinterments required in these two cemeteries for each alternate. These reinterments are based on the density of plots in each section and on the number of graves per plot. Many plots contain multiple reinterments. Discussions with representaives of the cemeteries indicate that in some cases there are as many as eight burials per plot.

Greenwood Cemetery is poorly maintained. There is visual evidence of illegal dumping and reports of numerous cases where cars have been abandoned on the property. The majority of the cemetery is overgrown with tall weeds and brush. Reports indicate, and visual observations substantiate, the fact that many people actually have to clear a path through the brush in order to visit their family plot. In contrast, Oakland Cemetery is very well maintained.

As indicated in the above table, Alternate A-1 and A-2 have the most adverse effect on Greenwood Cemetery and pass through Oakland Cemetery. Alternate B would require the most reinterments and would have the most detrimental effects on Oakland Cemetery. Alternate C requires slightly over one acre of Oakland Cemetery land fronting on Adams Avenue, however, nearly three acres of ground severed from Friends Hospital which border on Oakland Cemetery could possibly be utilized as replacement cemetery land with this alternate.

Alternate D affects only Greenwood Cemetery, passing through its rear section. Conversations with Greenwood Cemetery representatives indicate that passing through this section would be least damaging.

Alternate F affects only Greenwood Cemetery requiring slightly over three acres of cemetery land fronting on Adams Avenue.

Previous correspondance with Greenwood Cemetery officials indicate that this cemetery has deferred improvements due to lack of funds and the expected construction of the Pulaski Highway over the last twenty years. The officials

TABLE 67

EFFECT ON GREENWOOD AND OAKLAND CEMETERIES

	Alternate*					
	A-1	A-2	B	C	D	F
Greenwood Cemetery	Total Cemetery Acres = 47.89					
Acres Required	4.83	4.70	5.23	4.89	4.26	3.23
Reinterments	5400	5400	1900	1800	1700	2300
Oakland Cemetery	Total Cemetery Acres = 41.58					
Acres Required	3.78	3.84	8.73	3.24	0	0
Reinterments	400	400	7600	800	0	0
Totals						
Acres Required	8.61	8.54	13.96	8.13	4.26	3.23
Reinterments	5800	5800	9500	2600	1700	2300

* No direct effect caused by Alternate E

Source: PennDOT Highway Engineering Report (Vol I, II, and III), Dec- March, 1974-75.

indicate that the Pulaski Highway would benefit this cemetery by providing much needed funds for proper care of the grounds.

Previous correspondance with Oakland Cemetery officials indicate that the construction of the Pulaski Highway through lands of this cemetery would be strongly opposed.

The relocation of graves to other sites within Greenwood Cemetery was previously discussed with officials of the cemetery. The relocation can be accomplished through the cemetery corporation. PennDOT would enter into an agreement with the cemetery indicating which area is to be cleared and the grave relocations would be accomplished by the cemetery corporation. After the area is cleared, PennDOT would then acquire the vacant land from the cemetery. With this procedure, PennDOT would not have to be directly involved with the grave relocations.

b. No-Build Alternative Effects

The No-Build Alternative would have an effect on the operation of the Greenwood and Oakland Cemeteries during the widening of Adams Avenue. These effects could be minimized by keeping access to the cemeteries open at all times during the construction period.

The No-Build Alternative would not require the condemnation of any cemetery lands. The elimination of funds anticipated by Greenwood Cemetery from the construction of the Pulaski Highway might result in the sale of some of the cemetery property to private developers.

15. Air Quality

a. General

Section III of this document discusses the consistency of the Pulaski Highway with the State Implementation Plan and the Transportation Control Strategies. This consistency is based on the fact that the Pulaski Highway will have a positive regional and sub-regional effect (reduced bulk emissions) compared to the "No-Build" Alternative. While this type of analysis (mesoscale) is invaluable in terms of identifying the overall effect of the Pulaski Highway on air quality, another type of analysis is necessary to evaluate the air quality impact on sites adjacent to a particular highway alignment. Such air analysis is termed a microscale analysis.

b. Microscale Impact

Valid microscale predictive techniques have been developed for nonreactive pollutants such as carbon monoxide, but are not yet available for reactive pollutants such as hydrocarbons, oxidants, and particulates. Therefore, the microscale analysis pertains only to carbon monoxide.

Carbon monoxide concentrations at the various receptors due solely to vehicular traffic on L.R. 1078 for 1980 and 1995 were determined for both the most probable and worst case conditions. The peak one-hour levels were predicted by use of the "HIWAY" model (a predictive model developed by the Environmental Protection Agency). Eight-hour concentrations were obtained by multiplying the one-hour values by appropriate constants, for the two years. Carbon monoxide emission factors were calculated based on the latest data available from EPA at the time of the study. The EPA document entitled "Compilation of Air Pollutant Emission Factors (AP-42)" was the basis for the calculations. (See discussion later in this section regarding emission factor changes).

The results, for each meteorological condition, are presented in two parts.

(1) Receptors located adjacent to the common (Southern) section extending from I-95 to the general location of Adams Avenue and Leiper Street.

(2) Receptors influenced by the seven alternate alignments between Adams

Avenue and Leiper Street and their intersection with Roosevelt Boulevard. (See Plate 182 and Table 67A for receptor locations).

One and eight-hour carbon monoxide levels due to L.R. 1078 traffic will be extremely low in 1980 and 1995 at all locations examined for the most probable meteorological conditions in the Pulaski Highway area. Table 68 lists the anticipated highway generated CO concentration at the eleven receptors adjacent to the southern section. Table 69 and 70 identify carbon monoxide levels at the twenty-five receptors in the northern section.

Two facts can be learned from Tables 68 through 70. They are:

(1) The increased traffic volumes expected in 1995 over those forecast for 1980 are adequately offset by the anticipated decrease in vehicular emission factors.

(2) L.R. 1078 generated carbon monoxide levels under the most probable meteorological conditions, i.e., D stability and an 8 knot wind from 210° will be insignificant and can be ignored.

Peak one-hour and eight-hour concentrations at the receptors examined will occur, during an E Stability and 0.8 mph wind conditions, under a variety of different wind directions. Peak CO levels will vary somewhat at a single receptor from alternate to alternate. The wind angle producing the peak concentration will change as a function of receptor/alternate relationship.

While 0.8 mph was found to be indicative of worst case wind speeds in the study area, its use (because of the mathematical function in the HIWAY model) gives results that, according to EPA, are not characteristic of the ambient levels. EPA suggests that a minimum wind speed of 1 meter/second be used in the model. For this reason, worst case concentrations are shown in parentheses in the following tables for 1 meter/second wind speeds. This results in an approximate 65% reduction of Pulaski Highway generated CO predicted concentrations (see 6/3/75 EPA letter referenced in "Comments and Coordination " Section).

TABLE 67A
AIR PREDICTION SITES

Number	Site Address	Land Use
2S	Coral & Vici Sts.	Residential
3S	Torresdale & Hunting Park	N.E. Catholic H.S.
4S	Hunting Park & Kensington Aves.	Residential
5S	Deal St., west of L.R. 1078	Residential
6S	Leiper & Ruan	Playground
7S	Deal St. near Griscom	Residential
8S	Frankford & Adams Aves.	Park
9S	Ruan & Griscom Sts.	Residential
10S	Hunting Park & O Sts.	Park
11S	Ashland St.	Industrial
12S	Luzerne St.	Industrial
1N	Adams Avenue	Deni Playground
2N	Adams & Pilling	Residential
3N	Adams Avenue	Simpson Memorial Park
4N	Castor Avenue	Northwood Park
5N	Ramona Ave. & Herbert Street	Residential
6N	Rutland Street	Northwood Park
7N	Wyoming Avenue	Parkview Hospital
8N	Cayuga and O Streets	Playground
9N	S. of Castor Avenue	Tacony Creek Park (Southern end)
10N	Wyoming Avenue	Tacony Creek Park
11N	Summerdale Avenue	Houseman Rec. Center
12N	Friends Hospital - Central	Hospital Grounds
13N	Roosevelt Blvd. & F Street	Tacony Creek Park
14N	Whitaker Avenue	Tacony Creek Park
15N	Frankford Creek	Tacony Creek Park near Friends Hospital
16N	Bingham Street	Tacony Creek Park
17N	Friends Hospital	Hospital Grounds
18N	Roosevelt Boulevard	Friends Hospital Grounds
19N	Frankford Creek	Friends Hospital Grounds
20N	Ramona Avenue	Greenwood Cemetery
21N	Summerdale, East of Roosevelt Blvd.	Residential
22N	Foulkrod Street	Residential
23N	Allengrove Street	Residential
24N	Large and Arrott Streets	Residential
25N	Castor Avenue	Greenwood Cemetery

TABLE 68
CO CONCENTRATIONS (PPM)
MOST PROBABLE CASE
SOUTHERN SECTION

	1980		1995	
Receptor	1 Hour	8 Hour	1 Hour	8 Hour
2S	---	---	---	---
3S	---	---	---	---
4S	---	---	---	---
5S	---	---	---	---
6S	0.2	0.1	0.1	0.1
7S	0	0	0	0
8S	0	0	0	0
9S	0.1	0.1	0.1	0.1
10S	---	---	---	---
11S	0.1	0.1	0	0
12S	---	---	---	---

Note: Values are for L.R. 1078 generated CO only.

Source: Air Quality Study (Vol. I & II), Scott Environmental Technology Inc., October 1974.

TABLE 69
PEAK HOUR CONCENTRATIONS OF CO (PPM)
MOST PROBABLE CASE
NORTHERN SECTION

Receptor	1980							1995						
No.	A-1	A	B	C	D	E	F	A-1	A-2	B	C	D	E	F
1N	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
2N	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
3N	0.1	0.1	0.1	0	-	-	0.1	0.1	0.0	0.1	0	-	-	0.1
4N	0.1	0.1	-	-	-	-	0.1	0.1	0.1	-	-	-	-	0.1
5N	0.3	0.2	0.1	-	-	-	0.2	0.2	0.1	0	-	-	-	0.1
6N	0.1	0.1	-	-	-	-	0.1	0	0	-	-	-	-	0
7N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11N	0.1	0.2	0	-	-	0	0.1	0.1	0.1	0	-	-	0	0.1
12N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13N	-	-	-	-	0.2	-	-	-	-	-	-	0.1	-	-
14N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15N	-	-	-	-	0	-	-	-	-	-	-	0	-	-
16N	-	-	-	-	0	-	-	-	-	-	-	0	-	-
17N	-	-	-	-	0	-	-	-	-	-	-	0	-	-
18N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20N	-	-	-	0.1	0.1	-	-	-	-	-	0	0	-	-
21N	0.2	0.2	0.1	0	-	0	0.2	0.1	0.1	0.1	0	-	0	0.1
22N	0.1	0.1	0	-	-	-	0.1	0.1	0.1	0	-	-	-	0.1
23N	0.1	0	-	-	-	0.2	0.1	0.1	0	-	-	-	0.1	0.1
24N	0	0.1	0.1	-	-	0.4	0	0	0.1	0	-	-	0.2	0
25N	-	-	0	0.1	0.1	-	-	-	-	0	0.1	0.1	-	-

Note: Values are for L.R. 1078 generated CO only.

Source: Air Quality Study (Vol. 1 & II), Scott Environmental Technology Inc., October 1974.

TABLE 70
8 HOUR AVERAGE OF CO (PPM)
MOST PROBABLE CASE
NORTHERN SECTION

Receptor No.	1980							1995						
	A-1	A-2	B	C	D	E	F	A-1	A-2	B	C	D	E	F
1N	.2	.1	.1	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1
2N	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	0	.1
3N	.1	.1	0	0	-	-	.1	0	0	0	0	-	-	0
4N	.1	.1	-	-	-	-	.1	.1	.1	-	-	-	-	.1
5N	.1	.1	0	-	-	-	.1	.1	.1	0	-	-	-	.1
6N	0	0	-	-	-	-	0	0	0	-	-	-	-	0
7N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11N	.1	.1	0	-	-	0	.1	0	.1	0	-	-	0	.1
12N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13N	-	-	-	-	.1	-	-	-	-	-	-	.1	-	-
14N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15N	-	-	-	-	0	-	-	-	-	-	-	0	-	-
16N	-	-	-	-	0	-	-	-	-	-	-	0	-	-
17N	-	-	-	-	0	-	-	-	-	-	-	0	-	-
18N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20N	-	-	-	.1	.1	-	-	-	-	-	0	0	-	-
21N	.1	.1	.1	0	-	0	.1	.1	.1	0	0	-	0	.1
22N	.1	.1	0	-	-	-	.1	.1	.1	0	-	-	-	.1
23N	.1	0	-	-	-	.1	.1	.1	0	-	-	-	.1	.1
24N	0	.1	.1	-	-	.2	0	0	.1	0	-	-	.1	0
25N	-	-	.1	.1	.1	-	-	-	-	0	.1	.1	-	-

Note: Values are for L.R. 1078 generated CO only.

Source: Air Quality Study (Vol. I & II), Scott Environmental Technolgy Inc., October 1974.

Other factors influencing the carbon monoxide concentrations stated herein are the recent extensions given auto-makers regarding emission control devices and the new EPA methodology in computing automotive emission factors. While the resulting new emission factor values can not be exactly compared with the old emission factor values (because of additional parameters considered in the new calculations), it is known that the extensions and the new methodology result in the new emission factor values being on the order of from 20 to 40 percent higher than the old values.

Since the minimum wind speed modification (65 percent reduction) and the emission factor modification (20-40 percent increase) tend to balance each other to some degree (on the conservative side), it appears that the values stated in the table (for 0.8 mph) give a reasonable indication of future air quality.

The resulting L.R. 1078 generated CO concentrations were examined to determine the wind direction which produced the highest pollution level at each receptor for all of the alternates. Tables 71 through 78 identify these peak one-hour and eight-hour CO concentrations and the wind angle associated with this peak hour for all Build Alternates. These tables indicate total CO concentrations, that is, L.R. 1078 generated CO plus background CO.

Examiniation of these tables show that peak concentrations at the receptors examined result from a wide variety of wind directions. As would be expected, the maximum concentration at a receptor occurs when the wind transports highway generated pollution from a relatively long, and reasonably straight section of the alternate closest to the receptor. For example, concentrations are relatively high at receptors 6 N and 24 N when a wind from 185 degrees carries the pollution generated from Alternate E towards them. Similarly, high concentrations result from Alternate C at receptors

TABLE 71

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)*

In Southern Section - I-95 to Leiper Street **

Receptors	Worst Cast Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
2S	350	19.4(15.7)	10.8(8.8)	11.0(8.6)	6.4(5.0)
3S	135	21.7(16.6)	12.1(9.3)	12.1(9.0)	7.1(5.2)
4S	-	13.7(13.7)	7.7(7.7)	7.2(7.2)	4.1(4.1)
5S	350	22.5(16.8)	12.5(9.4)	13.2(9.3)	7.7(5.4)
6S	315	18.9(15.6)	10.6(8.7)	10.6(8.4)	6.2(4.8)
7S	335	18.8(15.5)	10.5(8.7)	10.9(8.5)	6.4(4.9)
8S	335	22.0(16.7)	12.2(9.4)	12.5(9.1)	7.3(9.3)
9S	315	16.8(14.8)	9.4(8.3)	9.2(7.9)	5.3(4.5)
10S	135	20.4(16.1)	11.4(9.0)	11.6(8.8)	6.8(5.1)
11S	315	20.7(19.7)	11.6(11.1)	10.8(10.2)	6.1(5.7)
12S	335	22.1(20.2)	12.4(11.4)	11.7(10.5)	6.6(5.9)

* Total Concentration = Background concentration and highway generated concentration

** Values represent highest concentrations from all alternate alignments on receptors within the southern section

10.0 = Concentration based on 0.8 mile per hour wind speed

(10.0) = Concentration based on 1.0 meter per second wind speed

Source: Air Quality Study (Vol. I & II), Scott Environmental Technology Inc., October, 1974.

TABLE 72

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)

ALTERNATE A1

Receptors	Worst Case Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	320	19.6(15.8)	11.0(8.9)	11.4(8.7)	6.7(5.0)
2 N	320	17.4(15.0)	9.7(8.4)	9.8(8.1)	5.7(4.6)
3 N	320	15.5(13.7)	8.7(7.8)	9.5(8.3)	5.4(4.7)
4 N	320	14.9(13.5)	8.4(7.6)	9.0(8.2)	5.1(4.6)
5 N	350	16.1(13.3)	9.2(7.6)	9.1(7.4)	5.2(4.1)
6 N	320	13.0(12.8)	7.3(7.3)	7.9(7.8)	4.4(4.4)
7 N	140	15.2(13.6)	8.6(7.7)	9.4(8.3)	5.4(4.7)
8 N	350	17.3(15.0)	9.7(8.4)	9.5(8.0)	5.5(4.6)
9 N	350	18.2(15.3)	10.2(8.6)	10.0(8.2)	5.8(4.7)
10 N	140	13.7(13.1)	7.7(7.4)	8.3(7.9)	4.7(4.4)
11 N	170	14.0(12.6)	8.0(7.2)	8.0(7.0)	4.5(3.9)
12 N	140	14.0(13.2)	7.9(7.5)	8.6(8.0)	6.1(4.5)
15 N	140	10.2(10.0)	5.6(5.6)	6.2(6.1)	3.5(3.5)
17 N	140	10.6(10.2)	5.9(5.7)	6.4(6.1)	3.7(3.5)
18 N	140	13.5(12.4)	7.7(7.1)	7.6(6.9)	4.3(3.8)
19 N	140	13.7(13.1)	7.7(7.4)	8.3(8.0)	4.7(4.5)
20 N	350	15.2(13.6)	8.6(7.7)	9.3(8.3)	5.3(4.7)
21 N	170	19.7(15.2)	11.1(8.6)	12.1(9.3)	7.0(5.3)
22 N	170	13.7(12.5)	7.9(7.2)	7.9(7.0)	4.4(3.9)
23 N	350	12.1(11.9)	7.0(6.9)	6.7(6.6)	3.7(3.7)
24 N	320	14.5(13.3)	8.2(7.5)	8.7(8.1)	5.0(4.5)
25 N	140	15.1(13.6)	8.5(7.7)	9.4(8.3)	5.3(4.7)

* Total Concentration = Background Concentration and Highway Generated Concentration

10.0 = Concentration based on 0.8 mile per hour wind speed

(10.0) = Concentration based on 1.0 meter second wind speed

Source: Air Quality Study (Vol I & II) Scott Environmental Technology Inc., October, 1974

TABLE 73

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)*

ALTERNATE A2

Receptors	Worst Case Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	350	18.5(15.4)	10.4(8.6)	10.3(8.3)	6.0(4.8)
2 N	350	18.8(15.5)	10.5(8.7)	10.5(8.4)	6.1(4.8)
3 N	320	15.1(13.6)	8.5(7.7)	9.2(8.2)	5.2(4.6)
4 N	320	14.2(13.2)	8.0(7.5)	8.6(8.0)	4.8(4.5)
5 N	170	17.8(13.9)	10.1(8.0)	10.4(7.9)	6.0(4.5)
6 N	320	12.9(12.8)	7.3(7.3)	7.8(7.7)	4.4(4.3)
7 N	350	14.4(13.3)	8.6(7.5)	8.8(8.1)	5.0(4.5)
8 N	350	16.2(14.6)	9.1(8.2)	8.7(7.7)	5.0(4.4)
9 N	350	16.5(14.7)	9.2(8.3)	8.9(7.8)	5.1(4.5)
10 N	350	13.2(12.9)	8.0(7.3)	8.0(7.8)	4.5(4.4)
11 N	170	14.0(12.6)	8.0(7.2)	7.9(7.8)	4.5(3.9)
12 N	140	14.0(13.2)	7.9(7.5)	8.5(8.0)	4.8(4.5)
15 N	140	10.1(10.0)	5.6(5.6)	6.1(6.0)	3.5(3.4)
17 N	140	10.4(10.1)	5.8(5.6)	6.3(6.1)	3.6(3.5)
18 N	320	16.4(13.4)	9.3(7.7)	9.6(7.6)	5.5(4.3)
19 N	140	13.5(13.0)	7.6(7.4)	8.2(7.9)	4.6(4.4)
20 N	140	16.5(14.1)	9.3(8.0)	10.2(8.6)	5.8(4.8)
21 N	170	20.1(15.3)	11.2(8.6)	12.2(9.3)	7.1(5.3)
22 N	170	13.6(12.4)	7.8(7.1)	7.7(6.9)	4.3(3.8)
23 N	350	12.1(11.9)	7.0(6.9)	6.7(6.6)	3.7(3.7)
24 N	320	14.1(13.2)	8.0(7.5)	8.5(8.0)	4.8(4.5)
25 N	140	14.7(13.4)	8.3(7.6)	8.9(8.1)	5.0(4.5)

* Total Concentration = Background Concentration and Highway Generated Concentration

10.0 = Concentration based on 0.8 mile per hour wind speed
(10.0) = Concentration based on 1.0 meter per second wind speed
Source: Air Quality Study (Vol I & II), Scott Environmental Technology Inc., October, 1974

TABLE 74

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)*

ALTERNATE B

Receptors	Worst Case Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	335	20.7(16.2)	11.6(9.1)	11.1(8.6)	6.5(5.0)
2 N	305	16.8(14.8)	9.4(8.3)	9.3(8.0)	5.4(4.6)
3 N	195	14.3(13.3)	8.1(7.5)	8.6(8.1)	4.9(4.5)
4 N	195	14.0(13.2)	7.9(7.5)	8.5(8.0)	4.8(4.5)
5 N	165	14.0(12.6)	8.0(7.2)	8.0(7.0)	4.5(3.9)
6 N	195	13.9(13.1)	7.9(7.4)	8.4(8.0)	4.8(4.5)
7 N	125	15.7(13.8)	7.1(7.8)	9.5(8.3)	5.4(4.7)
8 N	345	17.6(15.1)	9.8(8.5)	9.5(8.1)	5.5(4.6)
9 N	335	19.5(15.8)	10.9(8.9)	11.2(8.6)	6.5(5.0)
10 N	125	14.6(13.4)	8.3(7.6)	9.1(8.2)	5.2(4.6)
11 N	195	13.5(12.4)	7.7(7.1)	7.5(6.9)	4.2(3.8)
12 N	15	13.8(13.1)	7.8(7.4)	8.4(8.0)	4.7(4.5)
15 N	125	12.3(10.8)	6.8(6.0)	7.5(6.5)	4.3(3.7)
17 N	125	11.7(10.5)	6.5(5.8)	7.1(6.4)	4.1(3.6)
18 N	15	13.9(12.6)	7.9(7.2)	7.8(7.0)	4.4(3.9)
19 N	125	14.8(13.5)	8.4(7.6)	9.0(8.2)	5.1(4.6)
20 N	155	18.3(14.7)	10.3(8.3)	11.4(9.0)	6.5(5.1)
21 N	195	16.0(13.9)	9.0(7.9)	9.7(8.4)	5.5(4.7)
22 N	195	12.5(12.1)	7.2(7.0)	6.9(6.7)	3.9(3.7)
23 N	195	12.8(12.2)	7.3(7.0)	7.1(6.7)	4.0(3.7)
24 N	195	14.6(13.4)	8.2(7.6)	9.0(8.2)	5.1(4.6)
25 N	155	22.9(16.3)	12.8(9.2)	14.3(10.1)	8.3(5.8)

* Total Concentration = Background Concentration and Highway Generated Concentration

10.0 = Concentration based on 0.8 mile per hour wind speed
(10.0) = Concentration based on 1.0 meter per second wind speed

Source: Air Quality Study (Vol I & II) Scott Environmental Technology Inc., October, 1974

