TRANSPORTATION PLAN

In association with:
Killinger - Alberto, Inc.Prepared by:
Glatting Jackson Kercher Anglin Lopez Rinehart, Inc.Prepared for:
The City of New Castle, Sponsored by WILMAPCO, and The Delaware Department of Transportation

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1.0 Introduction

1.1 Purpose of the Study

New Castle is a small city on the shore of the Delaware River. Established in the late 1600s, New Castle is nationally distinguished for its historic character, cultural heritage, and colonial architecture. Residents of New Castle have long recognized its urban fabric as a valuable asset. Many residents are members of families who have resided in New Castle for many generations.

The original town plan incorporated traditional design features such as: an interconnected street network, quarter-mile radii for walkable neighborhoods, a geometrically defined town center, a concentration of different land uses integrated within parks and public buildings, and an urban design that reinforces the street as the dominant element of the public realm.

However, New Castle has not been insulated from the continued growth of Wilmington and the surrounding region. Regional, commercial, industrial, and residential growth has encroached and blurred the edge between the City's historic town center and that of the surrounding suburban countryside. The City's historic resources and proximity to the river have earmarked the City as a regional destination.

The transportation system serving the City is evolving. Regional growth expanding from both Wilmington and Newark and its corresponding growth in traffic is impacting the quality of life in New Castle. Consequently, the City, the Delaware Department of Transportation, and the Wilmington Area Planning Council (WILMAPCO) teamed together to sponsor the development of a transportation plan for the City of New Castle.

The purpose of the study is to establish a vision to ensure the City's transportation system is a contributor, not a burden, to the City's quality of life. The Transportation Plan will establish the framework and policy recommendations necessary to establish common ground between continued regional growth, needed transportation planning, and the traditional urban fabric of New Castle.

1.2 Purpose of the Report

New Castle's urban fabric has evolved through careful planning and sensible urban design. The transportation system has developed with pedestrians, transit, and private vehicles sharing roles in providing Citywide mobility. The future success of New Castle is dependent upon the maintenance and enhancement of its unique urban form such that it continues to promote a high quality of life.

Because of this, New Castle's future mobility needs will not be met by accommodating vehicular demand at the expense of community fabric. In fact, the provision of more street capacity may no longer be the most important feature in the City's mobility future. Emerging with greater promise of mobility gains for residents are a broad spectrum of measures that reinforce and expand the urban fabric of New Castle including, walking, bicycling, transit, and traffic calming.

The purpose of this report is to address all of these sources of mobility with a transportation urban design analysis approach that first identifies existing assets, strengths and challenges, then subsequently identifies needs (current and future), and finally suggests strategies for translation into an action program.

1.3 Organization of the Report

This report is organized into seven (7) chapters. **Chapters 2 and 3** define the existing regional and local context. Regional and local issues influencing the transportation system will be identified, and opportunities for potential solutions will be addressed. **Chapter 4** examines traffic circulation issues throughout the City. Parking is discussed in **Chapter 5**, while **Chapter 6** examines pedestrian, bicycle, and transit circulation. **Chapter 7** identifies urban design issues that will contribute to improving the transportation system while preserving the character and quality of New Castle. **Chapter 8** documents an implementation strategy for the City, Department of Transportation, and WILMAPCO.

Regional Growth patterns and major environmental systems influence the form and function of the regional transportation network. This initial section examines New Castle's regional context and transportation issues beyond its borders that influence the transportation system within the City of New Castle.

2.1 Regional Land Use

Approximately 5,000 people reside in the City of New Castle, while approximately 450,000 people live in New Castle County. The City of New Castle is located south of Wilmington and east of Newark. *Figure 2.1* shows land uses throughout the Wilmington-Newark-New Castle area. At first glance, the City's position in the region indicates that the existing population base and the majority of employment centers are located north and west of the City and, therefore, do not directly impact travel patterns within the City of New Castle.

Figure 2.1 Regional Land Use Pattern

However, regional population and employment growth is expanding south of the Chesapeake & Delaware Canal into southern sections of New Castle County. This evolving development pattern is affecting the City of New Castle's transportation system. This historic, cultural, and environmental quality of New Castle are unique to the country and the region. Tourism traffic is an important element to the transportation system.

2.2 Regional Environmental Features

Environmental systems dictate the location and intensity of future development. The location and type of environmental features also have direct implications on the kinds of transportation improvements available to the region, given strict regulations and the need to preserve environmental resources.

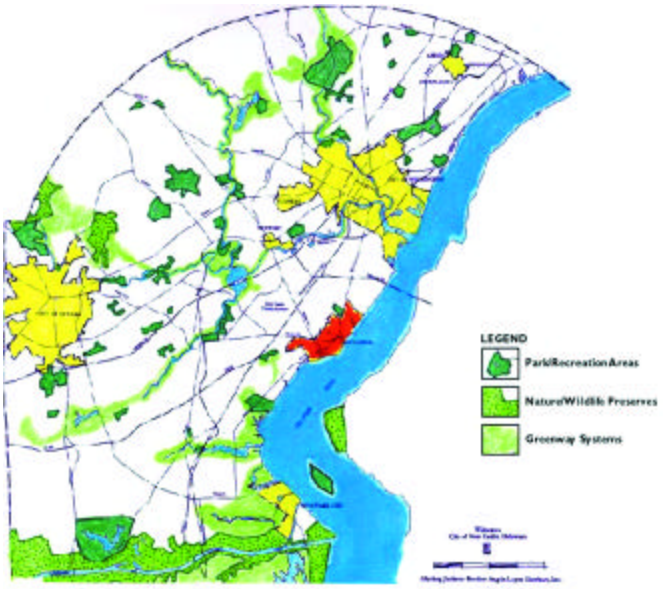

Figure 2.2 Regional Environmental Features

Due to the City's location south of Wilmington, it is important to investigate the possible extent of future development that could occur south of New Castle, particularly along State Route 9. *Figure 2.2* highlights the major environmental features in the Wilmington-Newark-New Castle area, particularly wetlands. The Delaware River is the major environmental feature in the region. Many areas south of the City of New Castle, east of State Route 9, are natural wetlands. Therefore, it is apparent that the majority of future development will occur in land away from the river, west of State Route 9.

2.3 Regional Population Centers and Transportation Network

Generally, traffic patterns in New Castle County flow to-and-from the north. One notable exception is weekend vacation travel headed toward the beaches. New Castle's position on Route 9 between population centers, particularly Wilmington and the beach resorts of Sussex County, creates reverse travel patterns on summer Friday evenings.

Regional population growth and environmental features, at first glance, appear to indicate that the City may not be significantly affected by regional travel patterns. Consequently, the majority of regular travel movements through New Castle, with the exception of beach travel, consist of either an origin or destination that is local to the New Castle area. However, growth in southern sections of the County is affecting, and has the potential to worsen, traffic patterns within the City of New Castle.

The predominant regional traffic issue in New Castle concerns managing existing and future traffic that is traveling clear through the City, either to developing areas along Route 9 or weekend traffic to the beach.

Figure 2.3 shows the location of New Castle within the northern section of New Castle County. Included in the diagram are jurisdictional boundaries of Wilmington and Newark along with the regional transportation network serving the County. Delaware Department of Transportation and WILMAPCO have developed a regional transportation system that is effectively serving the evolving traffic patterns of the Wilmington Metropolitan Region.

Figure 2.3 Regional Transportation Network

U.S. 13 is the primary roadway serving existing north-south travel out of Wilmington. Route 9 is performing auxiliary functions to U.S. 13. At a regional level, transportation problems in New Castle are related to the ability of U.S. 13 to accommodate north-south traffic flow in the region.

The Department of Transportation has developed a statewide Long Range Transportation Plan and WILMAPCO has developed its Metropolitan Transportation Plan (MTP) consistent to the needs of the region and the City of New Castle.

It is important to identify the regional issues that will improve the quality of life in New Castle. The following items summarize regional issues important to the city.