TABLE 75

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)*

ALTERNATE C

Receptors	Worst Case Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	330	21.7(16.6)	12.1(9.3)	13.0(9.3)	7.6(5.4)
2 N	315	20.1(16.0)	11.2(9.0)	11.5(8.7)	6.7(5.0)
3 N	180	15.6(13.7)	8.8(7.8)	9.8(8.5)	5.6(4.8)
4 N	180	15.2(13.6)	8.6(7.7)	9.5(8.3)	5.4(4.7)
5 N	240	12.6(12.1)	7.2(7.0)	7.0(6.7)	3.9(3.7)
6 N	180	13.8(13.1)	7.8(7.4)	8.5(8.0)	4.8(4.5)
7 N	315	17.1(14.3)	9.6(8.1)	10.4(8.7)	5.9(4.9)
8 N	105	16.6(14.7)	9.3(8.3)	9.2(7.9)	5.3(4.5)
9 N	150	19.2(15.7)	10.7(8.8)	11.1(8.6)	6.5(5.0)
10 N	135	15.2(13.6)	8.6(7.7)	9.4(8.3)	5.3(4.7)
11 N	210	13.2(12.3)	7.6(7.1)	7.3(6.8)	4.1(3.8)
12 N	60	14.1(13.2)	8.0(7.5)	8.6(8.0)	4.9(4.5)
15 N	60	11.6(10.5)	6.5(5.8)	7.0(6.4)	4.0(3.6)
17 N	135	14.0(11.4)	7.8(6.3)	8.7(7.0)	5.0(4.0)
18 N	60	15.0(12.9)	8.6(7.4)	8.6(7.3)	4.9(4.1)
19 N	30	18.4(14.7)	10.4(8.3)	11.2(9.0)	6.4(5.1)
20 N	150	14.4(13.3)	8.1(7.5)	8.9(8.1)	5.0(4.5)
21 N	210	14.2(13.3)	8.1(7.5)	8.6(8.0)	4.9(4.5)
22 N	30	13.0(12.2)	7.5(7.0)	7.2(6.8)	4.0(3.8)
23 N	180	13.5(12.4)	7.7(7.1)	7.7(6.9)	4.3(3.8)
24 N	180	13.9(13.1)	7.9(7.4)	8.6(8.0)	4.8(4.5)
25 N	150	19.1(15.0)	10.7(8.5)	12.1(9.3)	7.0(5.3)

* Total Concentration = Background Concentration and Highway Generated Concentration

10.0 = Concentration based on 0.8 mile per hour wind speed
(10.0) = Concentration based on 1.0 meter per second wind speed
Source: Air Quality (Vol. I & II), Scott Environmental Techology Inc., October, 1974

TABLE 76

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)*

ALTERNATE D

Receptors	Worst Case Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	315	19.1(15.6)	10.7(8.7)	10.8(8.5)	6.3(4.9)
2 N	315	19.8(15.9)	11.1(8.9)	11.3(8.7)	6.6(5.0)
3 N	270	14.8(13.5)	8.4(7.6)	9.1(8.2)	5.2(4.6)
4 N	270	12.7(12.7)	7.2(7.2)	7.7(7.7)	4.3(4.3)
7 N	135	16.1(13.9)	9.1(7.9)	9.9(8.5)	5.6(4.8)
8 N	90	16.6(14.7)	9.3(8.3)	9.1(7.9)	5.3(4.5)
9 N	135	19.5(15.8)	10.9(8.9)	11.0(8.6)	6.4(5.0)
10 N	135	15.3(13.6)	8.6(7.7)	9.4(8.3)	5.3(4.7)
12 N	135	12.7(12.7)	7.2(7.2)	7.7(7.7)	4.3(4.3)
13 N	180	14.6(12.5)	8.1(7.0)	8.5(7.2)	4.9(4.1)
14 N	360	12.0(10.7)	6.6(5.9)	7.2(6.4)	4.2(3.6)
15 N	120	11.2(10.4)	6.2(5.8)	6.8(6.3)	3.9(3.6)
16 N	150	13.8(12.2)	7.7(6.8)	8.0(7.1)	4.6(4.1)
17 N	135	10.7(10.2)	5.9(5.7)	6.5(6.2)	3.7(3.5)
19 N	135	13.9(13.1)	7.8(7.4)	8.4(8.0)	4.7(4.5)
20 N	270	13.1(12.8)	7.4(7.3)	7.9(7.8)	4.4(4.4)
24 N	270	12.7(12.7)	7.2(7.2)	7.7(7.7)	4.3(4.3)
25 N	165	15.5(13.7)	8.8(7.8)	9.6(8.4)	5.4(4.7)

* Total Concentration = Background Concentration and Highway Generated Concentration

10.0 = Concentration based on 0.8 mile per hour wind speed

(10.0) = Concentration based on 1.0 meter per second wind speed

Source: Air Quality Study (Vol. I & II), Scott Environmental Technology Inc., October 1974

TABLE 77

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)*

ALTERNATE E

Receptors	Worst Case Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	335	18.9(15.6)	10.6(8.7)	11.0(8.6)	6.4(5.0)
2 N	185	19.9(15.9)	11.1(8.9)	11.4(8.7)	6.7(5.0)
3 N	155	15.4(13.7)	8.7(7.8)	9.4(8.3)	5.4(4.7)
4 N	155	15.7(13.8)	8.8(7.8)	9.6(8.4)	5.5(4.7)
5 N	5	14.2(12.7)	8.1(7.3)	8.0(7.0)	4.5(3.9)
6 N	185	23.4(16.5)	13.1(9.3)	14.6(10.2)	8.5(5.8)
8 N	5	13.7(13.7)	7.7(7.7)	7.2(7.2)	4.1(4.1)
9 N	155	16.0(14.5)	9.0(8.1)	8.6(7.7)	5.0(4.4)
11 N	155	14.4(12.7)	8.2(7.3)	8.8(7.3)	5.0(4.1)
12 N	5	13.1(12.8)	7.4(7.3)	8.0(7.8)	4.5(4.4)
15 N	5	10.0(9.9)	5.5(5.5)	6.0(6.0)	3.4(3.4)
17 N	5	9.9(9.9)	5.5(5.5)	6.0(6.0)	3.4(3.4)
18 N	335	12.4(12.0)	7.1(6.9)	6.8(6.8)	3.8(3.7)
19 N	5	13.0(12.8)	7.3(7.3)	7.8(7.8)	4.4(4.4)
20 N	5	13.8(13.1)	7.8(7.4)	8.4(8.0)	4.7(4.5)
21 N	155	16.4(14.0)	9.2(7.9)	10.0(8.5)	5.7(4.8)
22 N	335	15.5(13.1)	8.8(7.5)	8.9(7.4)	5.1(4.1)
23 N	185	15.4(13.1)	8.8(7.5)	8.8(7.3)	5.0(4.1)
24 N	185	21.9(16.0)	12.3(9.0)	13.7(9.8)	7.9(5.6)
25 N	5	13.1(12.8)	7.4(7.3)	8.0(7.8)	4.5(4.4)

* Total Concentration = Background Concentration and Highway Generated Concentration

10.0 = Concentration based on 0.8 mile per hour wind speed

(10.0) = Concentration based on 1.0 meter per second wind speed
Source: Air Quality Study (Vol. I & II) Scott Environmental Technology Inc. October 1974

TABLE 78

TOTAL CARBON MONOXIDE CONCENTRATION (PPM)*

ALTERNATE F

Receptors	Worst Case Wind Angle	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	320	18.4(15.4)	10.3(8.6)	10.5(8.4)	6.1(4.8)
2 N	320	18.5(15.4)	10.3(8.6)	10.4(8.3)	6.0(4.8)
3 N	320	18.1(14.6)	10.2(8.3)	11.1(8.9)	6.3(5.0)
4 N	320	19.2(15.0)	10.8(8.5)	11.7(9.1)	6.7(5.2)
5 N	310	20.3(14.8)	11.5(8.5)	11.8(8.4)	6.9(4.8)
6 N	320	12.7(12.7)	7.2(7.2)	7.7(7.7)	4.3(4.3)
7 N	140	15.0(13.5)	8.5(7.7)	9.3(8.3)	5.3(4.6)
8 N	350	14.6(14.0)	8.2(7.9)	7.8(7.4)	4.5(4.2)
9 N	350	16.0(14.5)	9.0(8.2)	8.7(7.7)	5.0(4.4)
10 N	140	15.3(13.6)	8.6(7.7)	9.5(8.4)	5.4(4.7)
11 N	190	17.1(13.7)	9.7(7.8)	9.9(7.7)	5.6(4.3)
12 N	140	14.0(13.2)	7.9(7.5)	8.5(8.0)	4.8(4.3)
18 N	140	14.1(12.6)	8.1(7.3)	8.0(7.0)	4.8(3.9)
20 N	140	14.9(13.5)	8.4(7.6)	9.1(8.2)	5.2(4.6)
21 N	170	18.6(14.8)	10.4(8.4)	11.4(9.0)	6.6(5.1)
21 N(A)	170	18.8(14.3)	10.7(8.2)	11.2(8.2)	6.4(4.6)
21 N(B)	170	27.1(17.3)	15.2(9.8)	16.4(10.0)	9.6(5.7)
21 N(C)	170	13.2(12.3)	7.6(7.1)	7.4(6.8)	4.2(3.8)
22 N	185	21.0(15.1)	11.8(8.6)	12.3(8.6)	7.2(4.9)
23 N	190	13.8(12.5)	7.9(7.2)	7.8(6.9)	4.4(3.9)
24 N	320	17.9(14.6)	10.1(8.2)	10.9(8.9)	6.3(5.0)
25 N	140	16.2(13.9)	9.1(7.9)	9.9(8.5)	5.7(4.8)

* Total Concentration = Background Concentration and Highway Generated Concentration

10.0 = Concentration based on 0.8 mile per hour wind speed
(10.0) = Concentration based on 1.0 meter per second wind speed
Source: Air Quality Analysis-Alternate F, PennDOT

1 N and 2 N when the wind direction is from the northnorthwest. Alternate A-2 will create high concentrations at receptors 5 N and 21 N under 170° wind directions. Receptors 21 N(A), (B), and (C) were specifically analyzed with Alternate F to identify impacts due to the directional type Roosevelt Boulevard interchange. The receptors are located at the homes on the north side of the Boulevard between Summerdale Avenue and the Reading Railroad. Alternate F was found to create the highest concentrations of all alternates at receptor 21 N (B). For this reason and due to aesthetic considerations and utility relocation and maintenance requirements, condemnation of the homes along the north side of Roosevelt Boulevard has been included in the costs of Alternate F.

Future carbon monoxide levels at each of the receptors in 1980 and 1995 were determined by summation of the pollution anticipated at the receptors from all sources present at the time. These sources, for the Build Alternates, consist of the traffic on the Pulaski Highway plus the traffic forecasted on existing streets in the area for the Build situation. For the No-Build Alternative (See Table 79), the sources are basically the existing streets as forecast in future years without the Pulaski Highway.

c. Conclusions

Conclusions regarding the air quality in the microscale area are as follows:

(1) Existing (1974) pollution levels throughout the highway corridor exceed National Ambient Air Quality Standards for particulates, oxidants and carbon monoxide. The high particulate and oxidant concentrations result primarily from sources outside the highway corridor. Future levels of these pollutants will be influenced mainly by non L.R. 1078 related emissions.

(2) Carbon monoxide levels in the highway corridor will be

TABLE 79

EXISTING STREET CONCENTRATIONS (PPM)
NO-BUILD ALTERNATIVE

Receptor	1980 1 Hour	1980 8 Hour	1995 1 Hour	1995 8 Hour
1 N	11.8	6.6	6.0	3.4
2 N	11.8	6.6	6.0	3.4
3 N	11.0	6.2	6.2	3.5
4 N	11.0	6.2	6.2	3.5
5 N	10.3	5.8	5.5	3.1
6 N	11.0	6.2	6.2	3.5
7 N	11.0	6.2	6.2	3.5
8 N	11.8	6.6	6.0	3.4
9 N	11.8	6.6	6.0	3.4
10 N	11.0	6.2	6.2	3.5
11 N	10.3	5.8	5.5	3.1
12 N	11.0	6.2	6.2	3.5
13 N	10.3	5.8	5.8	3.2
14 N	11.5	6.5	6.7	3.8
15 N	11.5	6.5	6.7	3.8
16 N	10.3	5.8	5.8	3.2
17 N	11.5	6.5	6.7	3.8
18 N	10.3	5.8	5.5	3.1
19 N	11.0	6.2	6.2	3.5
20 N	11.0	6.2	6.2	3.5
21 N	11.0	6.2	6.2	3.5
22 N	10.3	5.8	5.5	3.1
23 N	10.3	5.8	5.5	3.1
24 N	11.0	6.2	11.0	6.2
25 N	11.0	6.2	11.0	6.2
2 S	11.8	6.6	6.0	3.4
3 S	11.8	6.6	6.0	3.4
4 S	11.8	6.6	6.0	3.4
5 S	11.8	6.6	6.0	3.4
6 S	11.8	6.6	6.0	3.4
7 S	11.8	6.6	6.0	3.4
8 S	11.8	6.6	6.0	3.4
9 S	11.8	6.6	6.0	3.4
10 S	11.8	6.6	6.0	3.4
11 S	20.6	11.6	11.0	6.2
12 S	20.6	11.6	11.0	6.2

Source: Air Quality Study (Vol I & II), Scott Environmental Technology Inc., October, 1974 lower in 1980 and 1995 than in 1974. This decrease in carbon monoxide will occur for both the No-Build Alternative and all of the Build Alternates proposed.

(3) No violations of the National Ambient Air Quality Standards of 35 ppm of carbon monoxide for a one-hour period and 9 ppm for an eight-hour period will occur in either 1980 to 1995 under the most probable meteorological conditions. Similarly, the one-hour standard will not be exceeded in future years for worst case conditions. Minor violations of the eight-hour standard will occur at some locations along the corridor under these worst case conditions in 1980 for all the "Build" and "No-Build" Alternates.

(4) Most of the violations predicted for 1980 would be eliminated by the further reductions in vehicular emissions proposed in the Pennsylvania State Implementation Plan.

(5) The number of violations will decrease each year after 1980 such that all violations will disappear by 1983.

(6) Alternate D most likely will have the least adverse impact on the significant receptors in the highway corridor. Alternates A-1, A-2 and E will produce slightly greater impacts. The other alternates, B, C, and F will create the greatest relative impacts.

(7) The interchanges at Roosevelt Boulevard depicted for Alternates B and C will create less impact in that area than the interchanges associated with Alternates A-1 and A-2.

(8) The interchange configurations in the Wingohocking Street-Castor Avenue area delineated for Alternates A-2, B, and F are favored, with those shown for Alternates A-1 and E next. The Alternate C configuration is the lest desirable of these five from an air quality aspect. The dual inter-

change configuration associated with Alternate D has distinct advantages that should not be overlooked.

On the basis of the above findings, it is concluded that:

(1) The long range impact of the Pulaski Highway will not be detrimental to the air quality within the broad corridor examined.

(2) While localized violations of the National Ambient Carbon Monoxide Standard will occur in the first few years of the anticipated operation of the highway, these carbon monoxide levels will be lower than pre-1974 concentrations.

16. Noise

a. General

Future noise levels at all receptors were calculated using two FHWA accepted prediction methods. The use and application of these prediction methods, the National Cooperative Highway Research Program (NCHRP) method and the Transportation System Center (TSC) method are referenced in the Noise Report. These prediction methods were computerized and used in the prediction analyses in the noise study. In general, the TSC method was used for receptors close to the roadway while the NCHRP method was used for receptors farther away if the ground cover conditions (rolling terrain, scattered trees and buildings, etc.) warranted its use. These methods used to calculate the noise levels and all supporting data can be found in the Noise Report. Both of these predictive methods are considered to be conservative. That is, they predict values generally higher than are likely to occur (See Scott Environmental Technology's 4-11-75 letter referenced in the "Comments and Coordination" Section).

Background noise level as determined in the noise study is defined as noise eminating from all sources except the Pulaski Highway. Therefore, the existing noise levels (as monitored) represent today's background noise.

The background noise levels in the future will be the existing (1974) noise levels (existing background noise levels) adjusted for any increases or decreases in noise sources. For purposes of the noise study, the adjustments were assumed to be entirely due to traffic volume changes on existing roads. Using this procedure, future background noise levels at all receptors were calculated for the estimated year of completion of the Pulaski Highway (1980) and the design year (1995).

Total noise levels were predicted at all receptors for all alternates, including the No-Build Alternative. Where noise abatement was found to be feasible, its effects were evaluated.

b. Abatement Strategies

The Pulaski Highway designs attempt to minimize right-of-way acquisition. Consequently, structures (elevated viaducts and retaining walls) are incorporated over most of the project length. An exception to this approach is Alternate D's treatment through Tacony Creek Park, where the design attempts to "fit" the roadway into the existing topography.

For elevated sections, the strategy of constructing a six foot high barrier on top of the parapet was analyzed. The effectiveness of this strategy is shown graphically for 20 and 50 foot high elevated structures (viaducts) in Plate 183. The values indicated are the predicted reductions due to the barrier as compared to no barrier. Note that the maximum attenuation due to the barrier occurs at a distance away from highway, depending on the height of the highway with respect to the receptor. This is because the highway structure itself provides significant shielding to receptors near the ground level and little additional attenuation is obtainable from the barrier. Moving away from the highway, the structure (viaduct), itself provides significant attenuation. The higher the viaduct is with respect to the receptor, the greater the area shielded by the viaduct.

In instances where the highway is depressed with retaining walls, reflected noise is a significant factor. While the retaining wall between the source (highway) and the receptor (near side retaining wall) acts as a barrier, the far side retaining wall (wall on the other side of the highway) reflects sound back towards the receptor. The combination of baffling the far side retaining wall and raising the near side retaining wall by six (6) feet was analyzed as an abatement strategy. This baffling can best be achieved by the specific design (slope, curvature, surface texture and composition) of the retaining walls being coordinated with the required attenuation at receptors. The effectiveness of this abatement strategy is shown on Plate 184, with values indicated the attenuation provided at receptors located at various distances from the highway at both 5 feet and 20 feet above the ground. The complex shapes of the graphs are due to the many interactions of the sound waves and the impact of the attentuation strategy on their paths.

Where the Pulaski Highway is proposed to be constructed through Tacony Creek Park, noise berms (earth mounds) are feasible in many locations. Should Alternate D be selected as the recommended alignment detailed design of these berms should be performed and their impacts upon other environmental factors weighed.

Alternate F will be designed to incorporate, where feasible, noise attenuation features. For example, just south of Wingohocking Street, the highway is designed so that the large factories on the west side of Adams Avenue act as a barrier between the highway and the residences on the east side of Adams Avenue. Also, between Castor Avenue and Roosevelt Boulevard the position of Adams Avenue over the southbound Pulaski Highway roadway will attenuate noise levels. In addition, land between the highway and the

Northwood community is available for noise abatement purposes.

c. Comparison with Design Noise Levels and Build - No-Build Comparisons

Tables 80 through 87 identify total L_{10} noise levels (levels exceeded ten percent of the time) at receptor sites (See Plate 72) along each alternate alignment. Build versus No-Build comparisons are shown as well as an indication of whether the design noise level of 70 dBA is exceeded. These tables are based on the Pulaski Highway constructed with abatement measures incorporated as indicated on the design plans. Unless otherwise noted, all receptors are classified as Land Use Category B (70 dBA design noise level).

Significant (10 to 15 dBA) reductions are predicted due to abatement measures at several receptors. This is due mainly to the fact that the receptor to source distance is small with regard to the barrier length. Also, the line of sight between the roadway and the receptor is well blocked by the barrier. Barrier abatements were predicted via methods described in the FHWA report entitled "Fundamentals and Abatement of Highway Traffic Noise".

Table 88 identifies the percent of sites adjacent to each alternate which would exceed the design noise level of 70 dBA and the average change in 1995 L_{10} noise levels as compared to the No-Build Alternative. Abatement measures are assumed to be incorporated and the values listed pertain to the entire length of the alternate - from I-95 to Roosevelt Boulevard.

d. Exceptions

The noise study concluded that noise levels in the Pulaski Highway area will increase in the future, regardless of whether or not the Pulaski Highway is built. The Pulaski Highway can be designed and constructed with noise abatement devices, resulting in average area noise levels only slightly

TABLE 80

"BUILD" - "NO - BUILD" COMPARISON

FOR All Alternates (I-95 to Leiper) WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTABLE ------ MODERATE ------ SEVERE)					OVER 70 dBA DUE TO PULASKI?	
			≤3	4-6	7-10	11-14	≥15	YES	NO
1*	82	86		X					X
2	78	78	X						X
3	68	64	θ						X
4	81	76	θ						X
5	79	76	θ						X
6	71	72	X						X
7	64	65	X						X
8	66	67	X						X
9	68	71	X					X	
10	68	70	X						X

PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT	10 %
ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S	

θ LESS THAN ZERO

* DESIGN NOISE LEVEL 75 dBA (LAND USE CATEGORY C)

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TABLE 81

"BUILD" - "NO - BUILD" COMPARISON FOR Alternate A-1 (WITH ABATEMENT)

SITE No.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTIBLE) ≤3	(MODERATE) 4-6	7-10	11-14	(SEVERE) ≥15	OVER 70 dBA DUE TO PULASKI? YES	NO
11	64	69		X					X
12	57	70				X		X	
13	82	83	X						X
15	72	73	X						X
16	90	90	X						X
18	88	88	X						X
22	88	88	X						X
23	68	69	X						X
24	73	73	X						X
28	75	76	X						X
30	59	61	X						X
31	63	62	θ						X
34	85	84	θ						X
39	83	83	X						X
41	83	83	X						X
44	71	73	X						X
45	69	73		X				X	
46	69	75		X				X	

PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT	17%
ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S	

θ LESS THAN ZERO

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TABLE 82

"BUILD" - "NO - BUILD" COMPARISON

FOR Alternate A-2 WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" — NOT PERCEPTABLE ≤3	MODERATE 4-6	7-10	11-14	SEVERE ≥15	OVER 70 dBA DUE TO PULASKI? YES	NO
11	64	68		X					X
12	57	64			X				X
13	82	82	X						X
15	72	73	X						X
16	90	90	X						X
18	88	88	X						X
22	88	89	X						X
23	68	69	X						X
24	73	76	X						X
28	75	78	X						X
30	59	62	X						X
31	63	63	X						X
34	85	85	X						X
39	83	83	X						X
41	83	83	X						X
44	71	73	X						X
45	69	77			X			X	
46	69	76			X			X	

PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT: 11%

ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S

TABLE 83

"BUILD" - "NO - BUILD" COMPARISON

FOR Alternate B WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTABLE ---- MODERATE ---- SEVERE) ≤3	4-6	7-10	11-14	≥15	OVER 70 dBA DUE TO PULASKI? YES	NO
11	64	68		X					X
12	57	67			X				X
13	82	82	X						X
15	72	73	X						X
16	90	90	X						X
18	88	88	X						X
19	61	66		X					X
20	88	89	X						X
22	88	88	X						X
23	68	69	X						X
28	75	75	X						X
29	56	63			X				X
30	59	67			X				X
31	63	77						X	
34	85	84	θ						X
39	83	83	X						X
40	84	83	θ						X
41	83	83	X						X
44	71	73	X						X
45A	63	67		X					X
46	69	73		X				X	
PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT								10%	
ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S									

θ LESS THAN ZERO

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TABLE 84

"BUILD" - "NO - BUILD" COMPARISON FOR Alternate C WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD"					OVER 70 dBA DUE TO PULASKI?	
			NOT PERCEPTABLE	MODERATE			SEVERE		
			≤3	4-6	7-10	11-14	≥15	YES	NO
11	64	68		X					X
12	57	65			X				X
13	82	82	X						X
15	72	72	X						X
16	90	90	X						X
19	61	67		X					X
20	88	89	X						X
22	88	88	X						X
23	68	68	X						X
29	56	60		X					X
30	59	60	X						X
31	63	64	X						X
39	83	83	X						X
40	84	83	θ						X
41	83	82	θ						X
42	82	82	X						X
43	87	86	θ						X
44	71	72	X						X
45A	63	75				X		X	
46	69	77			X			X	
47	69	76			X			X	
PERCENT OVER 70 dBA DUE TO PULASKI									
ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S									

θ LESS THAN ZERO

TABLE 84 (cont)

"BUILD" - "NO - BUILD" COMPARISON

FOR Alternate C WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTABLE ---- MODERATE ------ SEVERE)					OVER 70 dBA DUE TO PULASKI?	
			≤3	4-6	7-10	11-14	≥15	YES	NO
48	77	77	X						X
50	57	64			X				X
52	53	59		X					X

PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT: 13%

ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S

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TABLE 85

"BUILD" - "NO - BUILD" COMPARISON FOR Alternate D WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTABLE -- MODERATE -- SEVERE) ≤3	4-6	7-10	11-14	≥15	OVER 70 dBA DUE TO PULASKI? YES	NO
11	64	69		X					X
12	57	71				X		X	
13	82	82	X						X
15	72	73	X						X
16	90	90	X						X
18	88	88	X						X
19	61	78					X	X	
20	88	88	X						X
22	88	88	X						X
29	56	61		X					X
49	77	77	X						X
51	57	65			X				X
52	53	62			X				X
53	51	61			X				X
54	65	67	X						X
55	67	76			X			X	
56	67	70	X						X
57	65	73			X			X	
58	69	71	X					X	
59	86	86	X						X
60	86	87	X						X
PERCENT OVER 70 dBA DUE TO PULASKI									

ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S

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TABLE 85 (cont)

"BUILD" - "NO - BUILD" COMPARISON FOR Alternate D WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTABLE ---- MODERATE ---- SEVERE)					OVER 70 dBA DUE TO PULASKI?	
			≤3	4-6	7-10	11-14	≥15	YES	NO
61	86	87	X						X
62	68	72		X				X	
63	69	72	X					X	
PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT								29%	

ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S

TABLE 86

"BUILD" - "NO - BUILD" COMPARISON FOR Alternate E WITH ABATEMENT

SITE NO.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" — NOT PERCEPTABLE ≤3	4-6	MODERATE 7-10	11-14	SEVERE ≥15	OVER 70 dBA DUE TO PULASKI? YES	NO
11	64	69		X					X
12	57	63		X					X
13	82	84	X						X
14	85	85	X						X
15	72	73	X						X
17	61	65		X					X
21	61	65		X					X
25	63	66	X						X
25A	78	77	θ						X
26	57	65			X				X
27	69	71	X					X	
32	65	64	θ						X
33	59	62	X						X
35	55	76					X	X	
36	65	68	X						X
37	79	79	X						X
38	85	84	θ						X
41	83	83	X						X
42	82	82	X						X
43	87	87	X						X
44	71	72	X						X
PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT								10%	
ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S									

θ LESS THAN ZERO

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TABLE 87

"BUILD" - "NO - BUILD" COMPARISON FOR Alternate F WITH ABATEMENT

SITE No.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTABLE) ≤3	4-6 (MODERATE)	7-10	11-14	≥15 (SEVERE)	OVER 70 dBA DUE TO PULASKI? YES	NO
11	64	69		X					X
12	57	67			X				X
13	82	82	X						X
13A	82	82	X						X
15	72	74	X						X
16	90	90	X						X
20A	88	88	X						X
22A	88	88	X						X
23A	72	83				X			X
24	73	74	X						X
24A	73	76	X						X
24B	65	73			X			X	
31A	70	79			X			X	
34A	79	74	θ						X
39	83	82	θ						X
40	84	85	X						X
41	83	85	X						X
43A	87	84	θ						X
44	71	73	X						X
45	69	79			X			X	
46	69	78			X			X	
PERCENT OVER 70 dBA DUE TO PULASKI								(crossed out)	
ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S									

θ LESS THAN ZERO

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TABLE 87 (cont)

"BUILD" - "NO - BUILD" COMPARISON FOR Alternate F WITH ABATEMENT

SITE No.	TOTAL "NO-BUILD" L_{10}	TOTAL "BUILD" L_{10}	INCREASE IN NOISE LEVEL DUE TO PULASKI HIGHWAY AS COMPARED TO "NO-BUILD" (NOT PERCEPTABLE --- MODERATE --- SEVERE) ≤3	4-6	7-10	11-14	≥15	OVER 70 dBA DUE TO PULASKI? YES	NO
47	69	83				X		X	

PERCENT OVER 70 dBA DUE TO PULASKI WITH ABATEMENT	23%

ALL VALUES ARE 1995 NOISE LEVELS IN dBA'S

TABLE 88

COMPARISON OF ALTERNATE ALIGNMENTS

WITH ABATEMENT

ALTERNATE*	% OF RECEPTORS WHERE DESIGN NOISE LEVEL (70 dBA) IS EXCEEDED DUE TO PULASKI HIGHWAY	AVERAGE CHANGE (dBA) IN 1995 L_{10} LEVELS COMPARED TO "NO-BUILD" ALTERNATIVE
A-1	14%	1.2 dBA
A-2	11%	1.4 dBA
B	10%	1.9 dBA
C	12%	1.9 dBA
D	24%	3.0 dBA
E	10%	2.0 dBA
F	19%	2.4 dBA

* Includes entire route from I-95 to Roosevelt Boulevard.

Source: Environmental Noise Study, PennDOT, October, 1974

(1 to 3 dBA) higher than average noise levels if the Pulaski Highway is not built. See Alternate Plates for possible noise abatement locations.

Ranges in noise level increases over the No-Build Alternative are indicated in Tables 80 through 87. In general, 1995 noise levels generated by the Pulaski Highway will be approximately one dBA higher than 1980 Pulaski Highway generated noise levels.

The Federal Highway Administration (FHWA) Noise Standards allow for exceptions to the design noise levels for "sections of highways where it would be impracticable to apply noise abatement measures. This could occur where abatement measures would not be feasible or effective due to physical conditions, where the costs of abatement measures are high in relation to the benefits achieved, or where the measures required to abate the noise conditions conflict with other important values, such as desirable aesthetic quality, important ecological conditions, highway safety, or air quality." Exceptions are also required in instances where noise abatement measures are incorporated but the design noise levels are still exceeded.

Table 89 summarizes the noise analysis sites with respect to exceptions likely to be required due to each alternate alignment. It is important to note that specific exceptions will not be requested until a final alignment is selected and the related interchange types and locations are determined. It is possible that modifications to barrier types will result from the comments received on this Draft EIS. The final recommended alignment will be analyzed in detail with respect to both exterior and interior noise levels.

The key to Table 89 is as follows:

0 - Design noise level not exceeded

1 - Design noise level exceeded primarily due to background noise. Attenuation of background noise is not feasible.

TABLE 89 PROBABLE NOISE EXCEPTIONS

Receptor \ Alternate	A-1	A-2	B	C	D	E	F
1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1
3	0	0	0	0	0	0	0
4	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1
6	1 & 2	1 & 2	1 & 2	1 & 2	1 & 2	1 & 2	1 & 2
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	2	2	2	2	2	2	2
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	2	0	0
13	1	1	1	1	1	1	1
13A	T	1	1	T	T	T	1
14	N	N	N	N	N	1	N
15	1	1	1	1	1	1	1
16	1	1	1	1	1	N	1
17	N	N	N	N	N	0	N
18	1	1	1	T	1	N	1
19	N	N	0	0	2	N	N
20	N	N	1	1	1	N	N
20A	N	N	1	1	1	N	N
21	N	N	N	N	N	0	N
22	1	1	1	1	1	N	T
22A	1	1	1	1	N	N	1
23	0	0	0	0	N	N	0
23A	T	T	1	1	N	N	2

TABLE 89 (cont) PROBABLE NOISE EXCEPTIONS

Receptor \ Alternate	A-1	A-2	B	C	D	E	F
24	1	1	1	1	N	N	1
24A	1	1	N	N	N	N	1
24B	N	N	N	N	N	N	2
25	N	N	N	N	N	0	N
25A	N	N	N	N	N	1	N
26	N	N	N	N	N	0	N
27	N	N	N	N	N.	1 & 2	N
28	1	1	1	N	N	N	T
29	N	N	0	0	0	N	N
30	0	0	0	0	N	N	0
31	0	0	2	0	N	N	0
31A	T	T	2	0	N	N	1
32	N	N	N	N	N	0	N
33	N	N	N	N	N	0	N
34	1	1	1	1	N	N	T
34A	1	1	1	1	N	N	1
35	N	N	N	N	N	2	N
36	N	N	N	N	N	0	N
37	1	1	1	1	N	1	1
38	T	1	1	1	N	1	T
39	1	1	1	1	N	T	1
40	T	T	1	1	N	T	T
41	1	1	1	1	N	1	1
42	T	T	T	1	N	1	1
43	T	T	T	1	N	1	1
43A	T	T	T	1	N	1	1
44	1	1	1	1	N	1	1

TABLE 89 (Cont) PROBABLE NOISE EXCEPTIONS

Alternate / ceptor	A-1	A-2	B	C	D	E	F
45	2	2	T	T	N	N	2
45A	0	0	0	2	N	N	0
46	2	2	2	2	N	N	2
47	2	2	2	2	N	N	2
48	N	N	N	1	T	N	N
49	N	N	N	T	1	N	N
50	N	N	N	0	T	N	N
51	N	N	N	0	0	N	N
52	N	N	N	0	0	N	N
53	N	N	N	N	0	N	N
54	N	N	N	N	0	N	N
55	N	N	N	N	2	N	N
56	N	N	N	N	0	N	N
57	N	N	N	N	2	N	N
58	N	N	N	N	2	N	N
59	N	N	N	N	1	N	N
60	N	N	N	N	1	N	N
61	N	N	N	N	1	N	N
62	N	N	N	N	2	N	N
63	N	N	N	N	2	N	N

2 - Design noise level exceeded primarily due to Pulaski Highway. Practical noise abatement measures are not sufficient to attain design noise level.

N - Noise level not directly influenced by Pulaski Highway.

T - Receptor's acquisition required by Pulaski Highway.

17. Water Resources

a. General Effects on Physical and Chemical Water Quality

Several of the physical and chemical characteristics of Tacony-Frankford Creek are expected to be altered during the construction phase owing to stormwater runoff, sedimentation, and channel modification. Changes which may be expected to occur independent of alternate alignments and road sections are listed in Table 90. The magnitude of these changes and the length of stream affected, however, will differ with the various alignments.

Stormwater runoff may carry debris, sediment, and chemical pollutants generated by construction activities. Heavy equipment such as trucks, bulldozers, and cranes can be sources of insoluble substances, such as diesel fuel, oils, and lubricants. These substances form oily films on the surface of the water which inhibit light penetration and oxygen diffusion. Runoff containing soil additives used to control water infiltration and soil compaction also may degrade the quality of receiving waters.

Grading can result in the exposure of subsoil materials which may contain loose aggregates that can be eroded easily by wind or rain. If the right-of-way were cleared and left unprotected during autumn, winter, and early spring, significant erosion could occur. Exposed soil is disaggregated by alternating freezes and thaws and by fluctuations of moisture content. Precipitation during this period could carry appreciable amounts of sediment into surface waters, and wind erosion might be significant during periods of drought.

TABLE 90

Changes in physical and chemical parameters expected to occur in Tacony-Frankford Creek during normal operation of Pulaski Highway independent of alternative alignments and road section.

PARAMETER	DIRECTION OF CHANGE
Color	Increase
Turbidity	Increase
Filtrable residue	Increase
Nonfiltrable residue	Increase
pH	No change
Conductivity	Increase
Temperature	No change
Dissolved oxygen	Decrease
Biochemical oxygen demand	Increase
Chemical oxygen demand	Increase
Total organic carbon	Increase
Total phosphorous	No change
Nitrate-nitrogen	Increase
Total kjedahl nitrogen	Increase
Surfactants	No change
Phenols	Undetermined
Oil and grease	Increase
Cyanide	Increase
Chloride	Increase
Lead	Increase
Copper	Increase
Chromium	Increase
Zinc	Increase
Nickel	Increase
Cadmium	Undetermined
Other metals	Increase

TABLE 91

Total sediment expected in runoff from seven alternate alignments of the Pulaski Highway (Road Section B) during one year of construction with no sedimentation control measures (Pennsylvania Department of Transportation, 1973; Oral communication, Pasqual Dougherty, 9 January 1975).

ALIGNMENT	QUANTITY (CUBIC YARDS)
Alternate A-1	6,226
Alternate A-2	9,945
Alternate B	7,006
Alternate C	10,090
Alternate D	23,405
Alternate E	7,843
Alternate F	5,699

Source: Biological and Physical Assessment for the Proposed Pulaski Alternatives, Jack McCormick and Associates, October, 1974.

Estimates of the amount of sediment in runoff from Section B during one year of construction with no sedimentation control measures were prepared by the Pennsylvania Department of Transportation for each of the alternate alignments (Table 91). Soil loss ranged from 6,226 cubic yards (9541 tons) per year for Alternate A-1 to 23,400 cubic yards (36,000 tons) per year for Alternate D.

Suspended solids washed into the stream during rainstorms or snow-melt will increase stream turbidity, filtrable residue concentrations, and conductivity. Organic debris and residues absorbed on the surface of suspended particles may increase biochemical oxygen demand (BOD) and chemical oxygen demand (COD) downstream, causing a concomitant decrease in dissolved oxygen concentrations. Total organic carbon (TOC) and nutrient concentrations (phosphorus and nitrogen) are likely to increase. Dissolved substances may increase nonfiltrable residue level, as well as color. Various heavy metals may have greater concentrations in the soil than in the waters of adjacent streams. Erosion and sedimentation may, therefore, increase stream concentrations.

Construction activities in the vicinity of Tacony-Frankford Creek are expected to alter temporarily turbidity, transparency, color, and other physical chemical, and biological characteristics of the stream, and are expected to lessen the value of affected portions of the stream for wildlife. The fording of a stream by tracked or wheeled vehicles can compact and dislodge bank materials. Construction can cause blockage and other radical changes in the drainage of a stream, which may alter its velocity and/or sediment balance and result in the erosion of formerly stable area. Culverts concentrate flows and create high velocities which erode the stream bed, create washouts, and undermine the outlet end of culverts. Stream widening, deepening, realignment, and bank clearing or smoothing, as well as the proximity of adjacent paved road sections can change the hydraulic characteristics of the stream. These changes may increase or decrease the stream velocity and create bottom scour with subsequent deposition of sediment and creation of sand bars, which encourage meandering and bank cutting at downstream locations. Placement of bridge piers and abutments at stream crossings decrease channel holding capacity, increase stream velocity, and change flow characteristics. This may produce additional sediment from the erosion of the channel and its banks downstream. Logs, branches and other debris can adhere to the supports and further impede stream flow. Hydraulic dredging and gravel and fill removal from stream banks or beds without protective barriers, can affect the stream sediment load and increase turbidity manyfold for miles downstream.

During the operation of the Pulaski Highway significant volumes of stormwater will be collected and released. The effect on receiving waters will depend on the location of point discharges which will vary with different alignment alternatives and road sections. Several physical and chemical changes expected to occur in Tacony-Frankford Creek owing to the normal operation of Pulaski Highway are identified in Table 90.

In an attempt to correlate pollutant loads in receiving waters with the discharge from municipal treatment plants, one study concluded that in general street runoff was a more significant source than treated sewage discharges. Highway runoff is somewhat different from urban runoff. It usually contains higher concentrations of heavy metals, suspended solids and oils. Many of the pollutants in highway runoff are absorbed onto dust and soil particles, but others have quite different origins. A more complete listing ofpollutants that affect highway runoff water quality is presented in Table 92.

TABLE 92

Sources and constituents that affect highway runoff water quality (Sylvester and DeWalle, 1972)

SOURCE	CONSTITUENT
Vehicles	Lubricants, hydraulic fluids, coolants, rubber from tires, dirt carried on under carriages and fenders, wearing vehicle components, fuel residue, particulate exhaust emissions, brake and clutch lining materials.
Street surface material	Asphalt and its decomposition products, Portland cement, aggregates, road marking paint, expansion joint compounds, crack fillers.
Atmospheric fallout	Deposited airborn materials.
Runoff from adjacent areas	Silt, leaves, grassclippings, soil stabilizers, growth control compounds.
Litter	Tobacco and numerous other items.
Spills	Oil spills, chemical spills, etc.
Ice control compounds	Salt and additives.

Source: Biological and Physical Assessment for the Proposed Pulaski Alternatives, Jack McCormick Associates, October, 1974.

The use of deicing chemicals during the winter season can have a marked effect on stream quality. The deicing agent most commonly used by PennDOT is sodium chloride (NaCl) with an additive of an anti-caking compound, sodium ferrocyanide ($Na_4Fe\ (CN)_6\ H_2O$). Cyanide ions (CN) are released by the decomposition of sodium ferrocyanide in the presence of sunlight. These substances, if used, would be transported in runoff from melting snow or ice into Tacony-Frankford Creek. An analysis of the "worst case" salting practices prepared by PennDOT has indicated that cyanide concentrations would not exceed Pennsylvania State Water Quality Standards in the Creek adjacent to Road Section B. However, if sodium ferrocyanide is used as an anti-caking agent, the concentrations of cyanide in the roadway runoff resulting from "worst case" salting practices would exceed the State of Pennsylvania Standard by a factor of ten.

b. General Effect of Aquatic Biota in Tacony-Frankford Creek

Changes in the physical and chemical parameters of Tacony-Frankford Creek owing to stormwater runoff, sedimentation, and channel modification during construction operations will affect the aquatic biota. Insoluable substances (i.e., fuels, oils and lubricants) used in the maintenance of construction equipment may be washed into the stream during rain storms and/or snowmelt. Such compounds, in large quantities, may be toxic to fish and aquatic invertebrates. These substances also may stress aquatic biota by preventing surface oxygen diffusion and by reducing light penetration. Chemicals used to seal cracks, concrete curing compounds, paints, crankcase oil, and other pollutants that may be present in runoff from the construction site would affect aquatic organisms adversely. The solubilities of heavy metals in receiving waters are low (usually less than 10% of the available metal) and toxic effects are reduced in hard waters such as

Tacony-Frankford Creek. The toxic effects of heavy metals on aquatic biota may be limited to quiescent water where heavy metals could accumulate to toxic concentrations (Pitt and Amy, 1973).

Sedimentation poses the greatest potential harm to aquatic biota during the construction phase. Soil eroded from areas disturbed by construction would produce increased sedimentation in the stream and an attendent increase in turbidity and decrease in dissolved oxygen. Photosynthesis and respiration would be impaired. Sediments also may bury macroinvertebrates, cause abrasion of gills in fish, cover fish eggs, and reduce the diversity of aquatic habitats.

Various forms of nitrogen and phosphorus would enter the stream as detritus or be absorbed on particles contained in runoff. These nutrients may stimulate the growth of algae unless their production is inhibited by turbidity or toxic conditions.

Stream channelization would artificialize aquatic habitats and kill or dislodge stream organisms in the immediate vicinity of construction activities. Sedimentation also would be increased in downstream sections of Tacony-Frankford Creek. Dredging, jetting, pile driving, and filling associated with construction of bridge supports can produce similar temporary deleterious effects, and also can eliminate permanently the soft substrates in which organisms burrow in stream bottoms. Bridge piers, however, can have a positive effect by providing additional hard substrate for stream organisms which attach to them in fast moving water.

Suspended solids, toxic compounds, and nutrients transported to Tacony-Frankford Creek in highway runoff may have detrimental effects on the aquatic biota. The major short-term effects of road surface runoff likely will result from extreme oxygen demand. Heavy metals (particularly copper, lead, zinc and possibly cadmium) and other toxic materials may exert direct toxic effects on aquatic organisms if allowed to accumulate to lethal concentrations in pools.

The use of deicing compounds would increase chloride levels slightly in the Creek, but this is not expected to affect the biota. If sodium ferrocyanide is used as an anti-caking compound, the analyses indicate that the cyanide concentrations resulting from "worst case" salting practices would increase by a factor of ten in the stream. Although resultant concentrations would be less than applicable State of Pennsylvania Water Quality Standards, organisms immediately in front of or downstream from stormwater drains may be adversely affected. The toxicity of cyanide to fish is increased greatly by (high) temperatures and low dissolved oxygen concentrations. Temperatures are not expected to be high when deicing agents are used, but dissolved oxygen levels may be reduced during periods of runoff. The effects of shading by highway viaducts may have some affect on photosynthesis, but generally, no significant change is anticipated.

c. Specific Effects of Alternates on Biota and Water Quality

(1) Common Section (Delaware Expressway to Leiper Street)

Section C probably will introduce more toxic materials and suspended solids to Tacony-Frankford Creek than any of the alignments in Section B. Both Section 4 and Section 5 of the stream (See Plate 65) may be affected adversely by storm water runoff. Section C will cross Tacony-Frankford Creek four times on viaduct. In addition, two elevated ramps which connect the highway to Interstate Route 95 will cross the stream at the south end of the section. To support these facilities, 30 piers will be erected in the creek and parts of three piers and other support structures will extend into the confirmed and legal channel of the stream. The construction of these piers will increase settleable solids in Tacony-Frankford Creek, and these may bury sessile invertebrates, and clog the gills of filter feeding organisms and fish which occasionally may enter Section 5 and/or Section 4 of the Creek from the Delaware River. Suspended solids also will inhibit light penetration to photosynthetic organisms (filamentous algae). Organic materials released in the water from construction activities may be absorbed onto silt and clay particles and contribute to oxygen demand.

In general, Section 4 and Section 5 of Tacony-Frankford Creek presently do not meet most water quality criteria developed by the Pennsylvania Department of Environmental Resources. Degraded conditions presently limit biolocial communities to those composed of a few tolerant forms.

(2) Alternates A-1, A-2, B, E and F

Because these five alternate alignments are adjacent to Tacony-Frankford Creek only for a short distance south of Wingohocking Street in the vicinity of stream Section 3, they will have considerably less impact on water quality than the other alternate alignments. Stream Section 3 presently is channelized and has a concrete bottom. No macroinvertebrates or fishes were observed in this section. Low summer flows and the lack of appropriate habitats in this stream section are expected to inhibit the establishment in the future of invertebrates or fishes. Attached filamentous algae may be affected somewhat in this section, but no significant change owing to construction activities is expected in the aquatic biota of Section 3.

Lowered dissolved oxygen levels, increased siltation, and toxic pollutants in runoff from exposed areas near Section 3 of Tacony-Frankford Creek may alter the water quality of stream Section 4. Almost all aquatic organisms observed in Section 4 were tolerant forms which probably will not be affected.

If a sediment basin and supportive erosion control procedures are utilized during construction activities to control the amount of suspended material in runoff entering stream Section 3, Alternates A-1, A-2, B, E, and F should have a minimum effect on water quality, with little or no effect on the aquatic biota of Tacony-Frankford Creek.

(3) Alternate D

Because Alternate D is closer to Section 3 of Tacony-Frankford Creek, and because this alignment would produce the greatest amount of sediment in runoff, the overall effect on stream Section 3 probably will be greater than that of any other alignment. The greatest impact, however, will be on Section 1. Construction will occur adjacent to Tacony-Frankford Creek from Fisher's Lane bridge to just north of Roosevelt Boulevard. The stream will be crossed four times. The potential degradation of water quality and the reduction or elimination of aquatic biota by storm water runoff will be most intense in the southern half of Stream Section 1. State water quality standards were met on most occasions in this section of the stream and it sustained a more diverse biological community than any other section of the stream at the time of this investigation.

The concentrations of chemical pollutants and the load of sediments that enter Stream Section 1 may be large enough during rains or snowmelt to degrade the next section downstream. The more slowly moving water in Section 2 may allow the deposition of toxic materials to the degree that their concentrations may reach lethal levels, and they may reduce the populations of invertebrates and fishes in this section.

Alternate D will require the channelization of 1670 feet of Tacony-Frankford Creek in Section 1. The construction of a box culvert in the vicinity of Roosevelt Boulevard would create a flat bottom basin with water of uniform depth; in contrast, the stream now contains numerous pools that alternate with shallow riffles. Such an alteration will be detrimental to the existing fishes and invertebrates. Natural streams have an average carrying capacity per acre of surface area more than three times as great as that of streams which have been altered by channelization (Tarplee, et al., 1971). A significant reduction in the size and weight of fish, number of individuals per species, and diversity of species also may occur in channelized stream sections.

Because the existing natural sediments will be replaced by the concrete box culvert, any movement of water or organisms into or out of the stream bottom will be prevented. The habitat provided by penetrable sediments is important to sustain diversity and productivity in the biotic stream community. This community is also an important link in the food chain of larger animals.

The proposed channel change and the construction of a box culvert under Roosevelt Boulevard would destroy the integrity of the stream-bottom zone and long-shore areas, and thereby would alter the aquatic community.

(4) Alternate C

Alternate C generally follows the alignments of Alternates A-1, A-2, B, E and F in the southern fourth of its length. It probably will affect Section 3 and Section 4 of Tacony-Frankford Creek to the same extent as Alternates A-1, A-2, B, E and F. Alignment C, however, parallels Tacony-Frankford Creek, northeast of Fisher's Lane. Stormwater runoff from this area may degrade the water quality of the southern sixth of Section 1 of the creek.

Most of the bottom dwelling organisms in Section 1 were intolerant of siltation. If sediments were to enter this section of the stream, they would stress the populations of aquatic macroinvertebrates and fish. Sediments in deep pools located beneath the Fisher's Lane (I Street) bridge and in

Section 2 of the Creek may accumulate toxic materials to deleterious levels.

A drainage system for Alternate C would discharge into the Creek immediately north of Fisher's Lane Bridge.

d. Hydrological Effects

All of the alternate alignments will discharge stormwater runoff into the Tacony-Frankford Creek. This increase, however, is not expected to increase the threat of flooding in the area. Tacony-Frankford Creek downstream from Castor Avenue to a location between Frankford Avenue and Aramingo Avenue (Stream Sections 3 and 4) has been modified by flood control structures to accommodate a 100 year flood. The additional runoff from each proposed alternative alignment of the Pulaski Highway during a 100 year storm has been estimated (Table 93). Alternate F produces the smallest increase in stormwater runoff. It is followed (in order of increasing runoff) by Alignments A-1, E, B, A-2, D, and C.