Regional Issues and Observations

1) **Travel capacity-fixed guideway transit and possible ferry service within the County** - Future regional

growth continues to expand into southern New Castle County. It appears that the residents of New Castle do not support the widening of roads within their jurisdiction. Therefore, it is assumed they will understand communities along other north-south routes also resisting continued widening of roadways within their own communities. However, regional growth requires additional north-south capacity. Residents in New Castle have indicated support for improving regional north-south capacity with alternative modes of travel, particularly premium transit in the form of fixed guideway transit as well as possible river ferry service connecting Wilmington with New Castle and southern areas.

2) **Land Development Regulations** - It is recognized that development will continue to occur in southern sections of New Castle County. Residents of the City of New Castle are not requesting that New Castle County prohibit growth; they have indicated a desire to support alternative modes of travel. Therefore, it is important for New Castle County to develop land development regulations that encourage development along identified transit corridors creating design standards that promote walking, cycling and riding transit as viable partners in a balanced regional transportation system.

3) **Project Coordination -** The Department of Transportation has a Transportation Enhancement (TE) pavement rehabilitation project for SR 9 from Delaware Street to Sixth Street currently in design. Appropriate elements based on recommendations made in this report will be implemented as a part of this project.

4) **ITMS -** The Department of Transportation is in the process of implementing Integrated Transportation Management System (ITMS) strategies for U.S. 13 including the State Route 273 intersection. The project, scheduled for FY 1999-2000, will address signal coordination and phasing along U.S. 13 and should reduce the number of diverted trips that are loading onto State Route 9.

5) **Enforcment -** Enforce truck traffic restrictions on bridges south of New Castle on Route 9 - Currently, trucks exceeding bridge weight capacities are inappropriately using Route 9. Enforcement will assist in managing this issue.

6) **Wayfinding -** Study Roadway Signing Issues relating to the use of Route 9 as an alternative travel route to U.S. 13.

Transportation issues extend beyond the transportation network, especially in a community with as rich a heritage as New Castle. The local context of New Castle must be fully examined to establish a baseline of understanding before any analysis and recommendations can be made.

Transportation systems do not operate in a vacuum. Transportation systems are directly influenced by physical and social environments. The physical environment is generally defined by the roadway network, building architecture, and environmental features. The social environment dictates the level of activity that occurs within the built environment. The social environment is responsible for generating travel patterns.

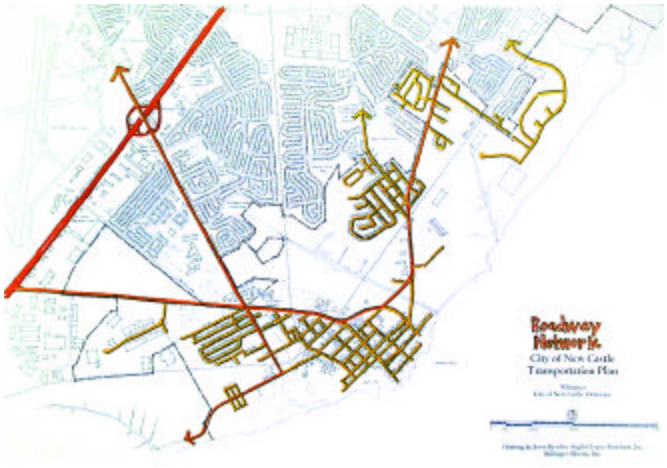

Figure 3.1a Local Roadway Network

3.1 Local Roadway Network

The City of New Castle has an interconnected roadway network, with a logical hierarchy. *Figure 3.1a* shows the City's roadway network, including regional thoroughfares and local roadways. The state roadways in and adjacent to New Castle are Routes 9, 141, and 273, with Route 13 serving as a regional spine northwest of the City. The local roadways, shown in yellow, vary from those carrying only neighborhood traffic to those, like 6th Street, that presently carry a large share of regional through-traffic.

Figure 3.1b Posted Speed Limits

Posted speed limits generally define street hierarchy as well as illustrate the travel behavior. *Figure 3.1b* shows the posted speed limits throughout the City, with the lower speeds reflecting potential "cut-through" residential and historic areas, and the higher speeds coinciding with the intended regional roadways.

Traffic control devices manage traffic flow. Known locations of traffic control devices enhance opportunities for traffic calming measures. *Figure 3.1c* illustrates the locations of auxiliary left-turn lanes and traffic control devices, including speed bumps, flashing signals, and full signals within the City.

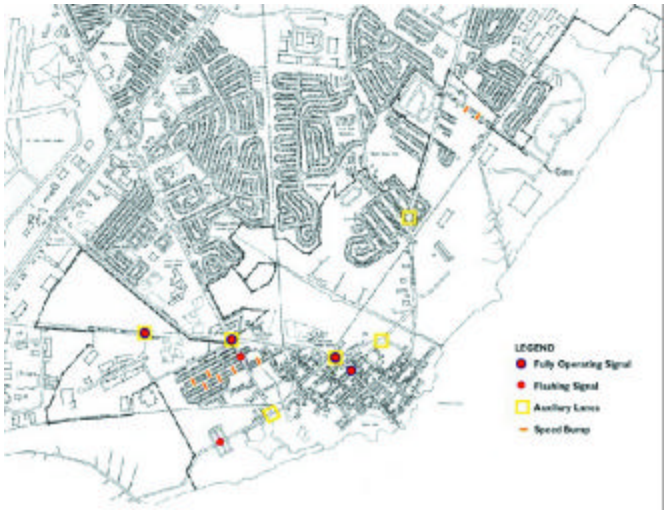

Figure 3.1c Control Devices

Traffic volumes define street hierarchy and potential regional cut-through problems. Traffic volumes for the major roadways through the City are shown in *Figure 3.1d*, including both 1998 base figures and 2020 projections. The latter assume a 1.5% annual growth rate for Routes 13, 273 and 141 and a 1% growth rate for all other roadways. These same growth rates have been applied to all the Highway Capacity Analyses performed for this report.

Finally, *Figure 3.1e* identifies the distribution of on-street parking throughout the City, which affects traffic speeds, volumes, and, naturally, parking supply. The issue of parking in New Castle is discussed in detail in Chapter 5.

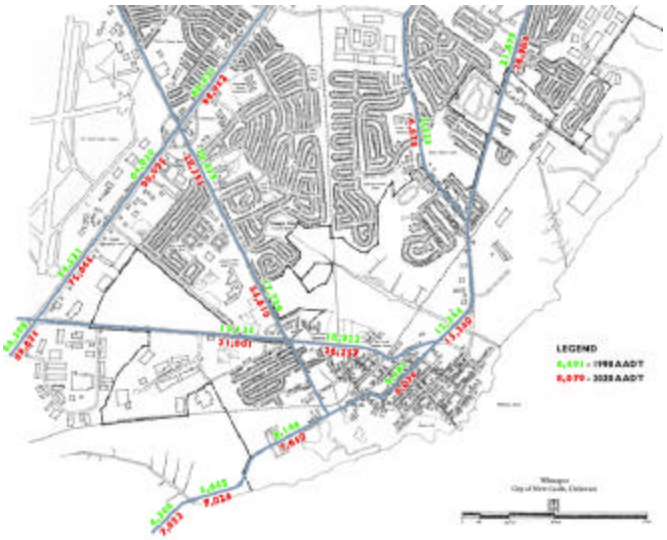

Figure 3.1d Traffic Volumes

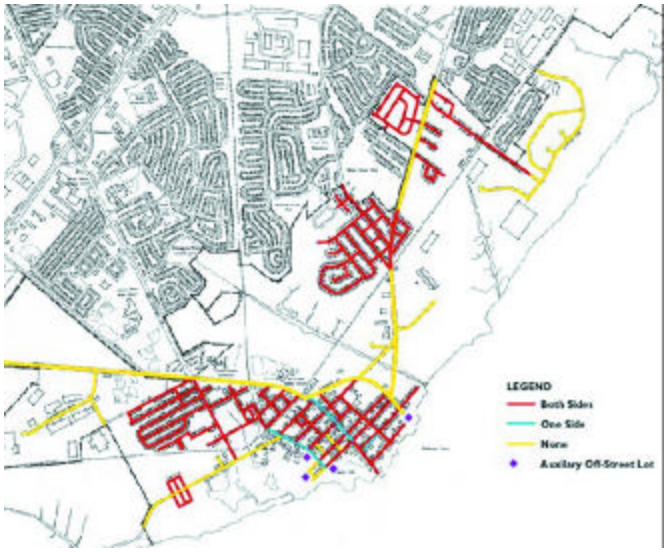

Figure 3.1e Parking Inventory

3.2 Building Figure Ground

The urban design context of New Castle ranges from its compact, pedestrian-scale historic center to the large-scale industrial complexes of Centerpoint Boulevard, Riveredge Industrial Park, and the Chicago Bridge and Iron Site. *Figure 3.2a* shows this diverse range of building scales. *Figure 3.2b* is a blowup of the historic core, clearly showing the consistent pedestrian frontage and small building scale.

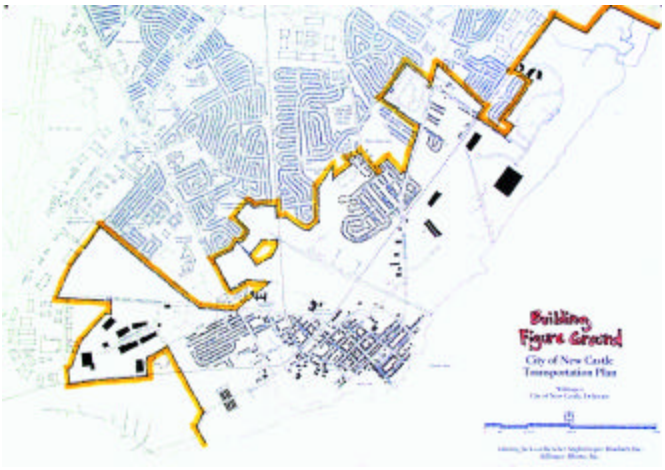

Figure 3.2a Figure Ground

Figure 3.2b Town Center Figure Ground

3.3 Environmental Features

Environmental assets and constraints play a large part in the range of measures that can be taken to solve New Castle's transportation challenges. Because of its location along the Delaware River, the City contains many wetland areas, shown in *Figure 3.3,* that cannot be built upon without extensive drainage and permitting. The extent of these wetland areas is such that penetrating them with new roadways in these modern times would face strict regulations and prohibitive costs. On the other hand, these features make clear positive contributions to the trip quality through the City, helping to create a coveted "town and country" experience.

Figure 3.3 Environmental Features

3.4 Commercial Areas

Commercial areas within New Castle are important in the context of this study because they are high destination areas for automobile and pedestrian traffic. *Figure 3.4* shows the commercial areas of the City of New Castle. These include the historic commercial core along Delaware Street, the automobile-oriented commercial centers along Ferry Cutoff, the commercial area along South Street and Seventh Street just southwest of the historic core, and a commercial center nestled along Route 141 just inside the City limits.

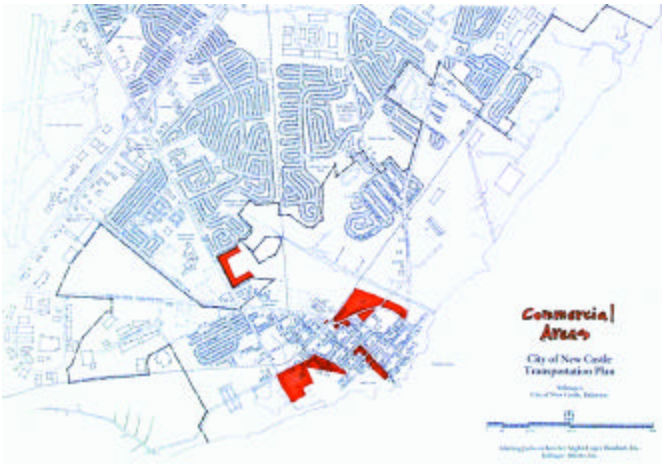

Figure 3.4 Commercial Areas

3.5 Industrial Areas

Travel to and from industrial areas is likely to generate sharp peaks coinciding with the morning and evening rush hours, because these areas are overwhelmingly employment-oriented. It is important to assess these areas of truck traffic in terms of both accommodation and safety. *Figure 3.5a* illustrates the industrial areas in New Castle, including the booming Riveredge and Centerpoint complexes and the old CBI site. It is very important to acknowledge these locations because of their current and future job potential as well as potential impacts on residential areas.

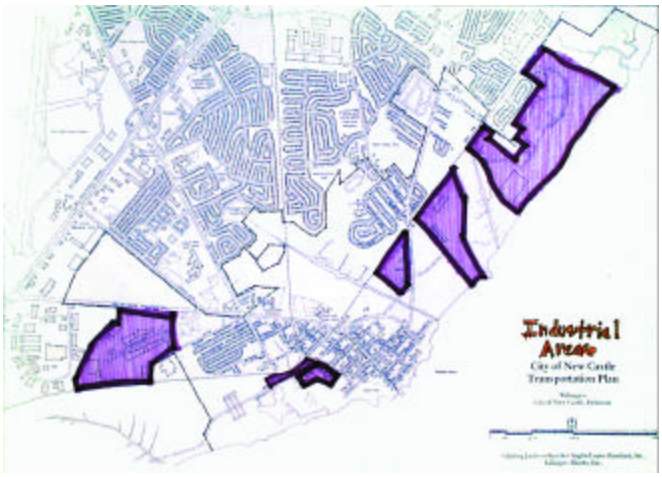

Figure 3.5a Industrial Areas

The old Chicago Bridge and Iron Site has depended on access from Wilmington Road via Sixth Street. As truck traffic has increased to the industrial site, vibration and traffic impacts to the cemetery and nearby historic structures have increased.

It is recommended that the City of New Castle shift access to the Chicago Bridge and Iron Site north from Sixth Street to City owned Right-of-Way. Access from Wilmington Road would shift north opposite of the City's Trolley Barn. Sixth Street would be closed with a cul-de-sac. This is shown in *Figure 3.5b.*

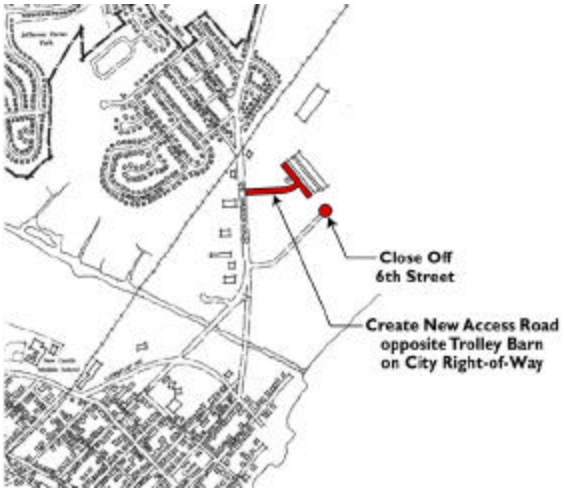

Figure 3.5a Chicago Bridge and Iron Site Recommended New Access

3.6 Residential Areas

Residential areas, which cover a large portion of the City's landmass, are shown in *Figure 3.6*. These residential areas constitute trip "productions" for trips both internal and external to the City of New Castle. It is also important to map residential areas because these areas are the most sensitive to traffic volumes.

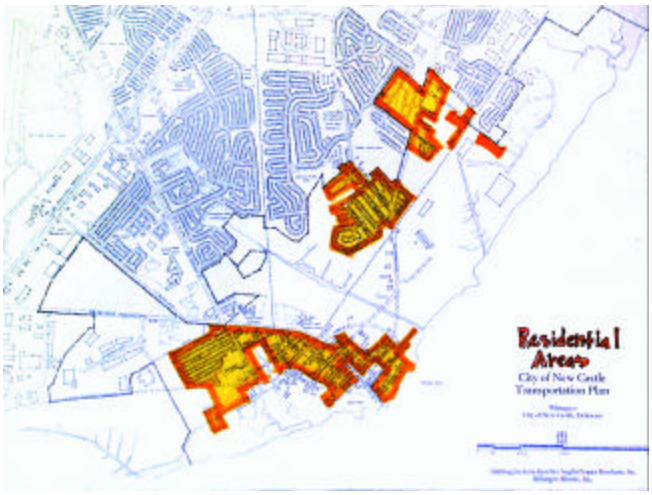

Figure 3.6 Residential Areas

3.7 Parks and Open Space

New Castle is enriched with numerous parks and an extensive greenbelt. In 1762, William Penn established the 13-member Trustees of New Castle Common to preserve the historical City and to manage land and open space now held in trust. Because of this, the City has a well-established open space network surrounding the City. Due to its position along the edge of the Delaware River, a major portion of the City's surface area is classified as "wetlands." As a result, the combination of Trust land and wetland, as shown in *Figure 3.7*, improves the environmental quality of the region, but also serves as a constraint to further development of the City's transportation network. Supplementing this "natural" open space are the land holdings of the New Castle Trust and the "recreational" open spaces of Battery Park and related public facilities.