The southern section of Tacony-Frankford Creek (Stream Section 5) is affected by tidal fluctuations in the Delaware River. The extent of local flooding near the mouth of Tacony-Frankford Creek partially is determined by precipitation and runoff in upstream regions of the Delaware River watershed; and by the diurnal and annual stages of the tide cycle, as well as by runoff from the upstream drainage area of Tacony-Frankford Creek. Relative to these factors, the additional runoff from the proposed Pulaski Highway probably would be insignificant.

8. Vegetation and Wildlife

a. General

(1) Man's Relationship

Man's relationship to the vegetation and animal cohabitants of this planet has been long and intimate. Natural areas that provide contact with wild organisms have widely recognized aesthetic and recreational values,

TABLE 93

Estimated increase in stormwater runoff from the various proposed alignments of the Pulaski Highway during a 100 year storm. Calculations were based on a maximum rainfall (8 inches per hour) and the assumption that all precipitation onto impervious material is discharged into Tacony-Frankford Creek (Data supplied by Pennsylvania Department of Transportation).

	RUNOFF (CUBIC FEET PER SECOND)		
ALIGNMENT	ROAD SECTION B	ROAD SECTION C	TOTAL
A-1	113.32	65.52	178.84
A-2	129.19	65.52	194.71
B	123.75	65.52	189.27
C	143.61	65.52	209.13
D	133.31	65.52	198.83
E	116.89	65.52	182.41
F	112.04	65.52	177.56

Source: Biological and Physical Assessment for the Proposed Pulaski Alternatives, Jack McCormick Associates, October, 1974.

consequently, the protection and enhancement of natural resources should be a matter of official policy in every modern society.

The aesthetic and recreational values of urban parks and natural areas are considerable. A significant feature of these areas is the opportunity they provide for human contacts with vegetation and wildlife. These may range from casual encounters with more adaptable and/or easily observed species to serious study by local naturalists.

Some urban parks also may have significant historical value in that they contain remnants of the forest types which once covered the area now occupied by the city.

(2) PennDOT Policy

It is the Pennsylvania Department of Transportation's policy in urban areas to remove abandoned houses, street pavements, other obstacles, and all existing vegetation from the area required for the construction of the roadway and slopes. The only departure from this general policy for road Section B (Alternate D) of the Pulaski Highway would be in the area under the viaduct over Tacony-Frankford Creek near I Street (Fisher's Lane). Existing trees under the proposed viaduct will be removed, but shrub and herbaceous vegetation will not be eliminated prior to construction. As a result of shading, however, the vegetation on the area below the viaduct will become less dense with time. Inspections of the area beneath the Whitaker Avenue bridge indicated that the soil has been exposed and packed, and there are only scattered patches of herbaceous vegetation.

(3) Acreage Affected

The acreage of each vegetation type to be eliminated by each of the proposed alternate alignments is shown in Table 94. The acreages affected by Alternates A-1, A-2, B, C, E, and F may seem disproportionately large to

TABLE 94

Estimated total acreage losses and percent lost per type in the study area north of Leiper Street (Figure 1), expected to result from six alternate alignments for the proposed Pulaski Highway (Road Section B).

	Alternate A		Alternate B		Alternate C		Alternate D		Alternate E		Alternate F	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
FOREST	(0.0)	(0.0)	(0.0)	(0.0)	(1.8)	(1.6)	(15.9)	(14.4)	(1.0)	(0.9)	(0.0)	(0.0)
Beech-oak	0.0	0.0	0.0	0.0	0.0	0.0	4.4	8.5	0.6	1.2	0.0	0.0
Ash-sycamore-boxelder	0.0	0.0	0.0	0.0	0.8	2.3	6.5	19.0	0.4	1.2	0.0	0.0
Blackcherry-locust	0.0	0.0	0.0	0.0	1.0	4.1	5.0	20.7	0.0	0.0	0.0	0.0
SCRUB	(4.6)	(8.1)	(5.7)	(10.0)	(5.6)	(9.9)	(5.3)	(9.3)	(6.8)	(12.0)	(3.4)	(6.0)
GRASSLANDS	(25.2)	(8.0)	(24.2)	(7.6)	(32.1)	(10.1)	(21.8)	(6.9)	(11.0)	(3.5)	(23.2)	(7.3)
Grassland	3.0	2.9	4.4	4.2	3.4	3.3	16.2	15.5	3.5	3.3	5.2	5.0
Grassland/trees	16.6	10.8	11.8	7.7	15.4	10.0	2.1	1.4	7.5	4.9	12.0	7.8
Grassland/ornamentals	5.6	9.6	8.0	13.7	13.3	22.0	3.5	6.0	0.0	0.0	6.0	10.3
UNVEGETATED LAND	(55.8)	(8.7)	(50.4) 49.5	(7.9)	(37.2)	(5.8)	(22.0)	(3.4)	(47.6)	(7.4)	(57.7)	(9.0)
Urban	54.9	8.8	49.5	7.9	36.4	5.8	18.5	3.0	46.7	7.5	56.5	9.0
Water	0.9	5.6	0.9	5.6	0.8	5.0	3.5	21.7	0.9	5.6	1.2	7.5
TOTAL	(85.6)	(7.6)	(80.3)	(7.1)	(76.7)	(6.8)	(65.0)	(5.8)	(66.4)	(5.9)	(84.3)	(7.5)

Source: Biological and Physical Assessment for the Proposed Pulaski Alternatives, Jack McCormick Associates October, 1974 that affected by Alternate D. This results from the taking of a large block of urban land north of Roosevelt Boulevard for the interchange (Alternates A-1, A-2, B, E) and from the extension of the rights-of-way for these alignments approximately 800 feet west and 1000 feet east along Roosevelt Boulevard (Alternates A-1, A-2, B, C, E, and F). It is estimated that the grassland/tree type will be eliminated from less than 30% of the total area occupied by this type along Roosevelt Boulevard.

(4) Environmental Modifications

In addition to the loss of wildlife habitat resulting from construction activities, other short-term adverse environmental modifications will include increased noise levels caused by construction activities, increased human activity, increased ambient levels of dust and other air pollutants, and despoilation of stream habitat through soil runoff and mechanical disturbance of the stream bed and banks.

Nearly all mammals, birds and more mobile reptiles and amphibians that reside near construction sites will migrate from these areas. Depending on their mobility and sensitivity, the animals will compete with established populations in suitable habitats nearby or in more distant locations. Many displaced individuals, especially small mammals, reptiles, and amphibians, will be subject to high mortality rates by virtue of their increased movements and exposure, their stressed condition, and their unfamiliarity with new areas. The intrusion of additional animals into already occupied habitats also will result in a period of increased competition and stress in established populations. The displacements resulting from noise and similar disturbances are expected to be temporary in that they generally will coincide with the duration of construction. Effects will vary, however, according to species characteristics, habitat availability, and duration and degree of disturbance. Birds may be more prone to abandon construction areas during initial stages of their reproductive cycles than during nesting when they may exhibit a strong attachment to their nest sites. Species of wildlife that are better adapted to human activities such as the Norway rat, house mouse, rock dove, house sparrow, American robin, cardinal, starling, and mockingbird are expected to reoccupy disturbed sites rapidly. By preempting available habitats quickly, these animals may gain a competitive advantage over less adaptive animals.

(5) Breeding Impact

The scheduling of construction activities also will have a significant bearing on their effects on wildlife populations. The breeding period is an especially sensitive time for vertebrates. Their movements are more exact. The young of most vertebrates in the project area are expected to be born or hatched during April, May, and June. Construction activities in forest habitats, scrub habitats, and stream habitats during this period may result in failures in reproduction, and subsequent declines in the local populations of wildlife in these habitats.

(6) Effect of Lighting

According to the preliminary plans, the entire Pulaski Highway system will be illuminated in accordance with standards set by the City of Philadelphia.

In terms of significant wildlife areas, the most substantial illumination would occur on segments of Alternate D that traverse Tacony Creek Park at ground level. Greenwood Cemetery is intersected by a depressed roadway (Alternate A-1, B, C, D and F), but the height of standard mainline lamps (35 feet or 40 feet) would extend above ground level and could illuminate Cemetery grounds adjacent to the road. A substantial segment of Alternate C passes through the Friends Hospital grounds in a depressed section. Application of conventional lighting standards would result in illumination of the Hospital grounds near the roadway.

Although light has a profound ecological effect, few data are available on the influences of roadside lighting on wildlife behavior patterns. Positively phototropic insects may increase in the vicinity of artificial light sources, and they will attract insect feeding vertebrates such as bats, toads, the common nighthawk, and screech owl and subsequently may increase roadkills. Species that are exclusively or primarily nocturnal may avoid light areas; this will reduce further the habitats available to them. The activities of other species that primarily are active about dawn and dusk may be prolonged in the vicinity of illuminated areas.

(7) Impact on Rat Population

Data are not available on the abundance and distribution of Norway rat populations in the project area. Few sections of Philadelphia are considered to be free of rats, and rats generally are most abundant near waterways, in sewer systems, and where garbage and refuse are available, both in urban zones and recreational areas. In the City of Philadelphia, any site proposed for excavation or construction must be examined by inspectors of the Philadelphia Rat Control Program, and certified to be free of rats, before necessary construction permits are granted. The license applicant (Pennsylvania Department of Transportation), therefore, will be responsible for the elimination of existing rat populations prior to construction. If areas beneath elevated sections of the roadway are not kept free of rubbish, substantial rat populations may reestablish in these areas.

b. Effects of Alternates

(1) Common Section-Delaware Expressway to Leiper Street (see Plate 185)

In Section C the right-of-way will require about 80 acres, 65% of which presently is in urban uses. The proposed alignment would eliminate 14.4 acres of scrub or more than 52% of the terrestrial open space in this section of the study area. The scrub occurs in narrow belts along both sides of lower Frankford Creek and is used principally by passerine birds, small mammals, and several amphibians and reptiles. Local populations of these species will decline as a result of elimination of scrub habitat.

(2) <u>Alternates A-1 and A-2</u>

Alternates A-1 and A-2 (Alignment A) are identical in their horizontal alignment but differ in their vertical profiles (See Plates 185 and 186). Alternate A-1 is a depressed highway through Greenwood Cemetery and Oakland Cemetery, whereas A-2 is elevated.

The right-of-way for Alignment A contains 86.5 acres, 64% of which is in urban residential or industrial uses. This alignment eliminates 25.2 acres of grassland type which includes 3.0 acres of grassland subtype, 16.6 acres of grassland/trees subtype (primarily in Oakland Cemetery and along Roosevelt Boulevard) and 5.6 acres of the grassland/ornamental subtype. No forest acres will be crossed by the alignment but several large trees will be removed from Oakland Cemetery and Friends Hospital.

About 4.6 acres of scrub habitat will be destroyed in Greenwood Cemetery. A limited reduction in the abundance of wildlife species that occur in scrub habitats is expected. Damage to vegetation in adjacent areas by construction vehicles should be minimal owing to the open character of the alignment. Because scrub vegetation resprouts rapidly, accidental trespass by construction machinery outside of the required right-of-way will result only in temporary reduction of habitat.

An elevated highway potentially is less of a barrier to the movement of ground-dwelling species of wildlife than is a depressed highway. Mobile mammals especially would be affected. A depressed highway would serve as a permanent barrier to the movement of land-dwelling species of wildlife. In this respect Alternate A-2 is preferable to Alternate A-1. Several species of birds (e.g., rock dove, barn swallow, eastern phoebe) utilize artificial structures associated with bridges and elevated roads for nesting. A depressed highway, however, will not present a physical barrier to many bird species that ordinarily make relatively short flights close to ground level. The potential adverse influence of noise and light at the existing ground level that would result from a highway also can be minimized more effectively in a depressed highway.

(3) Alternate B

Alternate B, which generally follows the same alignment as the A-1 and A-2 Alternate would require 80.3 acres, 62% of which is urban (See Plate 187). It eliminates 5.7 acres of scrub vegetation and 24.2 acres of the grassland type. The bisection of Greenwood Cemetery by Alternate B would result in a greater disruption of wildlife movement patterns than would the marginal intrusion of Alternate A. This barrier may reduce the value of the area to more widely ranging mammals, as raccoons, striped skunks, and opossums.

(4) Alternate C

The right-of-way for Alternate C would require a total of 76.6 acres (See Plate 188). This includes approximately 8.5 acres of the grassland/ ornamental type, but more significantly it would take the azalea gardens on Friends Hospital grounds. None of the historic elms which occur on the site would be disturbed by this alignment. Near the entrance of the Hospital on I Street (Fisher's Lane) 0.8 acre of ash-sycamore-boxelder forest and 1.0 acre of black cherry-locust forest would be cleared. The alignment also would extend through 5.6 acres of scrub, 23.6 acres of the grassland type and 37.2 acres of unvegetated land. Because it is depressed, the highway would constitute a barrier to wildlife movements between Greenwood Cemetery and other natural areas to the west and south.

(5) Alternate D

Among all of the alignments, Alternate D would result in the greatest combined loss of non-urban habitats (46.4 acres) and the largest areal loss of forest habitat (16 acres) (See Plate 189). Alternate D also would intrude on stream habitat to a greater extent (3.5 acres) than any other alignment, and would require re-channelization of about 1670 feet of the stream. This alignment, consequently, would reduce the habitat of all or nearly all species of wildlife that occur in the study area. There is insufficient information on the local distribution of species to determine whether any species might be eliminated from the area, but the combination of habitat reduction and intrusion of a highway into prime habitat undoubtedly would affect the general suitability of the area for some species and may reduce the competitive ability of others.

Alternate D would take approximately 29.3 acres of Tacony Creek Park, which is 31% of the Park (excluding Juniata Golf Links) in the study area. The acreage and percentage loss of each vegetation type in Tacony Creek Park and the study area are shown in Table 95.

The Park alignment would prevent the movement of wildlife from upland habitats south of the proposed roadway to areas of water located to the north or east. Among the species that are expected to be affected most detrimentally are those that utilize both stream and upland habitats. The proposed roadway would impose a prominent barrier to the movement of whitetail deer, which have been observed in the study area as recently as 1971 and the red fox which is expected to occur occasionally in the area.

TABLE 95

Estimated acreages of vegetation or landscape types in the right-of-way for Alternate D in Tacony Creek Park.

	VEGETATION TYPE						
	Beech-Oak Forest	Ash-Sycamore Boxelder Forest	Black Cherry-Locust Forest	Scrub	Grassland	Grassland Ornamental	Total
Total Acreage in Park (acres)	12.0	19.5	13.0	6.0	43.5	1.5	95.5
Acreage Eliminated (acres)	4.4	6.4	3.4	0.9	12.7	1.5	29.3
Percentage (%) Loss in Park	37	33	26	15	29	100	31
Percentage (%) Loss in Study Area	8	19	14	1	12	<1	6

Source: Biological and Physical Assessment for the Proposed Pulaski Alternatives, Jack McCormick, and Associates, October, 1974.

The areas which Alignment D would traverse contain some of the most significant vegetation in the study area. Construction of the access ramps north of Roosevelt Boulevard would require the removal of a green ash stand which contains several tuliptrees. Immediately south of Roosevelt Boulevard and west of Tacony-Frankford Creek a stand mapped as ash-sycamore-boxelder forest contains at least one American elm that may be removed for proposed Alternate D.

North of Roosevelt Boulevard 1.5 acres of beech-oak forest will be eliminated. Farther south along the alignment, a mature beech-oak stand will be bisected by the alignment and approximately 2.9 acres will be cleared. This stand, which is a remnant of the extensive Appalachian oak forest which covered the area prior to urbanization, contains some of the largest trees existant in the study area. These losses represent 37% of the type in the Park, and 8% of the type in the study area. Stands mapped as beech-oak forests in the study area included about 19 acres in Juniata Park and Northwood Park which are composed primarily of oaks, tuliptrees, and ornamentals, and which contained one or two beech trees. There was little or no understory in the stands. Excluding these two park areas, 13% of the beech-oak forest in the study would be eliminated by Alternate D.

Because of its extensive surface root system, American beech is very susceptible to damage by soil compaction. Specimens adjacent to the right-of-way may be weakened or killed if their root systems are disturbed by the side cut required for Alternate D. Oaks have deep tap roots and are not likely to be damaged by soil compaction, but decreased vigor and possibly even mortality may result if the root systems are subject to extensive mechanical damage.

(6) Alternate E

Alternate E, which straddles the Reading Railroad tracks, does not intrude on any areas considered to be of high value to wildlife, and intersects only 20 acres of non-urban habitats (See Plate 190). It would eliminate 6.8 acres of sparse scrub vegetation, and 11.0 acres of the grassland type. Alternate E, however, does infringe on Simpson Memorial Park and Northwood Park. It would eliminate 1.0 acre of the grassland subtype in Simpson Park, 0.6 acre of the beech-oak type in the northernmost section of Northwood Park, and 0.4 acre of the ash-sycamore-boxelder type adjacent to Northwood Park near the railroad bridge over Castor Avenue. Although both parks appear to be only moderately useful to wildlife, they contain habitats for such animals adapted to semi-natural environments as squirrels and passerine birds, and provide a setting for human exposure to these species.

(7) Alternate F

Alternate F has an alignment similar to that of Alternate A, but is located slightly to the east of Greenwood Cemetery and Oakland Cemetery. (See Plate 191). Alternate F impinges on the extreme southeastern corner of Greenwood Cemetery but does not intrude on Oakland Cemetery. The right-of-way would require a total of 84.3 acres, of which 67% is urban. Alternate F eliminates 23.2 acres of grassland vegetation types (including 12 acres of grass and trees), and 3.4 acres of scrub. Except for a slight intrusion in Greenwood Cemetery, the alignment does not encroach on areas considered to be of high value to wildlife. Alternate F usurps no forest vegetation, and requires less disruption of scrub and grasslands types than Alternate Alignments A or B.

19. Engineering, Right-of-Way, and Construction Costs

a. Build Alternate Effects

The costs for each alternate are shown in Table 96. Construction costs

TABLE 96

L.R. 1078 - PULASKI HIGHWAY

COST ESTIMATES

I-95 TO ROOSEVELT BOULEVARD

ALTERNATE

ITEM	A-1	A-2	B	C	D	E	F
CONSTRUCTION	$100,701,940	$117,780,700	$99,822,370	$100,594,480	$94,266,830	$112,972,010	$109,519,930
RIGHT OF WAY	$ 29,200,900	$ 25,489,600	$25,053,200	$ 20,505,200	$20,860,200	$ 24,112,100	$ 21,955,700
ENGINEERING	10,070,190	$ 11,778,070	$ 9,982,230	$ 10,059,440	$ 9,426,680	$ 11,297,200	$ 10,951,990
TOTAL	$139,973,030	$155,048,370	$134,857,800	$131.159,120	$124,553,710	$148,381,310	$142,427,620

NOTES

1. Construction costs include utility relocation costs, costs of noise abatement measures and 13% construction contingencies
2. Right-of-way Costs include supplemental payments and relocation costs
3. Engineering costs equal 10% of construction costs
4. All costs are based on 1974 unit prices

Source: PennDOT Highway Engineering Report (Vol. I, II, and III), Dec, March, 1974-75.

are based on 1974 unit prices typical within the study area. Right-of-way costs include both the value of the property and the maximum expected relocation costs and supplemental benefits. The costs are for the alternates with the interchanges indicated on the plan sheets.

b. No-Build Alternative Effects

Arterial streets which would require widening with the No-Build Alternative but would not require widening with the Build Alternate are, Adams Avenue, Wyoming Avenue, Tabor Road, Levick Street and Rising Sun Avenue. The costs of these street widenings are indicated in Table 97. Rising Sun Avenue was not considered because widening of this street is not feasible due to the large number of businesses and homes required.

The other streets which would require widening with both the No-Build and Build Alternates are Oxford Avenue between Summerdale Avenue and Roosevelt Boulevard and Tabor Road at Adams Avenue and at Levick Street. The costs of these widenings was not determined because they would be the same for both the Build and No-Build Alternate and would not influence the comparisons made.

20. Maintenance and Operating Costs

a. Build Alternate Effects

The yearly average maintenance costs for the Pulaski Highway can be estimated by applying the average maintenance costs per mile to the project. The average costs per mile for highway maintenance are shown below:

ITEM	COST PER MILE PER YEAR
Roadway (Concrete)	$ 37
Shoulder	$ 38
Drainage Facilities	$ 98
Grading	$ 490
Bridges	$ 646
Snow Removal	$ 2333
Line Painting	$ 21
Strips and Markers	$ 33
Guard Rail	$ 39
Other Services	$ 11

TABLE 97

NO BUILD ALTERNATE

ARTERIAL STREET	ADAMS AVENUE	WYOMING AVENUE	TABOR ROAD	LEVICK STREET
Width	20'	10'	12'	20'
Construction Costs	348,580	535.280	21,658	422,660
Right-of-Way Costs	$240,100	$106,000	$32,000	$639,000
Engineering Costs	$ 38,860	$ 53,530	$ 2,170	$ 42,270
Total Costs	$627,540	$694,810	$55,820	$1,103,930
Relocations	3	0	0	0

Source: PennDOT Highway Engineering Report (Vol. I, II, and III), Dec, March, 1974-75 .

The most expensive alternate from a yearly maintenance standpont would be Alternate D which would be the longest alternate. The Alternate D yearly maintenance costs would be $8,940.

The yearly maintenance costs of the other alternates would be less than Alternate D costs and would be approximately $7,000.00 for each alternate.

b. No-Build Alternative Effects

The yearly average maintenance costs per mile on the existing arterial system are indicated below. These figures are the PennDOT averages for Philadelphia County.

Item	Cost Per Mile Per Year
Roadway Surface and Base (Bituminous)	$ 1,727.
Shoulder	$ 38.
Drainage Facilities	$ 98.
Grading	$ 490.
Bridges	$ 646.
Snow Removal	$ 2,333.
Line Painting	$ 21.
Signs and Markers	$ 33.
Guard Rails	$ 39.
Other Services	$ 11.

The cost of maintaining the existing arterial street system would be increased with the No-Build Alternative due to the traffic growth remaining on the arterial streets. The heavy truck traffic increases would remain on the existing arterial street system and would lead to increased maintenance costs with the No-Build Alternative.

The cost of vehicle operation along the existing arterial streets with the No-Build Alternative would increase. The average daily speeds would drop from the existing 23.8 mph to 20.3 mph throughout the study area. Peak hour speeds would also decline from the existing average of 20.8 mph to 12.1 mph. As the operating speed drops the costs of operating the vehicle increases. The significant decline in peak hour speeds with the No-Build Alternative will greatly increase the cost of vehicle operation in the study area.

With the No-Build Alternative fuel consumption by drivers would be significantly increased compared to existing conditions (See Section I).

c. Build vs. No-Build Comparisons

The costs of vehicle operation along the existing arterial streets with the Pulaski Highway would be less than with the No-Build Alternative. The DVRPC traffic studies indicate that overall study area average daily travel speeds would increase from the existing 23.8 mph to 25.3 mph. Peak hour speeds would be slightly less than existing, 18.9 mph vs. 20.8 mph. In the Pulaski Highway corridor both average daily speeds and peak hour speeds would be higher than existing. This data is shown in Tables 64 and 65.

21. Operation and Use of Existing Highway Facilities and Other Transportation Facilities

a. Build Alternate Effects

The Build Alternates and improvements to the arterial streets would result in stable flow conditions throughout the study area. The Pulaski Highway would result in higher average daily speeds throughout the study area indicating better overall highway system performances.

The higher average daily speeds would also result in quicker service by the surface mass transit bus and trolley lines in the study area.

The Pulaski Highway would require only two minor routing changes of surface bus lines and would have little effect on the operations of the Frankford Elevated. The construction of the bridge over the Frankford Elevated would require temporary stoppages in the services of this facility for short periods of time, however, this construction could be accomplished during off peak travel hours and the mass transportation services could be continued through the construction site by shuttle bus services. No structural changes to the Frankford Elevated facilities would be required and the service stoppages would be for short durations only.

The construction would require temporary closings and detours around the project site. Because the highway would be elevated for much of its length, maintenance of traffic during construction would not be a problem except at Roosevelt Boulevard. Special stage construction plans would be prepared during the final design stage to assure a sequence of construction which would minimize the disruption of traffic flow along Roosevelt Boulevard. Major traffic tieups along the Boulevard during the peak hour travel periods could be expected during the construction period with all Build Alternates. Alternates D and E, however, would pass under the Boulevard through existing bridges and would result in the minimum amount of alterations of the Boulevard.

Except in the vicinity of Roosevelt Boulevard, only minor interference with existing roads is expected during construction. Alternates A-1, A-2, B, C and F all involve complex design and construction techniques associated with their Roosevelt Boulevard interchanges. Lane rearrangement of the Boulevard and utility relocation must be coordinated with the interchange construction to insure that acceptable traffic flow on the Boulevard is maintained. Alternates D and E would have Roosevelt Boulevard interchanges which do not involve the extensive lane shifts or utility relocations. In addition, Alternates D and E pass under the Boulevard via existing openings, thereby making them less complex schemes in terms of maintenance of traffic.