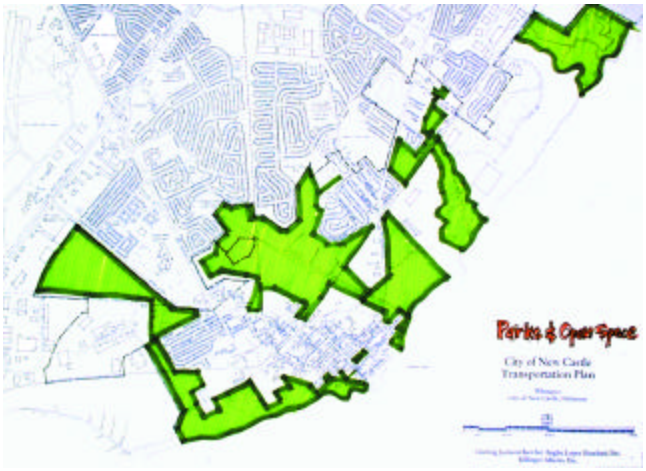

Figure 3.7 Parks and Open Space

3.8 Issues and Opportunities

New Castle is a unique community with real transportation issues. Issues facing the City can be classified into three (3) categories: Route 9, traffic calming, and downtown parking. *Figure 3.8* illustrates the basic transportation issues facing the City of New Castle.

Regional north-south traffic is increasing in the City. The physical configuration of Route 9 invites the growing traffic to travel through the City rather than encouraging motorists to use the designated Route 9 around the City. Therefore, many residential areas within the City are experiencing a high volume of cut-through traffic. Cut-through traffic is traffic that has neither an origin nor a destination within a particular area, i.e., it is just passing through.

Figure 3.8 Issues and Opportunities

The historic town center of New Castle is a national treasure for many reasons. In addition to its rich heritage and proximity to Battery Park and the Delaware River, the town center houses many residents. Unlike many towns throughout the United States, people actually live in the town center of New Castle. The combination of town center visitors, park users and residents tend to maximize parking demand in the summer months.

4.1 Background

The overriding issue with Route 9 through New Castle is that its design invites traffic onto local streets rather than accomplishing its originally intended objective of bypassing traffic around the historical part of the City. *Figures 4.1a and 4.1b* highlight this issue This "inviting" of traffic into the old part of the City, occurring at four locations, is due simply to the geometrics of intersections along Route 9, resulting from the cobbling together of four existing streets and roads to form Route 9 over the past decades:

• **At Third Street,** Route 9 bends while Third Street forms a direct connection into/out of the old City. Thus, it is more inviting for some traffic to continue into the City rather than follow Route 9.

• **At Sixth Street,** there is an even more pronounced invitation for traffic to continue into the City (on Sixth Street) rather than make the angled turn to continue on Route 9 *(see Figure 4.1c).* Several other features about the Route 9/Sixth Street intersection further reinforce the tendency for traffic to come into the City rather than bypass it. This "invitation" also applies in reverse. Traffic going northbound is given a direct and easy connection to Route 9 northbound, further encouraging the use of Sixth Street through town.

Figure 4.1a Reconsider Route 9

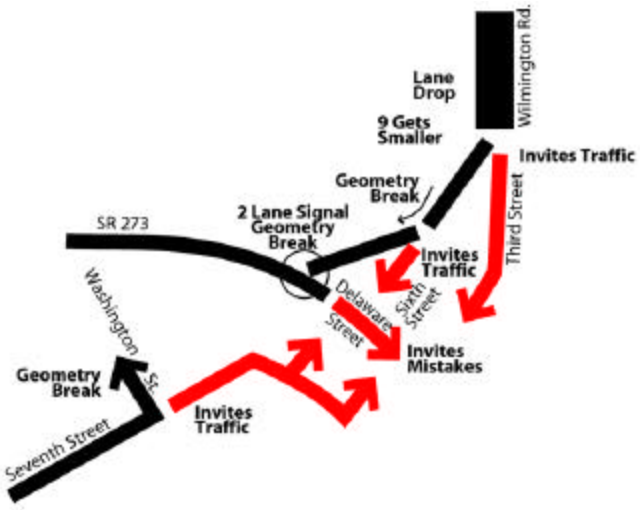

Figure 4.1b Route 9 - The Problem

Figure 4.1c On Route 9 looking south toward Sixth

• **At Delaware Street,** the historical alignment of the streets invites traffic into the City on Delaware Street, as opposed to continuing their bypass on Route 9 *(see Figure 4.1d).* While such rerouting is more of a "mistake" on the part of the driver rather than a short cut, it nevertheless is one more apparent discontinuity in Route 9, and constitutes one further reason why traffic is discouraged from using Route 9.

• **Seventh Street,** approaching the City from the south, there is strong incentive to continue on Seventh Street into the old part of the City (then onto Sixth Street, then rejoining Route 9 at Sixth Street), rather than following Route 9 around the old City by making the right-angle turn onto Washington Street, the signed Route 9 *(see Figure 4.1e).*

In short, the succession of three angular intersection geometrics (at Third Street, Sixth Street and Delaware Street) are disincentives to stay on Route 9. The traffic signal at Route 9 and Delaware Street is yet another disadvantage of Route 9 compared to the alternate routes. Some alternate cut-through routes encounter no traffic signal at all, others encounter only the Delaware Street/Sixth Street signal, a short, two-phase signal in a pleasant surrounding, which contrasts sharply with the lengthy multi-phase signal in a thoroughly unpleasant surrounding at a Delaware Street and Route 9.

In the interim, a 3-way stop sign configuration could assist in the immediate term to assist in alleviating speeding on Seventh Street. Once implemented, the City and the Department of Transportation should evaluate the 3-way stop sign intersection and its impact on cut-through traffic downtown.

Figure 4.1d Delaware Street looking West on Route

Figure 4.1e On Seventh Street looking North into town. Route 9 turns West on Washington Street

4.2 Route 9 Additional Observations

A further invitation for traffic to cut through the old part of the City rather than follow the signed Route 9 is the difference in distance involved. It is around 0.6 of a mile shorter trip through the City on a combination of the "cut through" routes of Sixth and Seventh Streets, as opposed to the use of the signed Route 9 around the old City.

Figure 4.2a shows the implications of the indirect routing for through-traffic, in terms of typical travel times. The yellow route represents the signed, official Route 9, while the orange route portrays the cut-through route through the City along Sixth and Seventh Streets. In each of the cases shown-mid-day, weekday evening rush, and Friday evening rush-the travel times through the City are lower than those along Route 9.

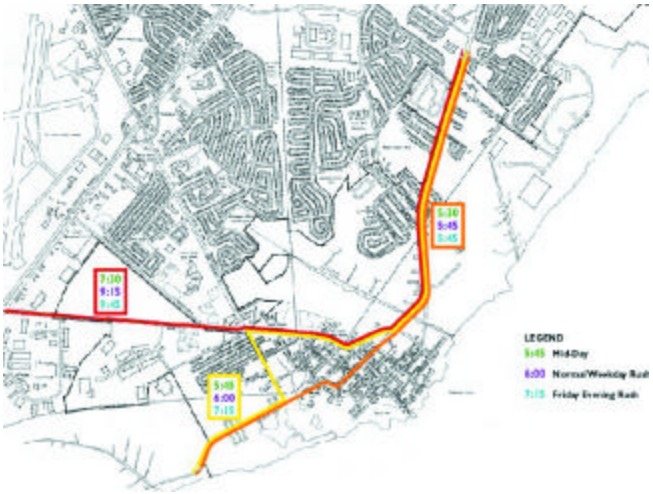

Figure 4.2a Travel times through city

Not only do the designs of Route 9 intersections and Route 9's longer overall length invite traffic into the City, but Route 9's cross-sectional design also actively discourages its use around the City. At precisely the point at which Route 9's capacity should be at a maximum (when bypassing the old City), its capacity is, instead, at a minimum (four lanes to the north of the old City but only two lanes around the old City). In a southbound direction, the lane drop (i.e., the point at which two southbound lanes become one) occurs at Sixth Street, presenting one of the stronger invitations to leave Route 9 and cut through the old City.