All other roads crossed by the Pulaski Highway are grade separated, except short sections of Arrott Street and Ramona Avenue at Roosevelt Boulevard which are closed by Alternate F.

The fuel consumption of standard size automobiles on level grades at uniform speeds is 0.050 gallons per mile at 20 mph and 0.047 gallons per mile at 25 mph.[1] Applying these fuel consumption rates to the daily vehicle miles

1 NCHRP Report 111, National Research Council, 1971

travelled results in the estimation of the number of gallons of fuel used by vehicles in the study area. This estimation indicates that, even though vehicle miles travelled are 2% higher with the Build Network, fuel comsumption is reduced by 4%.

The above estimation is based on uniform flow of traffic. This condition would occur along the Pulaski Highway and Roosevelt Expressway Extension with the Build Network, however, uniform traffic flow would not occur along the arterial streets in the study area. Standard size automobiles use 1.46 times more fuel along urban arterial streets with two stops per mile.[2] The adjustment of the fuel consumption rates to delineate vehicle travel along the local arterial streets and the proposed expressway would result in fuel savings with the Build Network greater than the 4% estimated above. Additional adjustments for fuel consumption by trucks would further increase the fuel savings resulting from more efficient operations with the Build Network.

b. <u>No-Build Alternative Effects</u>

The No-Build Alternative would result in severe traffic congestion throughout the study area. Even with major widenings of some of the arterial streets and the removal of parking where necessary, congestion would remain at various locations throughout the study area. The congestion would result in forced flow operating conditions on the arterial streets during the morning and evening rush hours.

The congestion would also result in slower operations for all of the surface mass transportation bus and trolley lines operating in the study area (See Plate 54).

The DVRPC traffic analyses indicate that with the No-Build Alternative,

2 Potential for Motor Vehicle Fuel Economy Improvement, U.S.DOT and U.S. EPA 1974

lower than existing average daily travel speeds and significantly lower than existing peak hour speeds would result throughout the study area.

22. Road User Benefit-Cost Analysis

a. General

A Road User Benefit-Cost Analysis was prepared for the Pulaski Highway project by the Pennsylvania Department of Transportation. This analysis expresses the comparative worth of the project by the ratio of annual benefits to the annual costs.

The goal of spending in Public Economy is to create an advantage or benefit for the public. Because the funds available for public expenditures are limited an economic analysis to determine the relative worth of each project is necessary to ensure that the funds are spent on projects that will result in substantial benefits for the public. In the case of the Pulaski Highway, the benefits to the public consist of savings in travel time and vehicle operating costs resulting from the implementation of the project. The costs consist of the expenditures required to implement and maintain the project.

The Benefit-Cost analysis computes the ratio of the user's annual dollar benefits to the State's annual dollar costs of the project. In this analysis the time value of money is the cost of capital to the State. The Benefit-Cost ratio is computed as follows:

$$\text{Benefit-Cost Ratio} = \frac{\text{Benefits to the User}}{\text{Cost to the State}}$$

At a Benefit-cost ratio of 1, the benefits are equivalent to the costs at an interest equal to the cost of capital. This establishes the minimum justification for an expenditure.

b. Road User Benefits

(1) System Performance Characteristics

The annual road user benefits are determined from a comparison of road user cost for the No-Build condition and the Build condition. The computation of road user costs for these two conditions are based on the daily vehicle miles travelled and the average daily speeds projected by the Delaware Valley Regional Planning Commission (DVRPC) for the highway system in the influence area of the project. The DVRPC prepared these projections for the year 1985 as indicated below:

1985 HIGHWAY SYSTEM PERFORMANCE CHARACTERISTICS

Characteristic	No-Build Network	Build Network
Daily Vehicle Miles Travelled (VMT)	5,787,700	5,897,900
Average Daily Speed	20.3 mph	25.3 mph

The traffic on the highway system will increase with time, therefore, the vehicle miles travelled must be adjusted to account for the variance over the period between the 1980 opening date of the project and the 1995 project design year. The DVRPC has estimated that highway travel will increase at a rate of 1.5 percent per year in the study area between 1980 and 1995. This travel growth rate can be used to compute an equivalent annual vehicle miles travelled over this 15 year period based on a gradient formula as follows:

$$\text{Equivalent Vehicle Miles Travelled} = a + \frac{g}{i} - \frac{ng}{i}(CRF-i)$$

where a= vehicles miles travelled for the first year of the study period
g= annual uniform numerical traffic increase
CRF= Capital Recovery Factor for n years at growth rate i
i= growth rate

The application of this formula resultsin an equivalent daily VMT of 5,914,500 for the No-Build Network and 6,026,900 for the Build Network.

The equivalent vehicle miles travelled were also adjusted to reflect the inclusion of trucks in the calculations. The percentage of trucks in the total volume of vehicles is 10 percent as determined by the DVRPC. The truck adjustment factor used was 3.5 which is an average value of the ratio of truck operating costs to passenger car operating costs.[1] The adjustment calculations are indicated below:

(a) No-Build Network
Adjusted VMT = 90% (VMT)+10%(VMT) x 3.5
= 7,393,125

(b) Build Network
Adjusted VMT = 90% (VMT)+10%(VMT) x 3.5
= 7,533,625

The 1985 projected average daily speeds were utilized as the annual average speeds over the 15 year study period. The average daily speeds would vary with time, however, it is infeasible to compute an average annual daily speed over the study period because of the large number of arterial streets influenced by the project. Average daily speed would decrease as traffic increases with time, however, the speed decrease would be more pronounced with the No-Build Network than with the Build Network.[2] The use of the 1985 average daily speeds, therefore, would not result in a biased advantage in favor of the Build Network.

The resultant adjusted highway system performance characteristics through the 15 year study period used to estimate road user costs are indicated below:

ADJUSTED HIGHWAY SYSTEM PERFORMANCE CHARACTERISTICS

Characteristic	No-Build	Build
Daily Vehicle Miles Travelled	7,393,125	7,533,625
Average Daily Speed	20.3 mph	25.3 mph

1 Reference: Road User Benefit Analysis for Highway Improvements, AASHO 1960

2 The capacity analyses studies performed by the Penna. Dept. of Transportation have concluded that almost all of the arterial streets inthe study area will operate under severely congested traffic conditions in 1985 with the No-Build Network. Traffic conditions are substantially improved with the Build Network and the proposed expressway would operate at stable flow conditions in 1985. Traffic increases will further aggravate traffic congestion along the arterial streets, however, traffic would continue to operate without delays on the proposed expressway beyond the 1995 design year.

(2) Road User Costs

The vehicle operating costs were estimated using the unit costs shown in the table below. These costs were obtained from a 1972 study performed for the U.S. Department of Transportation.[1] The results of this study are shown below. The vehicle operating costs used were for a standard size automobile, however, the gas and oil costs from that study were doubled to reflect recent trends. Insurance costs were included to reflect accident costs.

OPERATING COSTS

Item	Cents Per Mile
Fuel and Oil	4.3¢
Maintenance and Tires	2.6¢
Costs and Depreciation	4.4¢
Insurance	1.4¢
Taxes	1.3¢
Total Operating Costs	14.0¢

The costs of travel time and convenience were calculated based on an estimated cost of $3.00 per hour. This figure was obtained from NCHRP Report 133[2] published by the National Academy of Sciences. The costs of travel time and convenience for the No-Build Network which results in an operating speed of 20.3 miles per hour is 17.5¢ per mile. The costs of travel time and convenience for the Build Network which results in an operating speed of 25.3 miles per hour is 14.4¢ per mile. These costs were obtained from updating costs shown in table 7 of the AASHO Road User Benefit Analyses publication[3] to reflect the travel time and conveience costs of $3.00 per hour.

1 "Costs of Operating an Automobile", by L.L. Liston ad C.L. Cauthen; USDOT FHWA, Office of Highway Planning, Highway Statistics Division; April 1972
2 Procedures for Estimating Highway User Costs, Air Pollution and Noise Effects, 1972.
3 Road User Benefit Analysis for Highway Improvements, 1960.

The annual Road User Costs were estimated using the following formula:

R = 365 x VMT x U

where

R = Annual Road User Costs
VMT = Daily Vehicle Miles Travelled
U = Operating and Travel Time and Convenience Costs

The cost computations are indicated below:

(a) No-Build Network
R = 365 x 7,393,125x$0.315
R =$850,024,547

(b) Build Network
R = 365x7,533,625,x$0.284
R =$780,935,568

(3) Computations of Benefits

The annual road user benefits are the operating costs and travel time and convenience cost savings resulting from the proposed improvement. This saving is the difference between the road user costs for the No-Build Network and Build Network as shown below:

Annual Road User Benefits = No-Build Road User Cost - Build Road User Costs
= $850,024,547 - $780,935,568
= $ 69,088,979

c. Highway Costs

The annual highway costs were estimated for both the least expensive and most expensive Pulaski Highway alternate alignments. The costs of the Roosevelt Expressway Extension between 9th Street and the Pulaski Highway were included for both alternates.

The construction and right-of-way costs were adjusted to annual costs using capital recovery factors for discrete rates of return. The roadway was estimated on a 20 year life and right-of-way and structures were estimated on a 40 year life. Salvage value was not included.

The interest rate used was 8 percent. This percentage is the interest at which the state can borrow money for highway construction. The project would be funded from gasoline taxes and other road user taxes which are allocated to the federal and state Highway Trust Funds. The latest issue of bonds from the Commonwealth of Pennsylvania for highway construction were purchased for a 6.24 percent interest rate. The 8 percent therefore considers some inflation of the current rates.

The annual maintenance costs were computed for both Build Alternatives considered. The average annual maintenance costs per mile for the City of Philadelphia[1] as indicated below were utilized for these costs.

CITY OF PHILADELPHIA

ANNUAL MAINTENANCE COSTS

Item	Costs Per Mile
Bituminous Surface and Base	$ 1727
Concrete Surface	37
Shoulder	38
Drainage Facilities	98
Grading	490
Structures	646
Winter Services	2334
Line Painting	21
Signs and Markers	33
Guard Rails	39
Other Services	11

The annual highway costs computed for the least expensive and most expensive alternate alignments for the Pulaski Highway are shown below:

ANNUAL HIGHWAY COSTS

Item	Life	Least Expensive Alternate	Most Expensive Alternate
Roadway	20	$ 430,005	$ 370,675
Right-of-Way	40	1,749,336	2,137,558
Other *	40	12,718,766	14,959,108

* includes structure costs

1 Maintenance and Statistical Reports, Bureau of Maintenance Pennsylvania Department of Transportation, April, 1974

Item	Life	Least Expensive Alternate	Most Expensive Alternate
Maintenance	1	$ 17,386	$ 15,221
Totals		$14,915,386	$17,482,562

d. Benefit/Cost Ratio Computation

The Benefit/Cost Ratio for the two Build Alternates were computed as shown below:

(a) Least Expensive Alternate
B/C = Annual Road User Benefits/Annual Highway Costs
= $69,088,979/$14,915,386 = 4.63

(b) Most Expensive Alternate
B/C = Annual Road User Benefits/Annual Highway Costs
= $69,088,979/$17,482,562 = 3.95

e. Conclusion

The economic analysis indicates that the annual Road User Benefits resulting from the implementation of the proposed Pulaski Highway and the Roosevelt Expressway Extension would be greater than the annual highway costs of these improvements by a factor of 3.95 to 4.63.

This range of Benefit to Cost Ratio is well over the minimum justifiable ratio of benefits to costs, indicating that the implementation of these improvements would result in significant benefits to road users.

SECTION V

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

A. GENERAL

The intent of this section is to summarize the adverse environmental effects associated with implementing any of the alternative proposals either the No-Build Alternative or one of the viable alternate highway alignments. Since these effects are discussed in detail in Sections III and IV, they will only be briefly addressed in this section.

B. SOCIOLOGICAL EFFECTS

Aside from relocation effects, the major adverse sociological effects appear to be related to the fears of the inhabitants adjacent to the highway. These fears center on the beliefs that construction of the highway will cause neighborhood deterioration and disrupt community stability, although the sociological analysis indicates that these effects may still be experienced with the No-Build Alternative. The possible psychological effects on living relatives of those requiring reinterment in either cemetery is also identified as an adverse effect.

The sociological study emphasizes the importance of the different racial, ethnic, and religious group interaction within the community as the major means of combating neighborhood deterioration regardless of whether or not the Pulaski Highway is built.

C. RELOCATION

Relocation is one of the greatest adverse impacts related to construction of the Pulaski Highway. Although adequate replacement housing is available in the area and adequate monetary compensation is provided, relocation still requires the disruption of social ties. This disruption is likely to be most adversely experienced by the elderly, who represent possibly 10 to 15 percent of those requiring relocation. Special efforts should be made to assure that the elderly people's relocation and readjustment is accomplished in the least disruptive manner.

The No-Build Alternative would involve only minor adverse relocation effects.

D. ECONOMIC IMPACT

Given the residential-industrial mix of the area and that most of the houses are older and lower valued structures, their value is likely to rise less with the Build Alternates than with the No-Build Alternative. Land values should increase with respect to non-residential use due to construction of the Pulaski Highway. It is likely that after a brief period of relative depression, the market value of property should increase due to the Pulaski Highway compared to its value if the No-Build Alternative is selected. The decline in residential property values relative to property value increases in other areas of the region which has been in progress for several years can be expected to continue if the No-Build Alternative is selected.

It is estimated that the probable job loss because of the closing down of of businesses due to the Pulaski Highway would vary between 247 and 333 jobs. Tax loss directly attributed to the elimination of businesses in the study area due to the Pulaski Highway would result in less than 0.1 percent of the total City tax revenue. Since it is likely that the Pulaski Highway will promote the economic development of the macro-area, this loss will be reduced, if not totally offset.

E. FAST, SAFE, AND EFFICIENT TRANSPORTATION

Compared to the Pulaski Highway alternates, the No-Build Alternative has definite adverse effects related to fast, safe, and efficient transportation. Overall travel time is increased and accident costs are higher with the No-Build Alternative. The road user benefit-cost analyses indicate that the No-Build Alternative would result in significantly less efficient vehicle operations in the study area.

F. NATIONAL DEFENSE

Compared to the Build Alternates, the No-Build Alternative has adverse effects related to the movement of emergency vehicles. Local narrow roads tend to restrict large vehicle movement and are more susceptible to flooding than the Pulaski Highway would be.

G. RECREATION AND PARKS

Alternate D has a significant adverse effect on Tacony Creek Park. Alternate E adversely affects Northwood Park and Simpson Memorial Park, while also terminating adjacent to the Houseman Recreation Center. No other alternatives directly affect recreation or park lands.

H. FIRE PROTECTION

Under all alternatives, access to fire stations will remain. The Pulaski Highway would provide an additional route within the area for fire fighting apparatus.

I. AESTHETICS

The Pulaski Highway will definitely be aesthetically unpleasant to some residents required to live within its proximity. Shielding and architectural design can somewhat mitigate these adverse effects where feasible.

A certain adverse aesthetic impact is likely due to the effects of increased traffic on local residential streets. This impact is mostly related to the No-Build Alternative.

J. PUBLIC UTILITIES

No significant unavoidable adverse impacts upon public facilities are expected with either the Build Alternates or the No-Build Alternative.

K. PUBLIC HEALTH AND SAFETY

Compared to the Build Alternates, the No-Build Alternative is estimated to result in approximately 400 more accidents per year in the study area. With the No-Build Alternative, increased traffic on residential side streets could affect the safety of pedestrians and children.

The Pulaski Highway alternates which affect Friends Hospital will interfere with certain health related activities, especially those activities which are at least partially dependent upon the relative quiet nature of certain sections of the property (See Noise discussion). The taking of the azalea gardens by Alternate C is a definite adverse effect.

L. CONSERVATION

The most significant adverse effect on conservation would be caused by Alternate D where it traverses Tacony Creek Park. Soil erosion effects can be mitigated by the incorporation of appropriate sedimentation control devices into the design and construction of the project.

M. MULTIPLE USE OF SPACE

This opportunity only exists with the Build Alternatives, where such use is found to be acceptable to the community. It is important that the proper arrangements be made to insure that no adverse effects resulting from such use occur.

N. CEMETERIES

The adverse effects associated with the reinterment of bodies are the major concerns related to the cemeteries. The impact appears greatest to Oakland Cemetery, since it has the least available open land in which to reinter bodies. Alternates D, E, and F avoid Oakland Cemetery. Greenwood Cemetery has sufficient ground for reinterments. The No-Build Alternative requires no reinterments.

Oakland Cemetery would also be adversely impacted by routes which condemn its main building which has historic significance. Greenwood Cemetery officials have indicated that the money received from condemnation would enable them to properly care for the cemetery grounds.

O. AIR QUALITY

Compared to the No-Build Alternative, the Pulaski Highway would have adverse effects in terms of carbon monoxide concentrations adjacent to the project (microscale area).

However, on the mesoscale basis, construction of the Pulaski Highway results in improved air quality and is consistent with the State Implementation Plan.

P. NOISE

Construction of the Pulaski Highway will have a slight adverse effect (on the average of 1 to 3 dBA increase with abatement) on noise levels in the study area. This effect will be most noticeable where the particular alternate alignment traverses relatively quiet areas (Tacony Creek Park) and least noticeable or insignificant in already noisy areas (adjacent to Castor Avenue, Roosevelt Boulevard, etc.).

The No-Build Alternative commits the existing local streets to increased auto and truck traffic and the associated noise related thereto.

Q. WATER RESOURCES

Alternate D has the most significant effect on water resources due to its paralleling of Tacony Creek. The majority of the runoff discharges from the other alternate routes enter the creek downstream from the park, where the creek is contained within a concrete channel.

Significant contaminants presently enter the creek in the storm runoff from the existing street system and adjacent land uses. This adverse impact will continue to exist with or without the Pulaski Highway.

The implementation of sedimentation control devices and the use of selective roadway deicing materials are several possible measures to mitigate adverse impacts on water quality.

R. VEGETATION AND WILDLIFE

Construction of the Pulaski Highway will result in the removal of a variable amount of vegetation and will cause wildlife to migrate, at least temporarily, from the construction area. Wildlife habitat will be affected also by the operational characteristics of the facility (noise, lighting, etc.). These effects will be most prevalent where the facility traverse the less utilized sections of the cemeteries, Friends Hospital grounds, and Tacony Creek Park.

S. MAINTENANCE AND OPERATION OF EXISTING HIGHWAY FACILITIES AND OTHER TRANSPORTATION FACILITIES

Operation of all vehicles within the macro area will be adversely affected by the No-Build Alternative, due to the overall increasedcongestion as compared to Build Alternates. This affects passenger cars, trucks, buses, and trolleys.

Temporary adverse effects due to construction detours will exist. Increased snow removal costs and increased roadway areas would result from construction of the Pulaski Highway. The costs related to maintaining the increased lane miles would be offset, at least partially, by the decreased maintenance on local roads due to the reduction of automobile and truck traffic with the Pulaski Highway in operation.

SECTION VI

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Regardless of its location, construction of the Pulaski Highway will cause some short term disruption to the immediate residential communities. Those remaining in the influence area of the new highway would undergo a period of readjustment due to the effects of construction activities and associated detours of traffic.

In the short term, the No-Build Alternative results in no immediate disruption due to relocation and construction. However, in the long term, a certain amount of community disruption is inevitable due to necessary widening of local streets required to accommodate increased travel through the communities.

With the Build Alternates, possible short-term gains are likely due to relocation to housing of higher economic value and quality. Such gains could be offset somewhat if higher taxes accompany the increased value of housing.

In the short-term, a nominal tax loss can be expected since certain industries and home owners may wish to relocate outside of the City. This immediate loss nevertheless may be offset by the short-term gain in jobs and tax revenue attributed to the project's construction. In the short-term it can also be expected that residential property values immediately adjacent to the project will increase at a lesser rate than with the No-Build Alternative. However, in the long-term, due to a greater increase in acessibility and area development because of the project,all property values can be expected to increase.

The No-Build Alternative would require less of a commitment of highway funds in the short-term. It would, however, result in a commitment of increased congestion and operating costs to vehicles operating in the area. Operating revenues of the Delaware River Port Authority's Betsy Ross Bridge would be adversely affected by the No-Build Alternative in both the short and long-term.

The No-Build Alternative, in both the short and long-term, may force some of the thirty thousand (30,000) workers that influx the macro study area daily to seek other areas of employment. According to the economic survey, the trend of employment centers and firms moving out of the area as the result of numerous street restrictions on trucks is likely to continue with adoption of the No-Build Alternative.

In essence, the Build Alternate should improve the long-term economic growth and enhance the Northeast Section of Philadelphia as an important residential, industrial, and commerical area.

In terms of land use, the Pulaski Highway would require the acquisition of from 145 to 165 acres of land. A significant percentage of this land is traversed by sections of highway viaduct. Consequently, not all the land is lost entirely and some can be utilized for joint usage applications as well as marginal development. Some land acquired for highway usage, however, will be excluded in both the short and long-term, for any other purpose.

Certain institutions will be affected by the Pulaski Highway in the short and long-term. Friends Hospital will be most severely impacted by Alternate C. This alignment would disrupt the operations of the institution and require removal and relocation of the famed azalea gardens, a spring time attraction and therapeutic aspect of the grounds. Alternate D also affects some of the Friends Hospital property, however, it affects the rear portion which is generally forrested and contiguous to Tacony Creek Park.

Northwood Nursing Home would be acquired by Alternate F and would be in the proximity of several other alternates. The president of the nursing home has indicated that the management of the facility favors its condemnation as compared to remaining adjacent or near the Pulaski Highway. Their preliminary studies indicate that patient relocation "can be accomplished without undue burden to patients and their families."

The size of the area's religious congregations will be affected by the Pulaski Highway in both the short and long-term. No specific religious institution will be condemned, however, certain relocateeswho are members of a particular church or synagogue may choose to move out of the area, thus reducing that institution's membership.

In terms of fast, safe, and efficient transportation, the Pulaski Highway would be both a short and a long-term benefit. It would increase regional and local accessibility and decrease operating costs and accidents. It would concentrate regional traffic on regional facilities instead of on local roads.

Short and long-term travel demands will require the improvement of the Roosevelt Boulevard south of the Pulaski Highway with any of the Build or No-Build Alternates. In lieu of travel on local neighborhood streets, travel along the Boulevard will increase south of the Pulaski Highway if the Pulaski Highway is built, although lower volumes along the Boulevard north of the Pulaski Highway would result.

In the short and long-term, the Build Alternate would provide the opportunity for exclusive bus/carpool lanes which would be consistent with the area's transportation control strategies. Joint use for park-and-ride lots is also a possibility if the Pulaski Highway is built. Safety considerations preclude the construction of bikeways on the viaduct, but the area beneath the structure could, in some instances, be appropriate for such use.

The Pulaski Highway is a link in the adopted transportation plan for the region which includes rail, bus, trolley, truck, and automobile transportation facilities. In both the short and long-term, the Pulaski Highway would provide increased opportunities for usage by mass transit rubber tired vehicles (bus). The No-Build Alternative would result in long trips via surface mass transit due to the increased congestion on local roads. Since the Pulaski Highway is designed to accommodate primarily circumferential travel desires, and since new radial mass transit capacity is planned through the study area, it is unlikely that the Pulaski Highway would reduce central Philadelphia (radial) transit usage. Likewise, circumferential travel demand is too diversely oriented to be adequately served by fixed rail mass transit, as well as bus transit use. Circumferential rubber tired mass transit travel, however, could be enhanced by the addition of the Pulaski Highway to the existing transportation system. In essence, the Pulaski Highway would improve total transportation in the region.

Short-term and long-term commitments toward energy conservation appear to be mainly concerned at the present time with the development of more efficient automobiles. Trends both prior to and since the energy crisis and recent studies regarding gasoline pricing give no evidence to substantiate a significant change in the existing transportation prediction procedures.

Alternate D results in adverse short and long-term impacts upon Tacony Creek Park, while Alternate E affects local park and recreational areas in the Northwood area.

Vegetation and wildlife would be affected to the greatest degree by alternates that traverse Tacony Creek Park and Friends Hospital. These effects, however, are likely to be short-term with respect to depletion of vegetation from construction and long-term with respect to loss of habitat and effects on wildlife migration.

All alternates except Alternate E and the No-Build Alternative directly impact Oakland and/or Greenwood Cemetery. Short and long-term losses can be attributed to the reduction in burial ground and to the possible psychological impact upon living relatives of the deceased. Greenwood Cemetery officials have indicated that they forsee benefits from condemnation in that the funds received could be utilized for needed improvements. With the No-Build Alternative or Alternative E, Greenwood Cemetery officials have indicated that they could be forced to sell much of their land to developers in order to continue their operation. Alternate F eliminates any possible land loss of Oakland Cemetery, consequently, reducing any short or long-term adverse effects in terms of operations to this cemetery.

All of the Build-Alternates affect properties which have been identified as having either historical or architectural significance. It has been determined by the State Historic Preservation Officer (SHPO) that several of these properties have the potential to receive national recognition. As of this date, no property in the area has been given National Register recognition, nor does any property appear on the State Historic Inventory.

The Build Alternate from a regional or mesoscale air quality aspect in the short and long-term, would reduce emissions of carbon monoxide (CO) and hydrocarbons (HC). For the peak hour, emissions of these pollutants would be as much as 25% lower than with the No-Build Alternative. In the short and long-term, emissions of nitrogen oxides (NO_x) from the Build Alternates would be higher than the No-Build Alternative. These emissions, however, would still be below the 1972 emissions in the regional area. In summary, within the region, air quaility should improve because of the Pulaski's improvement to traffic flow and the implementation of emission controls.

From a microscale or local air quality aspect, in the short-term (1980) emission controls will not be sufficent to achieve compliance with the National Ambient Air Quality Standards for carbon monoxide with or without the Pulaski Highway. In the long and short run after 1980, carbon monoxide concentrations will be lower in the corridor for both the Build and No-Build Alternatives.

In the long-term (after 1983), no violation of either the one hour or eight hour carbon monoxide standards will occur under either the most probable or "worst case" meteorological conditions. Because of its resulting improvement in regional air quality, construction of the Pulaski Highway is consistent with the State Implementation Plan and is a short and long-term benefit.

In general, traffic loss on local streets in the study area would have the effect of reducing noise in certain sections of the study areas. Other receptors, however, would be close to the Pulaski Highway, and would be subjected to additional noise. In the long-term (1995) this increased change in L_{10} levels (noise that occurs 10% of the time), with abatement, would average between one and three decibels when compared to the No-Build Alternative.

In the short and long-terms, the water quality of the Tacony Creek will be affected by the deicing practices on the proposed highway as well as from local street storm water runoff which will be discharge into the stream. These additional contaminants will be received by a stream which is presently being polluted by local and upstream industrial and residential sewage. Neighborhood solid waste also has added to the degradation of this creek. These organic nutrients, oil, grease and additional contaminants in the long and short run will contribute to the continued elimination of intolerant organisms in the stream. Consequently, the creek can be expected to remain a health hazard. This will continue to be the case in the long and short run with both the Build and No-Build decisions. Recent environmental legislation enacted to improve water quality may result in improved conditions in the Tacony Creek, however, runoff from the Pulaski Highway would slightly retard any improvements.

Any delays in a decision regarding the Pulaski Highway will result in short-term impacts to those people who would be affected by any particular alternate. Uncertainty regarding the project often prevents people from making improvements or performing necessary maintenance on their properties. The uncertainty could also affect the market value of homes for sale in the area.

As indicated by both the Pennsylvania House and Senate Sub-Committee Reports, and in the Social and Economic Impact Basis Reports prepared for this study, it is in the best interest of the people and the area that a decision regarding this project be made at the earliest possible time.

SECTION VII

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

The highway facility would not generate large scale conversion of land uses within the larger Northeast area or within the immediate corridor. Consequently, in general, land uses should remain committed to their existing uses, however, presently vacant land and some deteriorated residential properties could be converted to industrial and manufacturing uses. This type of area growth may be considered by some as a negative commitment of resources. The No-Build decision, however, is a commitment to the eventual loss of industry and eventually jobs, because employers will continue to vacate the area. This result to other factions of our society may also be seen as a negative commitment of our resources.

The highway will affect and impact several business establishments in the micro area. Alternate E would affect the largest number of business properties (45) and Alternate F would affect the least amount of business properties (36).

The probable loss of city tax revenues, which include Real Estate, City Wage and Business Taxes, as a result of the highway condemnations, range from $306,300 per year with Alternate A-1 to $233,200 per year with Alternate F. Any long-term commitments of these monetary resources are not expected, because, due to the attractiveness of the area to business interests resulting from the improved regional access, it is expected that businesses will remain in the area.

With the No-Build decision, business establishments will continue to leave the study area as they have done in the past. This decision will also continue to irreversibly erode the City's tax base.

The highway facility may require as many as three hundred and three (303 with Alternative A-1) and as few as ninety-seven (97 with Alternatives C and D) residential type properties in the macro area. Several of the proposed alternates impact either existing neighborhoods, area hospitals, cemeteries, parks or potential historical resources. Only Alternate D, however, affects all of these resource types.

Impacts to these areas should be viewed as a partial irretrievable commitment of the area, City or regional resources to another land use. Many of the potential impacts to these resources, however, can be avoided by the No-Build decision.

Any decision concerning the Pulaski Highway must be made in consideration of the entire planned highway network. Consequently, the No-Build decision on the Pulaski Highway will have an adverse effect on the rest of the regional transportation system. A No-Build decision, therefore, implies a commitment to an incomplete highway system in the Delaware Valley. It also implies a commitment to inadequately facilitate automotive traffic going onto or coming from I-95 and the Betsy Ross Bridge, as well as, the truck traffic going or coming from the many truck terminals and port facilities near the Delaware River. The No-Build decision also implies a commitment to continue to congest the Tacony-Palmyra Bridge and the accompanying approach roads, as well as the neighborhoods between the Roosevelt Boulevard and the Betsy Ross Bridge. This No-Build decision would also commit the Betsy Ross Bridge to be used for less traffic than it was originally designed to carry as well as a commitment to a loss of revenue to the Delaware River Port Authority.

The Build decision implies a continued commitment to utilize our country's energy resources (oil, gasoline and various raw materials). The No-Build Alternative, however, implies a greater continued commitment. Recent transportation trends studied within Pennsylvania and throughout the country indicate a continued reliance on the automobile. This automobile use is expected to increase as automotive manufacturers produce more fuel efficient automobiles, as individual income rises and as a major part of the population enters the above average automotive use group.

The right-of-way already acquired for the proposed highway can be utilized for other land uses in the event that the No-Build decision is reached. If the Build decision is reached the right-of-way established will create a transportation corridor which can be retained for future highway use as well as for mass transit facilities.

If land is acquired from the Tacony Creek Park, Friends Hospital or either of the cemeteries, the land is not likely to be recommitted to its present land use if the built facility is ultimately abandoned. Loss of any parkland and Friend's Hospital land must be viewed as a loss of aesthetic and open space lands to the region as well as to the local neighborhoods. Loss of these lands as well as some cemetery land must also be viewed as a loss of habitat to some wildlife. Land taken from either one or both cemeteries could possibly, under the viaduct sections of the Build alternatives, be reclaimed for burial purposes, but this is unlikely.

Historical resources have been identified within the corridor. Some of these resources would be impacted. None of these resources are presently on the State Inventory or National Register.

The No-Build decision implies a continued commitment to poor regional air quality with regards to carbon monoxide and hydrocarbons. The Build decision implies an immediate short-term commitment to continued poor air quality in the microscale or local area during worst cast meteorological conditions. This condition can be expected to occur several days a year. With mitigation measures this type of commitment is neither an irretrievable commitment of resources or an irresponsible decision. Mitigating measures implies either administrative agreements with the Federal, State and Local Air Pollution Control Agencies or a delay of an opening of the facility until all "worst case" violations are within acceptable Federal standards.

Both the Build and No-Build decision accepts the continuation of the high ambient noise levels in the area. Under the Build decision this impact, however, is concentrated into a narrow band as opposed to being dispersed throughout the area. Noise mounds and barriers can be utilized to mitigate this problem. As a last resort, specific receptors which exceed the standards can be condemned for highway purposes.

SECTION VIII

THE IMPACT ON PROPERTIES AND SITES OF HISTORICAL AND CULTURAL (ARCHAEOLOGICAL) SIGNIFICANCE

A. HISTORY OF THE AREA

1. General

Lenni Lenape Indians inhabited the Delaware Valley Region before the advent of European settlement. Henry Hudson in 1609 was the first European to set foot in this region, and based on his findings these Indians were considered to be the first inhabitants of the area. The Delaware Indians were also inhabitants of the area and were named by the English for the Delaware River.

The Indians in this area used the Northeast section of Philadelphia mainly for hunting and argicultural purposes. They lived in an advanced Stone Age culture, making pottery and growing corn and tobacco. They lived in bark shelters, grouped together in villages, which housed all the members of their matrilineal families. Numerous arrow heads and bones have been discovered in the hills of Frankford, which is evidence of the Indian village which one flurished. Oxford and Bridesburg were also sites of Indian Villages.

2. First Settlers

The first permanent white inhabitants of the area were Swedes. Remnants of a Swedish mill built around 1660 suggest that the Swedes arrived in the middle 1600's before the central portion of Philadelphia was occupied. In 1683, land was bought west of the Delaware River from the Indians and named New Sweden by the Swedes. These people lived among Indians on very familiar terms.

After the Swedes, the English, mostly members of the Society of Friends, arrived in the 1680's and began developing the area.

In 1756, the Germans began to purchase land around the vicinity of Frankford. At the same time many people from the City of Philadelphia migrated to Frankford, purchasing farms for their country homes.

3. Early Transportation

With the arrival of the first settlers in the area, the building of roads and bridges began. One of the most important roads was Frankford Avenue (originally called the King's Highway) a post road between Philadelphia and New York. King's Highway originally followed an old Indian Trail along the Delaware River. This road was the first legally laid out county road in the Providence of Penn and was authorized in 1686. In 1725 the first public transportation facilities were started with the first vehicle running from Philadelphia to Frankford. In 1756 the first stagecoach service between Philadelphia and New York was started along King's Highway. In 1803 the Frankford and Oxford Turnpike Company was incorporated, and Frankford Avenue was made into a modern toll road. In 1832, when the Philadelphia and Trenton Railroad was completed, the stagecoachs from Philadelphia to New York were stopped.

4. National History

During the Revolutionary War period this area's involvement was significant. The land around Frankford was disputed territory during the occupation of Philadelphia. While British forces tried to keep Frankford Road open so that the farmers could bridge their produce to the British occupied city the American forces wanted to cut the city's supply. During one skirmish the British were attacked by the American forces led by Count Pulaski and caused to retreat. Frankford, after this time, ceased to be a fixed American post, mainly because of the inadequate number of American troops. However, companies of the Militia of Philadelphia City and County then participated in a sham battle called the Battle of Point-no-Point. It began at the mouth of the Frankford Creek and proceeded to Frankford where reserves were stationed.

Four military companies from Frankford also participated in the War of 1812. Their camp was near Marcus Hook, Pennsylvania.

During the Mexican War, one of the first groups to volunteer was a company of 81 men called the Frankford Artillery.

5. Neighborhood History

A number of conterminous communities included within the limits of the City and County of Philadelphia played a great part in the city's early development. Because of their divided governments, however, these communities had many disadvantages, such as; the lack of unified police and fire departments, an efficient system for the numbering of buildings, and a workable program to clean up the polluted Chohocksink Creek, which laid between two particular districts. In order to rectify these problems, the concept of governmental consolidation originated.

A series of political letters appeared in the area papers in June 1853 signed "Tecumseh" (Probably written by the perennial agitator, Eli K. Price) which discussed consolidation. A mass meeting was held in August 1853 and a General Executive Committee was organized. By December of 1853 this committe had decided that maintaining separate governments for the townships was wasteful. They arranged that there should be special farm tax rates, however, the northern suburbs were left in charge of their own schools and charities. They also organized a large representative Council, which permitted each village to elect its own Councilman, instead of having the ward elect a group at large.

In 1854 through the Consolidation Act the twenty-eight minor political divisions of the county merged with the city, consequently, relinquishing many of their governmental functions. The presently proposed Pulaski

Highway will run near or through (depending on which alignment) several of these former political divisions (See Plate 192). These political divisions before January 1, 1854 were:

a. Richmond incorporated in 1847 and lies to the northeast of Kensington. Gordon's Gazetteer(1832) describes Richmond as a small village of 20 dwellings, its growth came after the opening of the railroad and the coal wharves at Port Richmond in 1841.

b. Frankford's name comes from the Frankford Land Company (for Frankfort-Am-Main, the "Ford of the Franks") a German Company organized for promoting settlement in Tacony (Oxford) township. The industrial development of this area came after the War of 1812.

c. Bridesburg was incorporated in 1848 and called Kirkbridesburg, for Joseph Kirkbride, who operated a ferry service to New Jersey. The region was known in colonial times as Point-no-Point, due to the deceptive appearance of the blunt cape at the mouth of the creek.

d. Whitehall was incorporated in 1849 and covered what might be called East Frankford. In 1853 about two-thirds of the borough was annexed to Frankford. In 1816 Fredrick Fraley sold 20 acres of this land to the U.S. Government. Soon after, the area became known for the manufacture of small arms and ammunition and was called the Frankford Arsenal.

e. Aramingo was incorporated in 1850 and includes the land between Richmond and Frankford. Aramingo is said to be a derivation of Tumanaramingo, the Indian name for the Tacony stream.

f. Oxford was a township which laid east of Tacony Creek but north of Frankford. Tacony means "wood" or uninhabited place, and various forms of this name were early applied to this section in and around Oxford Township.

g. Unincorporated Northern Liberties was west of Tacony Creek, north of Aramingo and consisted of remnants of land after the creation of several districts, townships and boroughs. Lydia Darragh's famous 13 mile walk which she is said to have undertaken to warn of British troop movements to Washington was through this area.

h. Bristol township extended from Germantown to the Tacony Creek and was named for Bristol, England. While it became the so called "Mother of Suburbs" for Philadelphia, the name Bristol has not been attached to any of them. Present day Feltonville lies within this area.

6. Industry and Housing

The first Swedish settlers of the area were mainly farmers and traders. Considering this source of labor, the water power which could be harnessed from both the Tacony and Frankford Creeks and the area's proximity to the Philadelphia markets, the area was highly conducive to industrial development.

Of perhaps greatest historical interest are the factories which date from about 1830 and which derived their power from both water and steam. Factory workers wove cotton and woolen fabrics, chintzes, carpets and the like, knitted hosiery and produced dyes and calico prints. As the population and economy grew so did factories, increasing in size and number and expanding their domestic and foreign markets. A few of these mills disappeared, however, (as demonstrated by Hexamer Industrial Surveys, c. 1860-1895; and current photographs) most remain and have been adopted to diverse use. Moreover, it has been reported to the Philadelphia Historical Commission staff that a very high proportion of these industries are still economically viable.

Closely associated with the mills are the complexes of dwellings erected as housing for workers. In origin, some of these seem to date from the eighteenth century, with further construction commencing around 1830. They stand as a form of documentation for the history of the American labor movement, its aspirations and goals from the Workingman's Party of the Jacksonian era to modern vertical trade unions. Philadelphia played an exceptionally important part in this history. While most of these dwellings for industrial workers continue to line the streets of the area, almost all of the mansions of the early owners fell before later subdivisions for rowhouses which now dominate Frankford. The names of some of those owners and developers remain on street signs.

Since the industrialization of the Frankford watershed, the area has filled in rather densely. In addition to the manufacturing complexes, the area contains the full range of Philadelphia domestic architecture from the mansion now occupied by the YWCA at Arrott and Leiper Streets and the Victorian houses of Penn Street to the suburban farm home developments of the 1920's and 1930's as exemplified on Wakeling Street near Roosevelt Boulevard in Northwood and the even newer rows of homes on Potter Street.

The proposal for the construction of the Pulaski Highway may threaten the continued existence of a variety of these historically representative structures which contain every form of domestic and industrial design.

B. IMPACT OF THE PROPOSED PULASKI HIGHWAY ON LOCALLY IDENTIFIED HISTORIC AND ARCHITECTURAL RESOURCES

1. General

The alternates designated A-1 through F all entail the demolition of some buildings which constitute a part of the architectural record or are close enough to such structures as to threaten their context. A description of the consequences of each route appears in the following paragraphs (See Plate 193).

2. Alternate A-1

The construction of Alternate A-1 and its ramps may endanger the following blocks and/or buildings of architectural* or historical interest:

Adams Avenue

4200 block: more mid-nineteenth century rowhouses
1500 block: several somewhat isolated mid-nineteenth century rowhouses.
1200 block: early and mid-nineteenth century industrial workers houses.

Orthodox Street

963-969: 1880's frame house and a modern brick twin.

Castor Avenue

4516-4642: on the odd side, a slightly dilapidated but handsome late nineteenth century twin frame house; a unique building in Philadelphia. On the even side, early twentieth century houses.

Ramona Avenue *

4700-4726: twentieth century construction

Foulkrod Street*

800 block: recent construction

Fillmore Street*

4800 block: recent construction

Summerdale Avenue*

4800 block: recent construction

Roosevelt Boulevard*

4700-4852: recent construction

In addition, this route would require the complete or partial demolition of several factories along the Frankford Creek. Among the more significant of these are Solomon Wild's Frankford Woolen Mill between the Creek and Adams Avenue at Church Street, and Tremont Mills on Adams above Wingohocking, and the Vezin's Frankford Hosiery Mills on Adams between Unity and Orthodox. The Tremont Mills contains portions of structures dating from the beginning of the Industrial Revolution. At present, portions of these buildings remain in use while others are abandoned and dilapidated and in need of repairs. Finally Alternate A-1 requires the razing of several eighteenth century and early nineteenth century buildings in the Greenwood and Oakland Cemeteries.

3. Alternate A-2

The route designated Alternate A-2 has the same consequences except for the Ramona Avenue houses which are not involved in this proposal.

4. Alternate B

In Section C, Alternate B produces effects similar to Alternate A as far as Wingohocking except for the buildings along the 1100, 1200 and 4600 block of Adams Avenue. On the west side of the Creek between Cayuga and Wingohocking, the alignment comes near but does not physically affect the Helmark Construction Company which contains one of the oldest existent industrial buildings in the area. Upon its return east of the Creek, its consequences are not dissimilar from those of Alternates A-1 and A-2 almost to a point midway between Wingohocking and Castor. While avoiding the Orthodox Street houses, Alternate B again touches the 4500 block of Castor with its unusual frame house. From Castor to the Boulevard, no buildings of interest are involved; those north of the Boulevard are described under Alternate A-1.

The most significant buildings, historically, in the path of Alternate B are the factories and their residential adjacents, the frame house on Castor and the buildings in the cemeteries.

5. Alternate C

For Alternate C, the impacts from Adams and Leiper to Wingohocking resemble those for Alternates A1, A2 and B and of Alternate B from Winghocking to Castor. Beyond the Castor Avenue structures, no buildings are immediately involved; however, it should be noted that Alternate C comes perilously close to the most important structures architecturally in the entire area, Friends Hospital.

6. Alternate D

Alternate D from Leiper and Adams to the Creek repeats the other routes. It leaves untouched the factories east of the Creek, but runs through the one identified above as Helmark Construction. Upon the return of Alternate D west of the Creek, the effects of Alternate B recur as far as Castor. Beyond that point this route avoids the cemetery buildings but does hit several older structures at Friends Hospital near Fisher's Lane from Romona to the Creek. As with the other proposal, the industrial buildings and the Castor Avenue house should be regarded as historically important. The Fisher's Lane structure also falls into this category.

7. Alternate E

The fifth route, Alternate E, requires the razing of more buildings than any other proposal. The base to Wingohocking combines all the consequences of Alternates, A-1, A-2, B and C into one. In addition it takes a row of dwellings dating from the 1830's through mid-century on Adams Avenue and a row of later nineteenth century houses on Horrocks before joining the railroad alignment. Once Alternate E reaches the railroad, it skirts the edges of a set of streets lined with comparatively modern houses of no primary historical significance by the criteria of association, design, age or singularity. This applies all the way to Roosevelt Boulevard. Again, as in the case of each of the other options, the greatest historical and architectural loss caused by this route is to the older industrial and residential complexes along Adams Avenue.

8. Alternate F

The sixth route, Alternate F, is very similar to the effects caused by Alternate A-1, A-2. This alternative, however, does not affect the architecturally significant properties on the north side of the Boulevard or the historical property in Oakland Cemetery.

9. No-Build Alternative

In terms of the specific routes under consideration the No-Build and the No-Build with improvements obviously causes the least immediate damage to potential historic or architectural structures.

C. ARCHAEOLOGICAL AND PALEONTOLOGICAL RESOURCES

In June 1974 representatives of the Philadelphia Historic Commission, the Frankford Historical Society and members of the Interdisciplinary Team, stated that presently there are no specific archaeological or paleontological sites or diggings in the area,however, numerous indian artifacts have been found in the past. Consequently, the possibility of uncovering artifacts during excavation is conceivable.

Should the contractor's excavation operations encounter remains of prehistoric people's dwelling sites or artifacts of historical or archaeological significance, the operation in that locality shall be temporarily discontinued. The engineer will contact the Pennsylvania Historical and Museum Commission for determination of disposition. When directed by the engineer, the contractor shall excavate the site in such a manner as to preserve the artifacts encountered and shall remove them for delivery to the custody of the Pennsylvania Historical and Museum Commission.

D. HISTORICAL PRESERVATION PROCEDURES

1. General

Efforts have continually been made by governmental agencies and historical societies to foster the designation and preservation of landmarks. The National Historic Preservation Act of 1966 and the Demonstration Cities and Metropolitan Development Act have furthered preservation efforts, giving impetus to the City's landmark maintenance program.

The National Environmental Policy Act of 1969, in its effort to ensure maximum compatibility of engineering projectswith their physical surroundings required that landmarks and historic sites be seriously considered when evaluating the impact of such projects. Many of these Nationally Registered landmarks exist within the City of Philadelphia. None exist within the actual project boundaries, however, consideration is presently being given to those sites which may be potentially eligible for the National Register of Historic Places.

2. Actions Related to the Pulaski Highway

PennDOT, in accordance with the National Historic Preservation Act of 1966 and Executive Order 11593, has enacted the following procedures promulgated by the Advisory Council on Historic Preservation.

May 13, 1975 - An Historic Resource Survey report was forwarded to the Pennsylvania Historical and Museum Commission for the purpose of initiating a field view. This report contained information on twenty-two (22) historical resources in the Pulaski Corridor. These sites were identified by the Philadelphia Historic Commission (PHC) for use in the Environmental Impact Statement and are previously mentioned. None of these resources are on the National Register or the State Inventory of Historical Sites.

June 3, 1975 - A field view was held to further identify properties located within the Pulaski Highway area which may be eligible for inclusion in the National Register of Historic Places. Attending the field view were the following organizations: Pennsylvania Historical and Museum Commission (State Historic Preservation Officer - SHPO), Philadelphia Historical Commission - PHC, Philadelphia Planning Commission, Pennsylvania Department of Transportation (PennDOT), and Federal Highway Administration (FHWA). They visited the twenty-two sites identified in the Historical Resources Survey.

In conclusion, a determination was made by the SHPO that the opinion of the Keeper of the National Register, Department of the Interior, would be requested on seven (7) sites identified by PHC and one (1) site identified during the field visit which also was potentially eligible for inclusion in the National Register. These resources are:

Residences in the 1500 block of Adams Avenue.

Residences in the 4600 block of Adams Avenue near Orthodox Street.

Industrial buildings of Tremont Mill at Adams Avenue near Wingohocking Street.

Industrial building of Helmark Construction Company west of Frankford Creek between Cayuga and Wingohocking Streets.

Administration buildings on the Oakland Cemetery property.

Residence on FriendsHospital land near the intersection of Fisher's Lane and Romona Avenue.

Stone arch bridge on Fisher's Lane over Tacony Creek.

Residence on Ramona Avenue and "I" Street near Fisher's Lane (site added during field view).

The minutes of this field view were prepared by the FHWA and were concurred in by Mr. William Wewer, Executive Director of the Pennsylvania Historical and Museum Commission. A request for an opinion was forwarded, which included information such as, a general history of the area and each site, a description of the sites and properties, and various photographs, to the Department of the Interior who will render an opinion as to the individual eligibility for inclusion in the National Register of these eight (8) sites. If any of these sites are eligible for inclusion into the National Register the criteria of effect will be applied in accordance with the Section 106 procedures pursuant to the National Historic Preservation Act of 1966 and Executive Order 11593.

SECTION IX

COMMENTS AND COORDINATION

A. THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION'S ACTION PLAN

The Pennsylvania Department of Transportation (PennDOT) as an agent for the Federal Highway Administration prepared an Action Plan, which has become PennDOT policy.