Figure 4.2b Sixth Street in town is worth the trip

The physical appearance of Route 9 is itself a disincentive for its use. As it bypasses the old City (i.e., between Sixth Street and Washington Street), the predominant atmosphere, to the driver's eye, is roadside blight. Contributing to this blight are strip commercial buildings with their parking prominently displayed in front of the buildings, indeterminate roadside access points, lack of vegetation, discordant commercial signs and absence of pedestrians or other signs of attractive street life. By contrast, the alternate "cut-through" route using Sixth Street and Seventh Street immediately surrounds the driver with noteworthy colonial buildings, lush vegetation, active streets and other interesting scenery *(see Figure 4.2b).* Even if the cut-through route were longer, some users would choose to use it purely for its aesthetic qualities. With the cut-through route both shorter and beautiful, it's little wonder that it attracts a significant portion of the through-traffic volume that "should" stay on Route 9.

Cut-through traffic, already cited as a major problem by a strong consensus of area residents, will only become more aggravated with time. The continued development of residential subdivisions along Route 9 south of New Castle will generate continued through traffic (i.e., traffic with neither origin nor destination) in New Castle. This traffic should be channeled onto Route 9 and channeled away from the historical center of New Castle. Closer to (and even within) the City of New Castle, continued industrial and office park expansion will further add to the travel demand on Route 9 and, consequently, add to the demand for cut-through traffic in the old City.

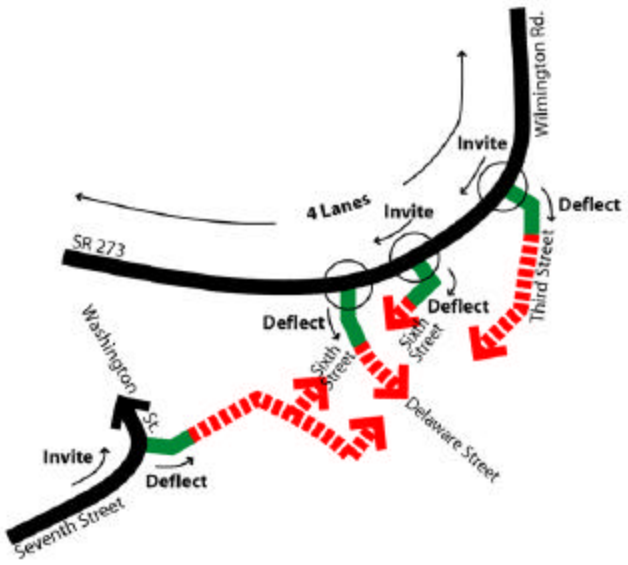

Figure 4.3a Route 9 - The Fix

4.3 Strategies for Improving Route 9

A clear and simple strategy for improving Route 9 was evident in the input from residents, stakeholders and the Steering Committee. This strategy consists of two complementing actions:

• **Invite through traffic (i.e., traffic with neither origin nor destination in New Castle)** to stay on Route 9 around the old City. Inducements involve the size of Route 9, its continuity, its intersection geometry and its appearance.

• **Discourage through traffic from leaving Route 9.** Measures include intersection redesign, deflection of alignment of intersecting streets, traffic control devices and signs.

This combined strategy of inviting traffic to remain on Route 9 while simultaneously discouraging it from leaving Route 9 and cutting through the old part of the City translates into the following recommended actions, as depicted in *Figure 4.3a.*

• **Continuous Four-Lane Section around the Old City -** Rebuild the section of Route 9 between Sixth Street and Washington Street to accommodate four lanes (two lanes of traffic in each direction), and short sections of left-turn lanes at key locations, if necessary. This measure removes the incentive for cut-through traffic that is currently caused by the narrowing of Route 9 as it nears the old part of the City. The proposed four-lane, urban cross-section (i.e., with the use of curbs) and potential left-turn lanes can be built within the existing paved space, which presently exhibits a rural cross section (i.e., no curbs) with wide shoulders *(see Figures 4.3b through 4.3d).*

As improvements along Route 9 are advanced through design and construction, drainage and flooding problems should be addressed along with roadway improvements. Two flooding areas along Route 9 identified by residents through this process include Route 9 at Carrie Dowie Elementary School and the intersection Route 9 and Sixth Street. Improvements such as improved drainage or raising the road should be considered as long as they contribute to the desired pedestrian qualities of the corridor.

Figure 4.3b Bird's eye view of Ferry cut-off

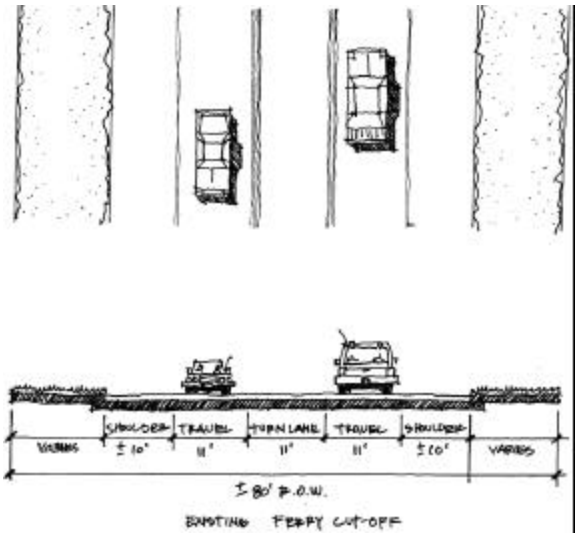

Figure 4.3c Existing cross section of Ferry cut-off

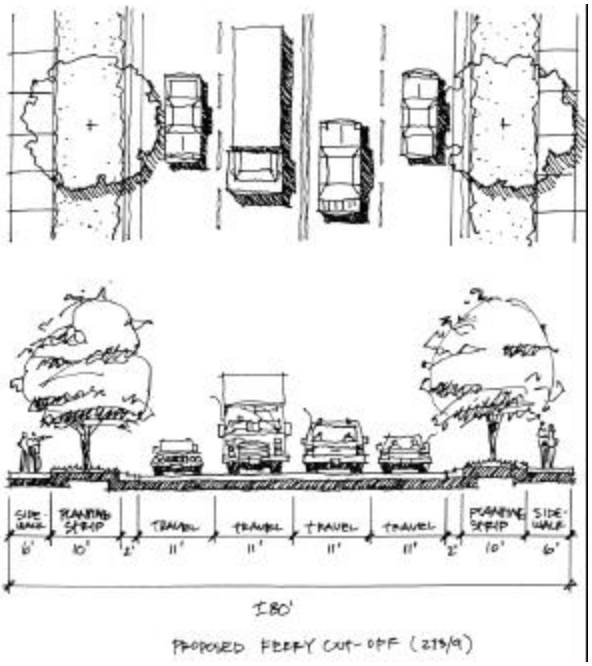

Figure 4.3d Potential cross section of Ferry cut-off (Route 9)

• **Revise Intersection Geometry along Route 9 -** To encourage continuity on Route 9, while discouraging turning movements on/off Route 9, revise the intersection geometry along Route 9. Intersection revisions will allow the City of New Castle to develop distinct gateways along Route 9 at Delaware and Sixth Streets, as shown in *Figure 4.3e*. In total, there are four such locations requiring geometric changes:

a. Realign the northern end of Third Street so that it intersects with Route 9 at a right angle intersection, with the "through" (i.e., straight) part of the T-intersection being Route 9. Also, eliminate the dropping of a lane of traffic on Route 9 at this point.

b. Realign the northern end of Sixth Street to meet Route 9 in a T-intersection favoring through movement on Route 9. "Smooth" the bend on Route 9 into a more continuous movement, replacing the existing condition shown in *Figure 4.3f*. A potential designs for this intersection is shown in *Figures 4.3g*. The alternative design creates two "T" intersections at Sixth Street and the Ferry Cut-off. A full signal is provided at Sixth Street, while the Ferry Cut-off would assume a "right-in, right-out" operational status. A public square could be located between the two intersections creating a unique opportunity to create a significant northern gateway to the City. *Figures 4.3h* illustrates urban design opportunities with a public square incorporated into the intersection's design.

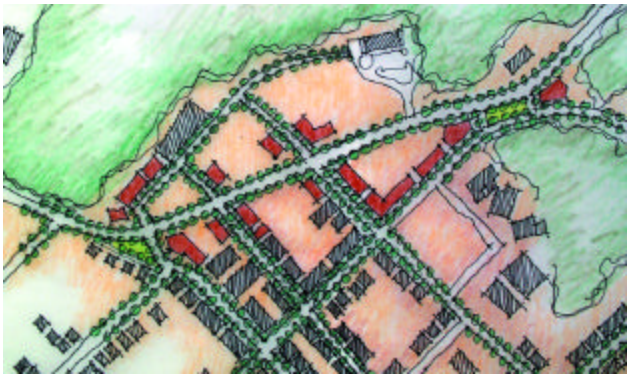

Figure 4.3e Plan view of Ferry cut-off incorporating new intersection geometry

Figure 4.3f Existing condition at Sixth and Chestnut

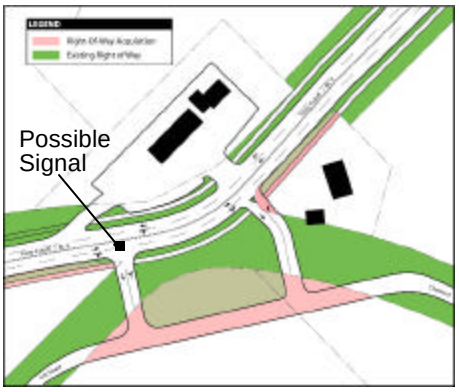

Figure 4.3g Alternative design concept for Sixth and Chestnut

Figure 4.3h Revised intersection at Sixth Street and Chestnut (looking South towards Sixth Street)

c. At Delaware Street *(shown in Figure 4.3.i)*, close up the western leg of the "triangle" formed by the original route of Delaware Street. The northern end of Delaware Street connection with Route 9 will then form a T-intersection favoring the through movement on Route 9. The present "slip ramp" at this location for northbound traffic offers no resistance to high-speed traffic and fails to properly transition motorists from a high-speed, highway environment to a low-speed, town center environment. The existing and proposed conditions are illustrated in *Figures 4.3j through 4.3n.* In the proposed design, traffic bound for Delaware Street would slow down to make a right-angle turn into the historic center. The slip-ramp is redesigned as a low-speed driveway - perhaps with textured paving - to ensure continued access to the businesses at the corner.

Figure 4.3i Existing photo of intersection at Delaware Street and Route 9

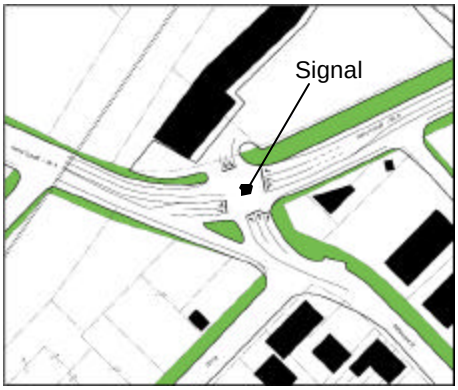

Figure 4.3j Existing configuration of intersection at Delaware Street and Route 9

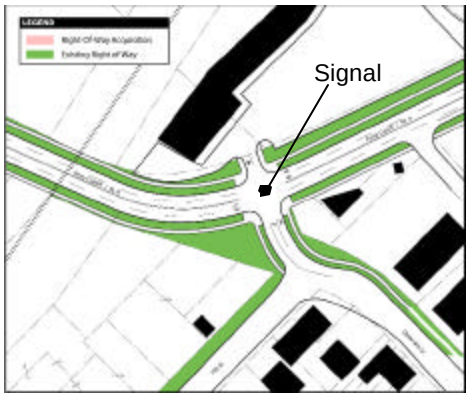

Figure 4.3m Alternative design concept for Delaware and Route 9

Figure 4.3n Revised intersection at Delaware Street and Route 9 (looking South down Delaware Street)

d. At Wilmington Road (Route 9) and Moores Lane, the current configuration isolates each turning movement in a uncontrolled condition, creating a hazardous scenario for motorists and pedestrians alike. This "channelization" of turning movements produces an intersection much wider than necessary for its purpose, creating safety concerns. Meanwhile, adding to the confusion is a fully open unsignalized intersection at 11th Street. This condition is illustrated in *Figure 4.3o.*

As shown in *Figure 4.3p*, it is recommended that the intersection be redesigned as a signalized intersection where all movements to and from Moores Lane take place in a "T" configuration that reduces the number of conflict points to one. The median facing 11th Street on Wilmington Road would be "closed" creating a “right in and right out only” condition. Left turning movements will be focused at Moores Lane, a very feasible scenario given the proposed signal and managable turn counts. This will eliminate the existing dangerous condition for vehicles on 11th street turning left through stacked cars wanting to turn left onto Moores Lane.

Figure 4.3o Existing Wilmington Road and Moores Lane intersec-

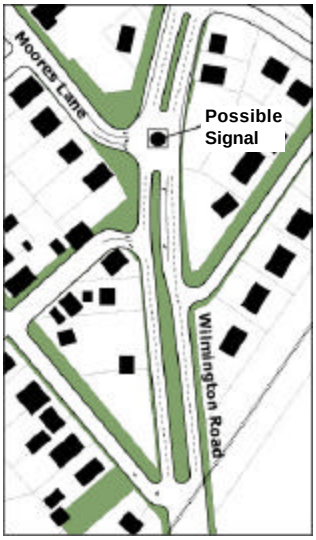

Figure 4.3p Proposed Wilmington Road and Moores Lane intersection

e. At Route 9 and Washington Street, replace the right-angled turn from Seventh Street to Washington Street with a curve *(see Figures 4.3q and 4.3r).* Provide the maximum radius of curvature consistent with existing right of way plus minimal intrusion into the adjoining property (parking lot). On the northwest corner of this location, realign Seventh Street just to the east of its current intersection with Washington Street, so that it bends slightly and meets the realigned curve (described above) in a T-intersection. The favored movement at this T-intersection is between Seventh Street to/from the south and Washington Street to/from the west. The movement along Seventh Street from the south into the old part of the City is no longer a continuous movement. Rather, this movement would require a right-hand turn from the new curve into Seventh Street northbound, and, conversely, a left-hand turn from Seventh Street southbound into the new curve. If necessary in the future, signal operation at this location should be timed to "favor" the through movement along Route 9 and, conversely, to discourage movement along Seventh Street into the old part of the City.

Figure 4.3q Existing Washington Avenue and Seventh Street Intersection

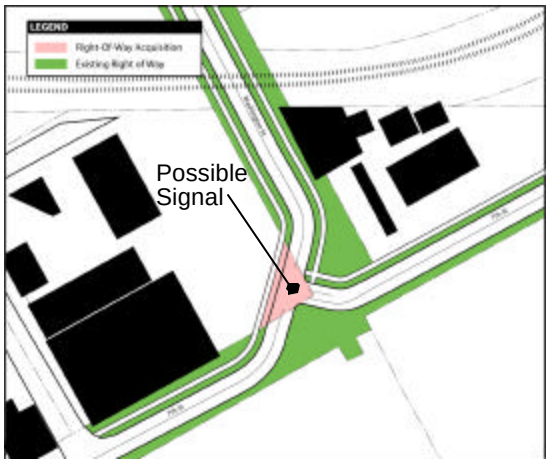

Figure 4.3r Alternative design concept for Washington Avenue and Seventh Street

Important to this proposal are further traffic management techniques along Washington Street, which traverses a residential neighborhood despite its designation as a state route. It is crucial that motorists travel through this neighborhood on the neighborhood’s terms, i.e., at safe speeds and with adquate bufffers between traffic and pedestrians. Many techniques - including physical modification, bulbouts, and landscaping - are available to achieve these ends without sacrificing the roadway’s carrying capacity.