The main purpose of this Action Plan is to achieve transportation improvements that are in the best overall public interest based upon a balanced consideration of the need for fast, safe and efficient transportation. The Plan also relies on application of an interdisciplinary analysis, interagency cooperation, full public participation, and early consideration of the economic, social, and environmental impacts in PennDOT's transportation planning, location and design processes. Consequently, it has been this approach that PennDOT's environmental and engineering staff have attempted to take in the development of the EIS for the proposed Pulaski Highway.

B. INTERDISCIPLINARY TEAM AND ADVISORY GROUP FORMATION

1. General

During the summer of 1974, PennDOT's District environmental and engineering staff began organizing the Pulaski Highway Interdisciplinary Team. In accordance with the Action Plan and NEPA concepts this was organized to consist of the following individuals and disciplines:

Community Representatives
Highway Engineers
Sociologist
Transportation Planners (Highway and Mass Transit)
Historian
Geologist
Archeologist
Economist
Ecologist
Biologist
Landscape Architect

Agronomist
Air and Noise Experts
Community Planner
Environmental Manager/Planner

Individuals from these disciplines met during the development of the basis reports which are integrated into the EIS. These meetings were also held in order to better coordinate all individual efforts and to analyze the various impending negative and positive impacts from the proposed Pulaski Highway. Government organizations were also asked to participate because of their expertise and experience in the areas which would be impacted. Consequently, the following consultants, governmental organizations and citizens became the members of the Interdisciplinary Team.

2. Membership

a. Elected Community Representatives

(SEE THE SEPTEMBER 11, 1974 CITIZEN MEETING DISCUSSION WHICH APPEARS LATER IN THIS SECTION)

b. Consultants

Dr. John Connors, Dr. Richard Leonard, Mr. Finn Hornum	Sociologist (LaSalle College) Phila., Pa.
Dr. Joseph Mooney, Dr. Joseph Kane	Economist (LaSalle College) Phila., Pa.
Scott Environmental Technology, Inc. (formerly Scott Laboratories)	Air and Noise Experts Plumsteadville, Pa.
Jack McCormick & Associates	Ecological Experts (Devon, Pa.)

c. Governmental Participants

Transportation Planning	Delaware Valley Regional Planning Commission (DVRPC) Southeastern Pennsylvania Transportation Authority (SEPTA)
Air and Noise Experts	DVRPC & PennDOT
Highway Engineering	PennDOT City of Philadelphia Department of Streets

Historian	City of Philadelphia Historical Commission
Environmental Manager/Planner	PennDOT
Archaeologist	PennDOT
Geologist	PennDOT
Agronomist	PennDOT
Community Planner	DVRPC & City of Phila. Planning Comm.

3. Structure

a. Interdisciplinary Team

As indicated on Plate 8 titled Pulaski Highway Interdisciplinary Team, these team members are in contact with the district's Environmental Manager who coordinated the various members' efforts and will write and compile the pre-draft, draft and final EIS based on the individual reports of the Interdisciplinary Team members.

All members on the Pulaski Interdisciplinary Team who submitted reports for inclusion within the EIS were requested to review the pre-draft and draft EIS in order to verify the accuracy of their reports and its inclusion within this document. These members will also help answer specific questions which are received from any review agencies, citizen delegates and/or governmental organizations during the EIS process.

b. Advisory Group

During the formation of the Interdisciplinary Team an Advisory Group to the Interdisciplinary Team also was organized. This group consisted of Governmental Organizations, a Railroad Company and two Chambers' of Commerce. Their participation was requested at the Interdisciplinary Team meetings that were held, as well as numerous civic meetings, in order that they might be kept informed of the EIS process. Their attendance would also enable them to actively participate and contribute to the interdisciplinary process. The Advisory Group was comprised of the following entities:

Penna. Department of Environmental Resources (PennDER)
U.S. Environmental Protection Agency (EPA-Region III)
Federal Highway Administration (FHWA)
City of Philadelphia - Philadelphia Health
Department - (Air Management Services)
Delaware River Port Authority (DRPA)
Montgomery County
City of Philadelphia - Fairmount Park Commission
Reading Railroad Company
Greater Philadelphia Chamber of Commerce
Northeast Chamber of Commerce
Office of Environmental Quality (PennDOT)

c. Relationship of Interdisciplinary Team and Advisory Group

Plate 9 indicates the relationship of the Advisory Group to the Interdisciplinary Team. During the time span of this lengthy process nearly every member of the Group participated in one form or another.

All members of the Advisory Group were requested to review and comment on the pre-Draft EIS.

d. Citizen Participation and Interdisciplinary Team Meetings

With the formation of the Interdisciplinary Team for the Pulaski Highway EIS study an effort was made to include citizen participation at the beginning of this process. Initial contact was made with the Delaware Valley Citizen's Transportation Committee (DVCTC) on June 27, 1974 in order to establish a workable method of incorporating civic participation in the process. This organization was chosen for its objective and impartial citizen point of view on the Pulaski Project, and its close affiliation to the Delaware Valley Regional Planning Commission. After an explaining of the proposed Interdisciplinary Team and Advisory Group composition and purpose, the DVCTC's Executive Committee proposed that the community representatives be elected in accordance with a democratic process. It was proposed that the DVCTC would organize a general meeting with the various interested organizational leaders, in order to determine the citizen representatives who would participate on the Interdisciplinary Team.

The first Interdisciplinary Team meeting was held on July 1, 1974 at the Delaware Valley Regional Planning Commission. The citizen leaders were invited to sit in on the meeting as temporary citizen representatives (These temporary representatives would be superceded once the elected representatives were chosen). At this meeting the individual consultants were introduced, the process for electing citizen representatives to the Interdisciplinary Team was explained, and plans and schedules were distributed. A question and answering period followed the formal presentation. PennDOT's Environmental Manager was the chairman at all Interdisciplinary Team meetings during the process.

Several citizen meetings were held in which the Pennsylvania Department of Transportation was invited to participate. The first on July 15, 1974 was held at the Juniata Park United Methodist Church in order to elect community representatives and present information on the Environmental Impact Statement, Interdisciplinary Team and the Advisory Group. Recommendations were made that citizen participation meetings be held in the evenings in the area of the project, and that all citizen representatives be notified in advance of these meetings. The civic leaders agreed that the number of representatives to be elected and placed on the Interdisciplinary Team should be decided upon by them. It was also noted that citizen participation would begin with this meeting and continue on through to the completion of the Pulaski Highway Environmental Impact Statement study, and into the final design if the build alternate was decided upon. Fifteen (15) (approximately half) of the eventual participating groups were present at this first civic meeting.

A second Interdisciplinary Team meeting was held at the Delaware Valley Regional Planning Commission on July 16, 1974. The purpose of this meeting was to briefly explain the consultants' findings to date, and to further explain and educate all in attendance of the EIS process.

A second citizen meeting was held on August 7, 1974 at Holy Innocents Church Social Hall in Juniata Park. Citizens from the area, as well as the citizen representatives, were also in attendance. The main objective of this meeting for the benefit of those who were still uninformed, was to again explain:

1/ The Environmental Impact Statement Process,
2/ Citizen input on the Interdisciplinary Team,
3/ The Interdisciplinary Team and their findings to date,
4/ The Advisory Group and its role in the Interdisciplinary Team process.

A third citizen meeting was held on August 21, 1974 at St. John Cantius Church Auditorium, in Bridesburg. The purpose of this meeting was to:

1/ Discuss the structure of the various citizen organizations and the election of official representatives,
2/ To elect representatives to the Interdisciplinary Team,
3/ To commence consideration of the alternatives and their effects.

The civic leaders discussed adopting various procedures from which the community representatives could be elected to the Interdisciplinary Team. It was decided, however, that more time was needed in order to review this structure and its qualifications.

A fourth citizen meeting was held on September 11, 1974 at Brith Israel Synagogue in Feltonville ("D" Street and Roosevelt Boulevard). The purpose was to again:

1/ Discuss the structure of citizen organizations and the election of official representatives,
2/ The election of representatives to the Interdisciplinary Team and
3/ That citizen leaders would present and discuss letters which verified them as appointed citizen representatives.

At this meeting the chairman indicated that he had received a total of 22 letters from organizations who had named individuals to be representatives at these meetings. A screening committee was organized to determine which groups were viable. Several groups were found ineligible because they represented no group. The subject of determining the number of representatives to be named to the Interdisciplinary Team was then considered, and after some discussion the number to be elected was decided at ten (10). It was also agreed, that five should represent the area east of the Frankford Avenue - Kensington Avenue line and five west of the line. Alternates were also eventually appointed by the elected representatives. These persons are as follows:

NAME	ALTERNATE	AFFILIATION
Thaddeus J. Przybylowski	(Bruce Beaton)	Bridesburg Civic & Businessman's Association
Joseph T. Kaminski	(Joanna Wajda)	Frankford Valley Civic Association
Stanley Chmielewski	(Domenic D'Amico)	Bridesburg Civic Council
Mrs. Clare Clark	(Francis McGinn)	Aramingo Civic Association
Edward Lewandowski	(Jack Dempsey)	Port Richmond Committee for Community Improvement
William E. Baldwin	(James Travis)	Northwood Civic Association
Patrick Geraghty	(Fred Camp- J. Travis)	Summerdale Civic Association
Domenic Fanticola	(Roland Woher)	Juniata Park Civic Association
Edward T. Gavin	(no appointee)	Frankford Senior Citizen's Central
Robert Jasner	(Louis Siegel)	Triangle Civic Association

A fifth citizen meeting was held on October 3, 1974 at St. James' Lutheran Church in Northwood. At this meeting a preliminary Pulaski EIS outline was distributed. A presentation and discussion of alternative alignments to the highway was also undertaken.

On October 10, 1974, a third Interdisciplinary Team meeting was held at PennDOT in St. Davids, Pennsylvania. This meeting was held specifically with the ten elected citizen representatives (a sub-committee to the Interdisciplinary Team) the chairman and PennDOT's staff. At this meeting a presentation was made of the basic steps taken by the Delaware Valley Regional Planning Commission (DVRPC) in determining the Regional Transit and Highway Networks. Information showing how the goals of the Pulaski were also the goals of the regional network were explained and illustrated.

A sixth citizen meeting was held on October 16, 1974, at the neighborhood center in Upper Northwood. At this meeting a description of each alternate was thoroughly explained and illustrated. Various interchange configurations and possibilities were discussed. The various numbers of homes, apartments and businesses that would be relocated and some mitigating measures to reduce these numbers were reviewed. The effects of traffic from the build and no-build alternates were also presented.

A fourth Interdisciplinary Team meeting was held on October 30, 1974 at PennDOT in St. Davids, at which the elected citizen delegates on the Interdisciplinary Team were present. At this meeting answers were given to specific questions which were raised at the previous citizen meeting of October 16th. The Economic and Sociological consultants were also present in order that they could give an explanation of their reports. An impact tabulation was also explained to those present, and alternate "F" was introduced, as an alternative which might mitigate some of the negative impacts which were identified to date.

A seventh citizen meeting was held on November 13, 1974 at Friend's Hospital. At this meeting, the United Northeast Civic Association's proposed alignment was to be discussed. The Economic and Sociolgocial Reports and alignment "F" were to be discussed again, in order that those not present at the October 30th meeting could be given an opportunity to hear these presentations. The meeting's agenda, however, was abandoned.

An eighth citizen meeting was held on December 4, 1974 in Bridesburg.

The agenda for this meeting consisted of a presentation of further data concerning the need for the Expressway. Also discussed were civic association positions concerning the Richmond Street ramps, and the possibility of extending an invitation to the Governor to attend the civic meetings.

A fifth Interdisciplinary Team meeting was held on December 11, 1974 in Bridesburg. At this meeting the Economic and Sociological consultants gave a further explanation of their reports and began explaining specific questions addressed to them by the elected citizen delegates on the team.

A sixth Interdisciplinary Team meeting was held on January 8, 1975 at Friend's Hospital. At this meeting the Delaware Valley Regional Planning Commission's Report, the Philadelphia Department of Street's Report and the Biological and Physical Assessment Report concerning the project were discussed. Again specific questions were addressed by the consultants and public officials.

At the seventh Interdisciplinary Team meeting on January 15, 1975 held at Brith Israel Synagogue preliminary discussions concerning the Air and Noise Reports were begun. The Historical Report which was prepared by the Philadelphia Historic Commission was also explained and questions addressed.

On January 22, 1975 the ninth citizen meeting was held at Brith Israel Synagogue. The purpose of this meeting was for anyone to openly discuss problems they saw in the ongoing process.

An eighth Interdisciplinary Team meeting was held at Oakland Cemetery's Administration Building on January 29, 1975. At this meeting, further discussions concerning the Air and Noise Reports were undertaken. Questions concerning the Philadelphia Planning Commission's Report were also discussed.

A ninth Interdisciplinary Team meeting was held at the Lawncrest Recreational Center on February 5, 1975. The purpose of this meeting was to present and discuss the PennDOT Report (Volume I) and the Conceptual Survey (Relocation Report).

A tenth citizen meeting was held on February 19, 1975 at St. Valentine's Church Hall. At this meeting numerous topics were discussed including the status of the citizen chairman, traffic analysis results as well as numerous design considerations.

An eleventh citizen meeting was held at the Brith Israel Synagogue on March 5, 1975. At this meeting several citizen resolutions were discussed in addition to several items not completed during the previous meeting.

A tenth Interdisciplinary Team meeting was held at the Brith Israel Synagogue on March 12, 1975. At this meeting the PennDOT Reports (Volumes II and III), the Air and Noise quality reports for alternate F and the pre-draft EIS were distributed and discussed. It was also explained that Interdisciplinary Team comments on the EIS should be received by the Environmental Manager on or before April 16, 1975.

An eleventh Interdisciplinary Team meeting was held on April 9, 1975 at St. Josephat's Ukrainian Catholic Church. Verbal comments were taken on the pre-draft EIS at this meeting. A transcript of this meeting was distributed to all in attendance.

e. Additional Meetings

On May 2, 1975 a meeting was held in the Governor's Office at the State Office Building, Broad and Spring Garden Streets, between Governor Shapp, citizens in favor of constructing the Pulaski Highway and Pennsylvania Department of Transportation personnel.

The Governor was informed that the concern of these people was that the Pulaski Highway would be dropped from State plans.

The Governor reassured the group that the State would not make a decision on the project until the Environmental Impact Statement was completed and a public hearing is held.

On May 16, 1975 at the State Capital Building in Harrisburg a meeting was held between Governor Shapp, citizens who are opposed to the construction of the Pulaski Highway, and Pennsylvania Department of Transportation personnel.

The citizens presented another scheme as an alternative to the proposed Pulaski Highway and Governor Shapp directed PennDOT to study the scheme and report back to him. The citizens further requested that the Richmond Street ramps be evaluated by the study team. Governor Shapp directed PennDOT to also conduct a study of the effects of closing these ramps and report to him on the results (This study in summary form is included within this report).

The Governor assured the group that the State would not make a decision on the project until the Environmental Impact Statement was completed and a public hearing is held.

f. Public Notification Processes

Over the time span of the Environmental Impact Statement process, and in particular beginning with the descriptive notification of the Impact Statement which appeared in the Philadelphia Inquirer and Daily News on Thursday June 13, 1975, the Philadelphia Bulletin on Sunday, June 16, 1974, the Juniata News on Tuesday, June 18, 1974, and the Frankford Bulletin on Thursday, June 20, 1974 (See Plate 10), the Pennsylvania Department of Transportation has maintained a comprehensive listing of interested parties and citizens.

A second listing of all interested parties has been compiled. These interested parties were contacted by the PennDOT District prior to the public advertisement for the Impact Study. Letters of recognition from the

District were mailed to these citizens, as well as a listing of their civic leaders already participating in the EIS process, their addresses and their respective phone numbers. They were also informed that the District Office would remain a source of information.

During December of 1974, because of questions which were being asked by people in the community concerning the continuing Interdisciplinary process, PennDOT published a newsletter in the regional and community newspapers. Please see Plate 11 which is a copy of the newsletter as it appeared in the Philadelphia Inquirer and the Philadelphia Daily News on January 30, 1975, the Sunday Bulletin on February 2, 1975, the Juniata News on February 4, 1975, the Frankford Bulletin on February 6, 1975 and the Frankford News Gleaner on February 20, 1975. All notifications appeared as half page advertisements except for the full page advertisement which appeared in the Daily News.

A copy of the EIS will be made available, as appropriate, to public institutions, such as local governments, public libraries and schools to permit them to make it available for public review. The closing date for public comment will be 45 days after the Council on Environmental Quality (CEQ) publishes the availability of the draft EIS in the Federal Register.

A public hearing for this project will be scheduled.

g. Final EIS Processing

The final EIS will be prepared by PennDOT in consultation with the FHWA. The Regional Federal Highway Administrator will review the final EIS, including the comments and the evaluations of comments attached, before processing the statement. Appropriate members of the FHWA Regional Office Staff will be an integral part of the review process. When the FHWA Regional Office is satisifed with the scope, content and the identification and evaluation of potential significant environmental impacts affecting the quality of the human environment, the final EIS shall be processed.

The final EIS shall be available for public review at both PennDOT St. David's and Harrisburg Offices and at the FHWA Washington headquarters, Regional and Divisional Offices. A copy will also be made available, as appropriate, to public institutions to permit them to make it available for public review. At the completion of this process the implementation of the recommendation may ensue.

h. Correspondance

The following pages contain a list of substantive letters and information that were received during the interdisciplinary/environmental process that contributed to the development of this EIS. These specific letters and information regarding coordination have been reproduced and can be found in the Appendix, Volume III. In addition, numerous opinion letters have been received during the EIS process which can be reviewed at PennDOT's District Office.

At the first citizen participation meeting during the summer of 1974 it was recommended by involved citizens that PennDOT maintain a free flow of information between the State and the communities. Since that time PennDOT has continued to distribute to all interested parties pertinent correspondance and information.

Of importance is the fact that a pre-draft of this EIS was distributed to the public in early March, 1975 followed by an Interdisciplinary Team meeting in mid-April, at which input from those in attendance was received. A transcript of this meeting can be found in the Appendix. Immediately after this meeting PennDOT began to organize the draft EIS as per this information as well as the descriptive input that was received later that month.

Further substantive information such as basis reports generated by citizens and consultants and utilized in the development of this EIS have been distributed to all involved. This information can be reviewed at the Pennsylvania Department of Transportation's District 6 Office in St. Davids, Pennsylvania.

Information letter sent by Fred Perri, a member of the Pennsylvania House of Representatives, August 27, 1973.

Historical information sent by James K. Travis, a member of Northwood Civic Association and the Interdisciplinary Team, for inclusion in the EIS, 1974. It contains 60 pages. A summary of its contents can be found in the historical section.

Comments on the Economic Basis Report by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, 1974.

Comments on the Philadelphia Historical Commission Basis Report by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, 1974.

Historical information and addendum sent by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, for inclusion in the EIS, 1974. It contains 3 pages. A summary of its contents can be found in the historical section.

Comments on the Biological and Physical Assessment Basis Report by Clare Clark, a member of Aramingo Civic Assocation and the Interdisciplinary Team, 1974.

Comments on the DVRPC Basis Report by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, 1974.

Comments on the Social-Cultural Basis Report by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, 1974.

Comments on the Philadelphia Department of Streets Basis Report by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, 1974.

Historical information sent by Edward T. Gavin, a member of Frankford Senior Citizens and the Interdisciplinary Team, for inclusion in the EIS, 1974. It contains 46 pages. A summary of its contents can be found in the historical section.

Comments on the pre-draft EIS by the Economic Consultants, members of the Interdisciplinary Team, for inclusion in the draft EIS, 1974.

Information sent on Reading Railroad Alternate by the Reading Company, a member of the Advisory Group, July 22, 1974.

Opinion letter from Leon Raider, a member of Northeast Transportation Action Council, August 7, 1974.

A letter in response to Leon Raider's questions on the 1973 Traffic Analysis which was sent by the DVRPC, a member of the Interdisciplinary Team, September 5, 1974.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on Leon Raider's letter of August 7, 1974 (September 18, 1974).

Letter of inquiry by Bill Baldwin, a member of Northwood Civic Association and the Interdisciplinary Team, October 10, 1974.

Traffic information sent by DVRPC, a member of the Interdisciplinary Team, October 21, 1974.

Opinion letter from Leon Raider, a member of Northeast Transportation Action Council (NETAC), October 23, 1974.

Information on revised Alternate D and E sent by Joe Schafer, a member of United Northeast Civic Association, October 30, 1974.

Letter of information from the Philadelphia Department of Streets, a member of the Interdisciplinary Team, November 12, 1974.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team on Leon Raider's letter of October 23, 1974 (November 13, 1974).

Letter of opinion sent by Leon Raider, a member of Northeast Transportation Action Council, November 18, 1974.

Information on funds for the Pulaski Highway sent by the Federal Highway Administration, a member of the Advisory Group, November 19, 1974.

Letter of request sent by Joe Schafer, a member of United Northeast Civic Assocation, November 25, 1974.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on William Baldwin's letter of October 10, 1974 (December 10, 1974).

Letter of opinion sent by Jack Schwartz, an interested citizen, December 10, 1974.

Opinion letter from Stanley Chmielewski, a member of Bridesburg Civic Council and the Interdisciplinary Team, December 11, 1974.

Information sent on fringe parking lots by Ronald S. DeNadai, PennDOT's District Transportation Planner, December 13, 1974.

Traffic information sent by DVRPC, a member of the Interdisciplinary Team, December 16, 1974.

Information on the House of Representatives Report on the Pulaski Highway sent by Alvin Katz, a member of the Pennsylvania House of Representatives, December 16, 1974.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on Jack Schwartz's letter of December 10, 1974 (December 17, 1974).

A letter of protest from Arsen Kashkashian, Mr. Raider's lawyer, December 19, 1974.

Comments sent by Jack McCormick and Associates, a member of the Interdisciplinary Team, in relation to questions asked at Interdisciplinary Team meetings of December 11, 1974 and January 8, 1975 (January 13, 1975).

A letter of protest to Alternate F sent by Jack Schwartz, an interested citizen, January 14, 1975.

Letter of opposition from Alvin Katz, a member of the Pennsylvania House of Representatives, January 14, 1975.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on Jack Schwartz's letter of January 14, 1975 (January 21, 1975).

Comments on the DVRPC Basis Report by Air Management Services, a member of the Advisory Group, January 27, 1975.

Letter of response sent by PennDOT, Secretary Jacob G. Kassab, on Alvin Katz's letter of December 16, 1974 (January 29, 1975).

Transmittal letter from DVRPC, a member of the Interdisciplinary Team, which included the following attached letters: Comments on Air Basis Report by B. Prasad, January 23, 1975; Comments on Biological and Physical Assessment Basis Report by Robert M. Giacoboni, January 29, 1975; and Comments on Noise Report by Henry Alexander, January 21, 1975 (January 31, 1975).

Economic information sent by Edward T. Gavin, a member of Frankford Senior Citizens Central and the Interdisciplinary Team, February 3,1975. It contains 35 pages.

Letter of opposition from Alvin Katz, a member of the Pennsylvania House of Representatives, February 18, 1975.

Archaeological information sent by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, February 21, 1975.

Comments on the Air Basis Report by the U.S. Environmental Protection Agency, a member of the Advisory Group, February 21, 1975.

Comments on the Air Basis Report by Air Management Services, a member of the Advisory Group, February 21, 1975.

Comments on the PennDOT Basis Report Volume I by DVRPC, a member of the Interdisciplinary Team, March 5, 1975.

A letter of dissatisfaction from Fred N. Perri, a member of the Pennsylvania House of Representatives, March 18, 1975.

Comments on the Air Basis Report sent by the Department of Environmental Resources, a member of the Advisory Group, March 21, 1975.

Comments on the PennDOT Basis Report Volumes II and III by DVRPC, a member of the Interdisciplinary Team, March 25, 1975.

Information on the energy crisis sent by David Arnold, Friends Hospital, March 26, 1975.

Information on NETAC's Alternate sent by Leon Raider, a member of Northeast Transportation Action Council, April 3, 1975.

A letter requesting information sent by James Travis, a member of Northwood Civic Association and the Interdisciplinary Team for Summerdale Civic Association, April 3, 1975.

Comments on the pre-draft EIS by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, for inclusion in the draft EIS, April 4, 1975.

Letter of response sent by PennDOT's Bureau of Economic Research and Programming on Leon Raider's letter of April 3, 1975 (April 8, 1975).

Comments on the pre-draft EIS by Thaddeus Przybylowski, a member of Bridesburg Civic Association and the Interdisciplinary Team, for inclusion in the draft EIS, April 9, 1975.

Comments on the pre-draft EIS by Robert O'Connor, a member of Lawncrest Community Association, for inclusion in the draft EIS, April 9, 1975.

Comments on the pre-draft EIS by Scott Environmental Technology Inc., a member of the Interdisciplinary Team, for inclusion in the draft EIS, April 9, 1975.