• **Add possible traffic signals on Route 9 at Sixth Street, Third Street, and Moore's Lane.** Further analysis is needed to determine the appropriateness of new signals. If new signals are warranted, with correct timing, these signals will not add delay to through trips in the peak direction on Route 9. They will, however, discourage use of Sixth Street and Third Street as cut-through streets and will improve the pedestrian and vehicular safety and accessibility. Each intersection will be important elements of restoring an appealing urban environment to Route 9 as it bypasses the City, by calming traffic flow and improving the walking environment.

Table 4.3 lists the results of Highway Capacity Analysis applied to locations of reconfigured and proposed signals. The table includes present and future levels-of-service for both the existing configurations and for the proposed designs. The future figures were based on DelDot growth rates of 1.5% per year for Route 273 and 1% per year for the remaining roadways. The Highway Capacity Reports for these intersections are included in Appendix A.

Table 4.3

LEVEL-OF-SERVICE FOR EXISTING AND PROPOSED INTERSECTION DESIGNS

Intersection Location	Hour	1999 Level-of-Service		2020 Level-	
		Existing Design (major/minor)*	Proposed Design	Existing Design	Proposed Design
Route 9th & 11th Street	AM Peak Lunch PM Peak	A/F A/C B/F	XXX**	B/F A/D C/F	XXX**
Route 9 & Moores Lane	AM Peak Lunch PM Peak	A/E A/D C/F	A A B	A/F B/F F/F	A A B
Third Street & Route 9	AM Peak Lunch PM Peak	B/B --- B/A	A --- A	C/B --- C/B	A --- A
Sixth/Chestnut/Route 9	AM Peak Lunch PM Peak	A/C*** A/D*** B/F***	B B B	B/E*** B/F*** D/F***	B B B
Delaware Street & Route 9****	AM Peak Lunch PM Peak	B B B	B B B	C B D	B B B
Washington Street & 7th Street	AM Peak Lunch PM Peak	A/C A/C B/D	A/B A/B A/F	A/C A/C B/F	B/C A/C A/F

* For unsignalized intersections, Highway Capacity Software provides levels-of-service for the turning movements of major and minor Streets, not for the intersection as a whole. The above chart shows levels-of-service for the left-turn movement of the major (uninterrupted) street and the left-turn movement of the minor street.

** "Right-in, right-out" configuration. All other movements from Route 9 will take place at Moores Lane.

*** In order to approximate the very unusual design of this intersection, it was coded into Highway Capacity Software as a "T" intersection with Route 9 as the major route, and with Chestnut and Sixth combined as the minor route (see Appendix A). In this case, the "left-turn" movement of the major street is the movement from southbound Route 9 to Sixth or Chestnut, while the minor street "left-turn" movement is that from Sixth or Chestnut onto southbound Route 9.

**** For this intersection, assigned movements into and out of the shopping center were also taken into account.

The operational condition, or level of service (LOS), of a roadway is measured by comparing the number of vehicles expected on the road with the number of vehicles the road can accommodate (capacity). The degree of congestion increases as the volume of vehicles approaches the road's capacity. Levels of service range from "A" through "F" with "A" being the best and "F" the worst. Definitions were generated from the 1994 Highway Capacity Manual (HCM) prepared by the Transportation Research Board, shown in *Table 4.4.*

LOS	DEFINITION
A	**Free Flow:** Users unaffected by others in the traffic stream.
B	**Stable Flow:** Slight decline in the freedom to maneuver from LOS "A"
C	**Stable Flow:** Operation of the vehicle becomes significantly affected by the interaction of others in the traffic system.
D	**Approaching Unstable Flow:** High volumes of traffic, speeds adversely affected, and the freedom to maneuver is severely restricted.
E	**Unstable Flow:** Operating conditions are at, or very near capacity. All speeds are low and the freedom to maneuver is extremely difficult.
F	**Exceeding Capacity:** Point at which arrival flows exceed discharge flows causing queuing delays. Stoppages may occur for long periods of time because of the downstream congestion. Travel times are also substantially increased.

Table 4.4 LOS Definitions

• Proceed with numerous urban design initiatives (described in detail in Chapter 7) to transform Route 9 from its current character as suburban strip development to a town-like extension of the old City. These urban design improvements include landscaping along the streets, transformation of undefined parking lot spaces into local streets, site development regulations that produce village rather than strip development, and architectural controls that cause new construction to carry forward the design theme of the old City.

4.4 Signal Progression on Route 9

Adding traffic signals on Route 9 raises the issue of whether they will disrupt through traffic flow on Route 9. The signal progression diagram, *Figure 4.4,* shows that the two additional signals (one at Sixth Street and one at Third Street) can be accommodated with almost no adverse impact to the traffic flow on Route 9. In the major direction of flow (southbound in the p.m. peak period), a "perfect" progression of 30 m.p.h. between Third Street and Delaware Street, and 35 m.p.h. between Delaware Street and Washington Street can be maintained. In this "perfect" progression, a southbound motorist driving at 30 and 35 m.p.h. will encounter a sequence of green signal indications. A motorist traveling southbound at a higher or lower speed will begin to encounter either red signal indications or fragments of a green cycle.

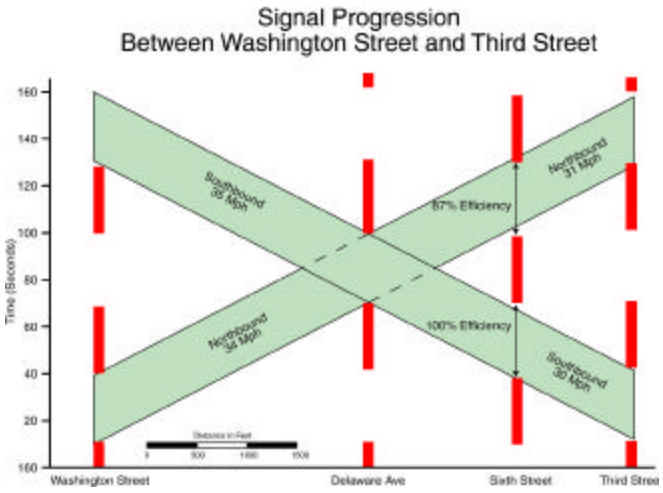

Figure 4.4 Signal Progression along Route 9

For a given sequence of signals, "perfect" progression can always be arranged in a single direction of flow. However, a high degree of progression in both directions is by no means assured. Progression in both directions depends upon the spacing of the signals, their timing and the desired vehicular speed.

In the case of the four-signal sequence (Washington Street, Delaware Street, Sixth Street and Third Street), it is possible to simultaneously achieve "perfect" progression at 30/35 m.p.h. in the peak (southbound) direction, while maintaining a very high degree of progression in the opposite direction (i.e., minor flow direction). In the minor flow direction, a progression speed of 34 m.p.h. can be attained between Washington Street and Delaware Street, and a progression speed of 31 m.p.h. can be obtained through the three-signal sequence between Delaware Street and Third Street. An almost-intact "green band" can be achieved through the signals in the northbound direction, indicating a high degree of signal system efficiency (87% efficient). This high degree of signal system efficiency translates into almost no chance of a backup from any one of the signals extending upstream to its adjacent signal.

For either direction of flow, the concern with achieving progression between Washington Street and Delaware Street is far less important than progression through the three-signal sequence between Delaware Street and Third Street because:

1) Washington Street is an existing signal, and there is, therefore, no issue of additional signals impairing the efficiency of the system, and

2) With a separation from the nearest signal (at Delaware Street) of 3,000 feet, the Washington Street intersection can be considered an "isolated" signal, for which progression is largely an irrelevant issue. Isolated signals are those that, because of their distance from the remaining signals in the system, experience an arrival pattern of vehicles that more resembles a random pattern rather than the "platoons" that are formed by sequences of more closely spaced signals.