Letter of opinion sent by Leon Raider, a member of Northeast Transportation Action Council, April 9, 1975.

Comments on Section XI, Comments and Coordination, of the pre-draft EIS by Scott Environmental Technology Inc., a member of the Interdisciplinary Team, April 11, 1975.

Comments on draft noise study by the Federal Highway Administration, a member of the Advisory Group, April 11, 1975.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on Fred Perri's letter of March 18, 1975 (April 14, 1975).

Comments on the pre-draft EIS by Air Management Services, a member of the Advisory Group, for inclusion in the draft EIS, April 14, 1975.

Comments on the pre-draft EIS by the Philadelphia Department of Streets, a member of the Interdisciplinary Team, for inclusion in the draft EIS, April 14, 1975.

Comments on the pre-draft EIS by Lorraine Brill, a member of Upper Northwood Community Council, for inclusion in the draft EIS, April 14, 1975.

A letter requesting automobile statistics sent by Mr. Louis Siegel, a member of Transportation Action Group (TAG), April 15, 1975.

A letter of inquiry sent by Alvin Katz, a member of the Pennsylvania House of Representatives, April 15, 1975.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on James Travis' letter of April 3, 1975 (April 16, 1975).

Comments on the pre-draft EIS by the DVRPC, a member of the Interdisciplinary Team, for inclusion in the draft EIS, April 16, 1975.

Opinion letter signed by James Travis, a member of Northwood Civic Association; Leon Raider, a member of Northeast Transportation Action Council, and David Arnold, Friends Hospital. Also attached were comments on the traffic projections and comments on the pre-draft EIS which are to be included in the draft EIS, April 16, 1975.

Comments on the pre-draft EIS by the Philadelphia City Planning Commision, a member of the Interdisciplinary Team, for inclusion in the draft EIS, April 17, 1975.

Letter of response to comments on the air information in the pre-draft EIS sent by Scott Environmental Technology Inc., a member of the Interdisciplinary Team, for inclusion in the draft EIS, April 21, 1975.

Comments on the pre-draft EIS by the Delaware River Port Authority, a member of the Advisory Group, for inclusion in the draft EIS, April 22, 1975.

Comments on the pre-draft EIS sent by the U.S. Environmental Protection Agency, a member of the Advisory Group, April 28, 1975.

Letter of opinion sent by Northwood Nursing and Convalescent Homes, Inc., April 28, 1975.

Comments on the pre-draft EIS sent by Jack Schwartz, an interested citizen, April 1975.

A letter of opinion sent by Clare Clark, a member of Aramingo Civic Association and the Interdisciplinary Team, May 2, 1975.

A letter of opinion sent by Thaddeus J. Przybylowski, a member of Bridesburg Civic Association and the Interdisciplinary Team, May 2, 1975.

Letter or response sent by PennDOT, a member of the Interdisciplinary Team, on James Travis - David Arnold - Leon Raider's letter of April 16, 1975 (May 5, 1975).

A letter requesting an appointment with the governor sent by Domenic Fanticola, a member of Juniata Park Civic Association and the Interdisciplinary Team, May 5, 1975.

An information letter on the Short Line Railroad Study sent by Lorraine Brill, a member of Upper Northwood Community Council, May 5, 1975.

An invitation was extended to PennDOT to attend a management personnel meeting by Sears, Roebuck and Company in order that the Pulaski Highway's current status could be discussed, May 12, 1975.

Comments on the pre-draft EIS sent by Modjeski and Masters, consulting engineers working with the Pulaski-Pennsauken Interchange, May 13, 1975.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on Louis Siegel's letter of April 15, 1975 (May 14, 1975).

Information letter sent by Mr. Anthony R. Tomazinis, Acting Director, Transportation Studies Center, University of Pennsylvania, May 20, 1975.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on Louis Seigel's letter of April 15, 1975 (May 23, 1975).

Information letter sent by the Federal Highway Administration, a member of the Advisory Group, May 29, 1975.

Information letter on worst case wind speed for HIWAY Model sent by the U.S. Environmental Protection Agency, a member of the Advisory Group, June 3, 1975.

Letter of response sent by PennDOT Secretary Jacob G. Kassab, on Alvin Katz's letter of April 15, 1975 (June 10, 1975).

Letter of opinion sent by Joseph Zazyczny, Councilman 6th district, June 20, 1975.

Letter of opposition sent by Martin Davenport, Chairman of the Eastern Pennsylvania Sierra Club, June 23, 1975.

An invitation was extended to PennDOT to attend a meeting held by Sears, Roebuck and Company in order that a presentation could be given by PennDOT on the studies of the Roosevelt Boulevard intersections with Langdon Street and Whitaker Avenue, July 22, 1975.

Transcript of the April 9, 1975 Interdisciplinary Team Meeting as revised by Lorraine Brill, August 13, 1975.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on James Travis - David Arnold - Leon Raider's letter of April 16, 1975 (August 15, 1975).

Letter of information on a revised interchange scheme sent by DVRPC, a member of the Interdisciplinary Team, August 27, 1975.

Letter of response sent by PennDOT, a member of the Interdisciplinary Team, on Lorraine Brill's letter of April 14, 1975 (September 11, 1985).

Pennsylvania Department of Transportation, Relocation Assistance Bulletin 47.

Pennsylvania Department of Transportation Right-of-Way Unit, Pulaski Highway Conceptual Housing Survey.

Letter from the Pennsylvania Department of Transportation to Clinton R. Studholm, Division of Wildlife Service, U.S. Fish and Wildlife Service, May 23, 1975.

GLOSSARY OF KEY TERMS

Action Plan - the guidelines followed by the Pennsylvania Department of Transportation (PennDOT) to assure that adequate consideration is given to possible economic, social, and environmental effects of proposed projects, and that the decisions on such projects are made in the best overall public interest.

Advisory Group - a collection of governmental, quasi-governmental, and private organizations that have been asked by the Interdisciplinary Team (ID-Team) to attend regular ID Team meetings to contribute their expertise, and to actively participate in the interdisciplinary planning process.

Aerobic Conditions - the condition in which free oxygen is present in the environment.

Algae - a group of simple aquatic organisms.

Alluvial Deposits - an accumulation of sediments marking the place where a stream moves from a steep gradient to a flatter gradient and suddenly loses its transportation power.

Ambient Level - the air pollution concentration existing at the time of concern.

Amphibians - smooth-skinned, cold-blooded, bony animals that lack claws and have a larval immature stage. The two major groups of amphibians in the project area are salamanders and frogs and toads.

Anaerobic Conditions- the condition in which free oxygen is absent from the environment.

Aquatic Biota - the water dwelling flora and fauna of a particular region.

Archaeological - pertaining to the scientific study of material remains (as fossil relics, artifacts, monuments, etc) of past human life and activities.

Arterial Street - a roadway primarily for through traffic, usually on a continuous route.

Assigned Traffic - referring to the allocation of future vehicular traffic on a highway network during the Traffic Assignment Phase of the Transportation Planning Process.

Average Daily Traffic (ADT) - the total volume during a given time period in whole days, greater than one day and less than one year, divided by the number of days in that time period.

Background Level - that level of pollutant concentration that results from all sources other than the proposed highway.

Benthos - the bottom environment in a body of water or the organisms which inhabit the bottom zone; freshwater benthic organisms usually include clams, worms, snails, flatworms, insect larvae, and attached algae.

Biochemical Oxygen Demand (BOD) - the amount of oxygen required by bacteria and other living organisms to oxidize, or decompose, the organic matter in water. The most common test for BOD measures the amount of oxygen required during 5 days.

Biomass - total weight (mass) of all organisms in the area under consideration. Often restricted to a particular group of organisms. (e.g. algal biomass.)

Biota - the flora (plant life) and fauna (animal life) of a region.

Census Tract - permanently established small-area divisons of counties containing roughly 2,500 in 8,000 persons. They are laid out with a view to permit statistical comparisons from census to census.

Chemical oxygen demand (COD) - a measure of the amount of oxygen required for the chemical decomposition of organic compounds in water.

Citizen's Repesentative - an individual elected by a particular community to attend Interdisciplinary Team meetings, and to act as information liaison between the Interdisciplinary Team and the members of his/her community.

Co-dominant - a species of plant that makes up an equal or nearly equal proportion of the individual plants in a given vegetation type.

Coliform bacteria - Escherichia coli and related species which are common in the colons of animals.

Ceiling Height - the height above the ground of the base of the lowest layer of clouds when over half of the sky is obscured.

dBA - decibels on the "A" scale. The A scale filters out portions of certain noise frequencies so as to provide a scale which best represents the sound frequency distributions heard by the human ear.

Decibel (dB) - a measure of sound intensity as related to a reference sound pressure. The reference level (OdB) is approximately the weakest sound that can be heard by the alert, young undamaged ear. A decibel is not a unit but a logarithmic number. A 20 dB difference means that the ratio of the two quantities is 10^2 or 100, the upper value being 100 times as great as the lower value.

Depressed Section - that portion of a roadway built below normal ground level.

Design Approval - the final approval of the recommended design location. This approval is granted by the FHWA for Interstate Projects and Safer Roads Demonstration Program projects. For all other Federal - Aid projects the authority has been delegated to the State. On these projects it is granted by the Deputy Secretary for Highway Administration.

Design Hour Volume - a service volume of the maximum number of vehicles that can pass over a given section of a lane or roadway in one direction on multilane highways (or in both directions on a two-or three-lane highway) during a specified time period while operating conditions are maintained corresponding to the selected or specified level of service. In the absence of a time modifier, service volume is an hourly volume.

Detritus - organic material (e.g. leaves, wood, etc.) that has settled to the bottom of a stream or pond.

Dissolved oxygen (DO) - oxygen gas (O_2) in water. It is absorbed by aquatic organisms and may combine with certain chemicals.

Dominant - having considerable influence on the conditions in a particular area by virtue of number or total mass of individuals or their activities.

Draft Environmental Impact Statement (draft EIS) - a document which contains an assessment of the significant effects a major action will have upon the quality of the human environment.

DVRPC - Delaware Valley Regional Planning Commission: The central planning agency for the nine county Delaware Valley Region.

Ecology - the study of the interrelationships of organisms to one another and to the environment.

Embankment Section - that portion of a roadway that is constructed on a fill area.

Environment - the sum total of all external conditions that may act upon an organism or community to influence its development or existance

Environmental Manager - that individual vested with the responsibility of implementing the PennDOT Action Plan, as well as organizing and assisting in the preparation of all Environmental Documents.

Erosion - the wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

Expressway - a divided arterial highway for through traffic with full or partial control of access and generally with grade separations at major intersections.

Familism - see Shevky-Bell Familism Index

Fauna - the animals or animal life developed or adapted for living in a specified environment.

Fecal coliform bacteria - coliform bacteria which enter the water from feces discharged by warm-blooded animals, including man.

FHWA - (Federal Highway Administration) - that branch of the U.S. Department of Transportation that reviews all proposed highway projects which are eligible for partial Federal funding.

Final Environmental Impact Statement (final EIS) - the detailed statement on a major action which significantly affects the quality of the human environment, as required by Section 102 (2) (C) of the National Environmental Policy Act of 1969. It contains the same supporting information required in the draft EIS with appropriate revisions to reflect comments received from circulation of the draft EIS and the public hearing process.

Flood Plain - nearly level land situated on either side of a channel which is subject to overflow flooding.

Flora - plant life, especially the plant life characteristic of a region, period, or special environment.

Forbs - the herbs, other than grass, characteristic of a particular environment.

Foreign Born - an individual born in a country other than the United States.

Foreign Stock - the sum of foreign born persons plus native persons of foreign or mixed parentage.

Forest - an area covered by trees whose tops, or crowns, form a nearly continuous shade. The height of individual trees generally is greater than 20 feet.

Frequency - the number of sound waves in a given period of time produced by a sounding body.

Grade separated - the crossing of two roadways at different elevations (grades); this strategy eliminates signalized intersections and therefore decreases total travel times.

Grassland - a vegetation composed of grasses, grass-like plants, and occasional herbs. In the study area, most grasslands are mowed annually or more frequently.

Habitat - the place or the kind of site in which a plant or animal normally lives during all or part of its life cycle. In this report, the habitats of animals largely are defined in terms of the vegetation.

Herbaceous - of any flowering plant except those developing persistent woody bases and stems above ground.

Highway Network - that complex of expressways, arterials, and collectors that collectively define the private transportation facilities of a region; frequently alluded to in terms of links (segments of a roadway) and nodes (intersections of two or more roadways).

Intensity - with respect to sound stimuli this term is equivalent to loudness.

Intersection Capacity - the maximum number of vehicles that can reasonably be expected to clear a given signalized intersection (calculated separately for each leg of the intersection) during one hour under prevailing roadway and traffic conditions. Since the figure is a function of geometrics, cycle-lengths (Red, Green, and Amber times), turning movements, etc., intersecion capacities vary widely from location to location.

Inversion Height - the height at which any further vertical diffusion of pollutants is restricted.

Ion - a charged atom, molecule, or radical whose migration affects the transport of electricity through an electrolyte.

L_{10} (10% Decile) - that sound level (dBA) exceeded by 10% of total measurements.

L_{50} (Median Noise Level) - that sound level (dBA) exceeded by 50% of total measurements.

Level of Service - a term which, broadly interpreted, denotes any one of an infinite number of differing combinations of operating conditions that may occur on a given lane or roadway when it is accommodating various traffic volumes. Level of service is a qualitative measure of the effects of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs. Level of service codes: A describes a condition of of free flow; B is in the zone of stable flow, with operating speeds beginning to be restricted somewhat by traffic conditions; C is still in the zone of stable flow but the speeds and maneuverability are more closely controlled by the higher volumes; D approaches unstable flow, with tolerable operating speeds being maintained though considerably affected by changes in operating conditions; E cannot be described by speed alone, but represents operations at even lower operating speeds than in level D, with volumes at or near the capacity of the highway; F describes forced flow operation at low speeds, where volumes are below capacity.

Link Capacity - the maximum number of vehicles that has a reasonable expectation of passing over a given section of a lane or a roadway in one direction during a given time period under prevailing roadway and traffic conditions.

Location Approval - the final approval of the recommended Corridor Location. This approval is granted by the FHWA for Interstate and Safer Roads Demonstration Program projects. For all other Federal-Aid projects the authority has been delegated to the State. On these projects it is granted by the Deputy Secretary for Highway Administration. For 100% State financed projects, this approval is also granted by the Deputy Secretary for Highway Administration.

Macroinvertebrate - animals without bones, but visible to the unaided eye; generally bottom-dwelling (benthos) aquatic animals.

Major Action - an action considered to be of superior, large, and considerable importance involving substantial planning, time, resources or expenditures. Any action that is likely to precipitate significant foreseeable alterations in land use; planned growth; development patterns; traffic volumes; travel patterns; transportation services, including public transportation; and natural and man made resources would be considered a major action. For example refer to Volume 7, Chapter 7, Section 2, Item 10.d of the Federal-aid Highway Program Manual.

Mammals - warm-blooded, bony animals that have hair and that nourish their young with milk secreted by mammary glands.

Mean - an arithmetic term equivalent to "Average"; for example, the mean of the following set of numbers: 6, 9, 4, 1, 5 is five ($25 \div 5$).

Meander - one of a series of somewhat regular and looplike bends in the course of a stream.

Median - a value in an ordered set of values below and above which there are an equal number of values; for example, in the following ordered set of numbers: 1, 2, 3, 6, 8 the median value is three (middlemost value) and the mean is four ($20 \div 5$).

Median Noise Level - see L_{50}

Mesoscale - the urban area or subarea which is affected by the facility via traffic changes and related pollutant changes along the existing street network.

Mica - any of the various colored or transparent mineral silicates crystallizing in monoclinic forms that readily separate into very thin leaves.

Micaceous Soil - soil that contains unusually high concentrations of the mineral mica.

Microscale - the immediate corridor of the Highway; generally the area directly affected by pollutants from vehicles on the proposed facility.

Modal Split - the term applied to the divison of person trips between mass and private transportation.

Model - a physical or verbal (technical) description or analogy used to help visualize something that cannot be directly observed.

National Environmental Policy Act (NEPA) of 1969 - Federal Legislation that requires the utilization of a systematic interdisciplinary approach to ensure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making. It further requires that procedures be developed which will ensure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical consideration.

National Register - the abbreviated form of the "National Register of Historic Places" which is a register of districts, sites, buildings, and objects, significant in American History, architecture, archeology, and culture, maintained by the Secretary of the Interior. The National Register is published in its entirety in the Federal Register each year in February.

Nutrient - something that nourishes or promotes growth and repairs the natural wastage of organic life.

Oscillating Source - an object which is continually vibrating.

Overstory - or tree stratum, is composed of all woody plants which have the bulk of their foliage 6 feet or more above the ground.

Paleontological - pertaining to the science dealing with the life of past geological periods as known from fossil remains.

Particulates - solid or liquid substances in the air.

Pasquill Stability Class - measures the atomospheric capacity to disperse pollutants in a vertical direction. Stability classes range from very unstable (the "A" condition), meaning good dispersion, to very stable (the "F" condition), meaning very poor dispersion.

Periphyton - groups of organisms living upon the surfaces of submerged, fixed objects such as plants, stone, and fallen branches.

Person Trips - the accumulated unit movements of individuals traveling between an origin and a destination without respect to the trip length.

Photosynthesis - a process in which carbon dioxide and water are brought together chemically to form a carbohydrate in the presence of light. It occurs principally in green plants.

Phototropism - reaction of an organism to light, either moving toward it (positive phototropism) or away from it (negative phototropism).

Phyto - referring to plants.

Plankton - plants (phytoplankton) and animals (zooplankton) that float in rivers, ponds, lakes, estuaries, or seas.

Pollutant - any gas, liquid, or solid that contaminates the environment.

ppm - parts per million: a scientific unit used in measuring the number of parts of a specific substance by volume, in a million total parts of a quantity of air or water.

Public Hearing - a meeting designed to provide the public-at-large with the maximum opportunity to express support of, or opposition to, a particular project in an open forum at which a verbatim record is kept.

Public Meeting - a meeting designed to facilitate participation in the decision-making process, and to assist the public in gaining an informed view of the proposed project at any level of the Action Plan process.

Putrefaction - the decomposition of organic matter; especially the typically anaerobic splitting of proteins by bacteria and fungi with the formation of foul-smelling incompletely oxidized products.

Railroad Network - the existing pattern of railroad facilities that is characteristic of an urban area.

Receptor - the site at which noise levels are monitored or analyzed.

Redevelopment - a common stategy of many urban governments to reconstruct, and therefore revive, an area that has deteriorated to an intolerable level.

Reptiles - cold-blooded, bony animals whose skin usually is covered with scales or bony plates. The major groups of reptiles in the study area are turtles, snakes, and lizards.

Riffle - a section of a stream in which the water is shallower and the current is of greater velocity than in adjacent areas.

Schist - a metamorphic rock type made up of medium to coarse grains in which parallel layers of mica-minerals dominate the composition and gross appearance of the rock.

Scrub - a vegetation type composed of small trees, shrubs, and herbs. Stands generally are dense and less than 15 feet tall.

Scour - the deep and sudden erosion that occurs along the banks of a rapidly running stream; particularly the erosion that occurs within the bends of a meandering stream during a storm.

Section 4 (f) of the Department of Transportation Act - legislation which requires that the Secretary of Transportation (U.S. DOT) can only approve a project requiring the use of public park or recreational lands, wildlife or waterfowl refuges, or historic sites, if: (1)there is no feasible and prudent alternative to the use of such land; and (2) the project includes all possible planning to minimize harm to the land.

Section 102 (2) C (NEPA of 1969) - this legislation requires that all reports and recommendations by Federal Agencies for major actions significantly affecting the quality of the human environment must be accompanied by a detailed statement (EIS) on: (1) the environmental impact of the proposed action; (2) the adverse environmental effects which cannot be avoided if the action is implemented; (3) the alternatives to the action; (4) the relationship between the short-term and long-term effects on the environment; and (5) any irreversible or irretrievable commitment of resources.

Sediment - solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice, and has come to rest on the earth's surface either above or below sea level.

Sedimentation - the depositing of sediment.

SEPTA - Southeastern Pennsylvania Transportation Authority: the principal public transportation operator in the Delaware Valley Region.

Service Volume - the maximum number of vehicles that can pass over a given section of a lane or roadway in one direction on multilane highways during a specified time period while operating conditions are maintained at a selected or specified level of service.

Sessile Organisms - motionless organisms that may or may not be attached to a substrate.

Shevky-Bell Familism Index - a socio-cultural indicator developed by Shevky and Wendell Bell to measure and compare degrees of "familism" in urban areas. The Familism Index is computed by combining separate scores for fertility of women in the labor force and single family dwellings.

Siltation - the deposition of soil particles (1/20 of a millimeter or less in diameter) in a body of water.

SMSA - Standard Metropolitan Statistical Area: a county, or a group of counties, containing at least one city (or "twin cities") of 50,000 or more population, plus any adjacent counties which are metropolitan in character and economically and socially integrated with the central county or counties.

Species - a group of individual animals or plants capable of breeding among themselves and having many other characteristics in common.

Stable Atmospheric Conditions - conditions which do not favor the good dispersion of pollutants; characterized by increasing temperature with height (inversion).

State Historic Inventory - a listing of those sites, buildings, structures, and objects of historical significance that may be found in the state of Pennsylvania.

State Historic Preservation Officer - the official within each state, authorized by the state at the request of the Secretary of the Interior, to act as liaison for purposes of implementing the National Historic Preservation Act of 1966; or his designated representative.

State Implementation Plan - the plan developed by the Commonwealth of Pennsylvania in accordance with the Federal Clean Air Act for the purpose of achieving federally established air quality standards.

Sub-Modal Split - the refined assignment of person trips for a particular transportation mode (i.e. Public Transportation) into its characteristic, component sub-modes (i.e. commuter railroad, El, trackless trolley, bus, etc.)

Substrate - the surface on which an organism lives; generally the soil, the stream bottom, or the face of a piling, rock, or other body.

Synergistic - joint action of two or more substances when the result is greater than or different from the sum of the individual actions.

Tax Base - those social and physical resources on which a governing body may impose tax rates and collect revenue, i.e. personal property and commercial/corporate profits.

Taxon (pl. taxa) - any unit of classification of organisms showing their relationship through evolution. Taxa referred to in this report are species, genera, families, orders, classes and phyla, in ascending order from smallest (most restrictive) to largest.

Through traffic - that traffic with origins and destinations outside of a specific study area.

Tolerant - able to exist and often thrive in the presence of a pollutant which inhibits the growth of sensitive organisms. If unqualified generally referring to organic pollution.

Total organic carbon (TOC) - a measure of the amount of carbon contained in the organic matter in a sample of water. The test requires the burning of the sample and measurement of the amount of carbon dioxide produced.

Transit Network - that complex of commuter railroad, rapid and light-rail transit conveyances (i.e. Lindenwold Line), trackless trolleys, and buses that collectively define the public transportation facilities of a region.

Trolley - a public conveyance for passengers that runs on tracks with motive power derived from an overhead electric powerline.

Turbidity - an expression of the property of materials in water to scatter and absorb light rather than allow it to be transmitted in straight lines.

Understory - or shrub layers, is composed of upright and twining woody plants with the bulk of their foliage less than 6 feet in height.

Vacancy Rate - the percentage of unoccupied dwelling units in a census tract at any particular point in time.

Vehicle Miles Travelled (VMT) - an approximated statistic representing the daily accumulated mileage for all vehicular movements.

Vertebrates - animals that have a bony skeleton, particularly a backbone composed of vertebrae. Major vertebrate groups in the project area are fish, amphibians, reptiles, birds, and mammals.

Vertical Mixing - the process by which pollutants are dispersed and/or divided; caused by temperature changes which exist in relation to elevation changes.

Viaduct - an elevated roadway consisting of a series of short spans supported on piers.

Volume to Capacity Ratio (v/c) - the ratio of demand volume (or service volume) to capacity for a particular highway link. The v/c ratio and travel speed are the two statistics most frequently used by traffic engineers in identifying "Level of Service".

WASP - an acronym for White-Anglo-Saxon-Protestant. A negative term used in reference to a particular group with a common sociological background.

Water Table - the upper surface of ground-water, or that level below which the soil is saturated with water; the locus of points in soil water at which the hydraulic pressure is equal to atomospheric pressure.

Wissahickon Formation - a belt of highly metamorphic and heterogeneous Mica Schists which reaches from Philadelphia to the Potomac River and beyond.

Zonal - pertaining to an area with predefined boundaries that is utilized in transportation planning analyses for the purpose of statistical evaluation, i.e. for determing a locus for trip origins and/or trip destinations.

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