4.5 Traffic Calming

The calming of Seventh Street *(see Figure 4.5a)* is a key issue because it reduces the potential of a severe incident at Dobbinsville while changing the expectations of travel through and around historic New Castle. The former is a large issue because the roadway to the south of town consists of a high-speed rural section, which does not change as motorists travel around the bend straight into the heart of the Dobbinsville community, as illustrated in the sequence of photographs encompassing *Figures 4.5b through 4.5e.* The flashing yellow signal presently at this location does very little to "make up" for the high-speed design of the roadway, hence creating a hazardous high-speed environment where there is a relatively high concentration of pedestrians and cyclists, many of whom are children.

In order to alleviate this situation, it is necessary to ensure that the design of Seventh Street is reconfigured to reflect slow speeds before Dobbinsville is approached. Such a revamped design would consist of a narrower overall paved width (i.e. eliminate shoulders), narrower lanes, an urban (curbed) section, street trees, and sidewalks. A narrower cross-sectional design should be extended from Dobbinsville into the historic town center, so that motorists are already traveling at low speeds by the time they get to residential neighborhoods in the historic core. Speed bumps are not recommended traffic calming solutions. Speed bumps do not provide aesthetic improvements and have an ineffective record in slowing traffic. We believe there are a wide variety of solutions available to reduce speed while improving the aesthetics of an area.

Additional traffic calming may be needed along 3rd, 4th, 6th, Washington, and Moores Lane in the future. It is anticipated that improvements and possible traffic signals along Route 9 will discourage regional cut-through traffic. However, if speeding problems persist on these streets, it is recommended the city pursue additional traffic calming strategies to manage traffic flow on 3rd, 4th, 6th, Washington, and Moores Lane.

Figure 4.5a Traffic Calm Seventh, Sixth, Fourth and Third Streets

Figure 4.5b Route 9 south of New Castle

Figure 4.5c Route 9 south of New Castle approaching

Figure 4.5d Route 9 south of New Castle in between

Figure 4.5e Route 9 in Dobbinsville

4.6 One-Way Street Considerations

In the course of the Steering Committee and public involvement meetings, July 14-16, 1999, it was suggested that Delaware Street be converted to one-way operation for most of its length, tentatively from Route 9 to Third Street. The motivation for this conversion to one-way was to gain additional parking spaces. The projected increase in parking ranges from only **fifteen to twenty spaces**, depending on decisions regarding loading zones, size of spaces, etc. as shown in *Figures 4.6a, and 4.6b.*

Gaining this amount of parking spaces falls far short of the justification for converting two-way streets to one-way operation. The number of spaces gained (fifteen to twenty) is not large, and there are several other options, none of them exhausted, for providing this amount of additional spaces in the immediate vicinity of Delaware Street. None of the other possible justifications for one-way operation (other than additional parking) are present. On the other hand, all of the disadvantages of one-way street operation would be encountered with the conversion of Delaware Street, which would include converting Harmony Street into the second half of the one-way pair to accommodate access.

One-way street operation is appropriate when at least one of the following factors is compelling and when no other remedies are feasible:

• **Capacity** - One-way streets provide a small increment (5-10%) of vehicular capacity. Under extreme traffic conditions, such as in downtown Wilmington or downtown Philadelphia, this small increment of additional traffic capacity is important.

• **Traffic Speed and Mobility** - In some instances, one-way streets are a part of a longer-distance regional or even interstate route. On such routes, the mobility of through traffic is the most important determinant of traffic operation. Local traffic needs, such as access (getting on/off the street) and the viability of fronting retail properties are sacrificed to through-traffic needs.

• **Parking** - On narrow streets (around 32 feet or less in width), a one-way operation makes the difference between the ability to have parking on both sides of the street or, conversely, the need to limit parking to one side. This situation is present on much of Delaware Street in downtown New Castle.

Figure 4.6a One-way street option for Delaware and Harmony

Figure 4.6b 15-20 additional parking spaces will become available on Delaware Street

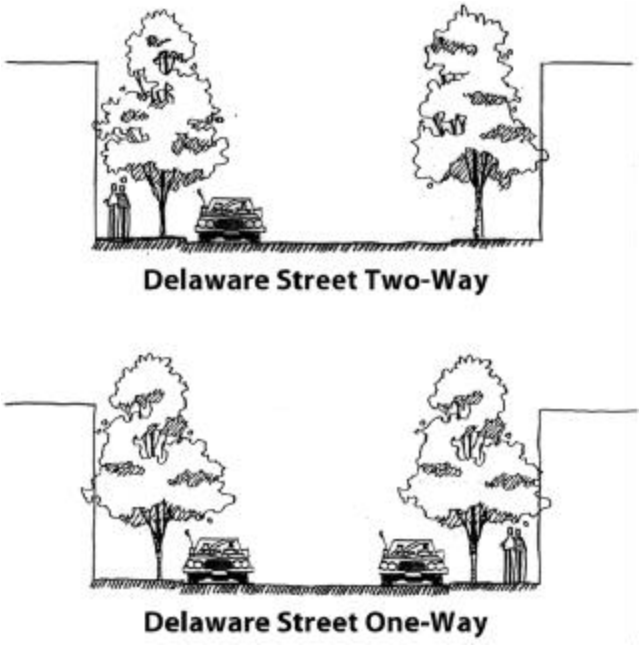

Figure 4.6c Cross Sections

• **Neighborhood Traffic Control** - In some situations, it is desirable to create a "maze" of street access throughout the neighborhood, thereby discouraging cut-through traffic, disorderly driving, drug trafficking, etc.

Of these four reasons for one-way traffic flow, only one -- parking -- has any validity for Delaware Street in downtown New Castle. The case for gaining more parking through one-way operation, furthermore, is not compelling, since several other options for gaining additional parking have not yet been exhausted. These options include small "vest pocket" off-street lots, nighttime use of commercial parking and neighborhood parking permits.

The disadvantages of a one-way traffic operation have received considerable attention recently, as cities seek to "take back" their downtown streets from their long-standing domination by traffic. Among the well-documented disadvantages of one-way traffic are:

• **Vehicular Speed** - Speeds are higher with one-way traffic because of: (1) the wider traveled way that is available as the traffic lane is converted to a parking lane, and (2) the absence of on-coming vehicles.

• **Turning Movements** - Vehicular turning movements are always greater in a given area with one-way streets compared to the same area with two-way streets. The reason is simply that all destinations require more turning movements for their access, either on the inbound trip, the outbound trip or frequently both. For a typical smaller downtown, a one-way street system is likely to increase the total vehicular turning movements by 60% compared to two-way streets. All turning movements result in the possibility of a legally turning vehicle conflicting with a legally crossing pedestrian.

• **Vehicle Miles of Travel** - One-way streets generate more vehicle miles of travel than two-way streets, due to the re-circulation ("going around the block") caused by one-way operation. Typically, for a small downtown, one-way streets generate an increment of around 20% of the vehicle miles of travel compared to two-way streets. Re-circulation becomes an even greater problem as main streets, as well as cross streets, are made one-way.

• **Pedestrian Comfort and Safety** - Pedestrians are more comfortable on streets that have traffic that both approaches as well as overtakes them. Pedestrian safety at intersections, frequently thought to be better for intersections of one-way streets, is not necessarily improved at one-way streets because of: (1) the large number of possible sequences of pedestrian/vehicle conflict that can occur at the various combinations of one-way street operations and (2) the large increase in the number of vehicular turning movements occurring within a one-way street system. Further, the higher vehicular speeds in a one-way street system are a source of hazard and discomfort to pedestrians.

• **Parking Supply** - One-way street operation degrades the quality of the available parking by making it more difficult to reach. For the traveling public most in need of simple parking access (visitors and tourists), a one-way street system can effectively remove most parking supplies from availability.

• **Visitors and Access** - Visitors are particularly perplexed by one-way streets, to an extent that is seldom appreciated by local residents who have mastered their intricacies. When the one-way street system consists not only of east/west streets but also north/south streets (as would be the case with a Delaware Street conversion), the impact on visitors becomes downright intimidating.

• **Retail Viability** - One-way streets are almost hostile to "Main Street" retailing, for at least two reasons: (1) access to the available parking becomes contorted or discouraging as noted above, and (2) the view of a sizeable portion of the downtown street frontage becomes "eclipsed" from the driver's eye view and, therefore, degraded in value as commercial frontage.

5.1 Background

There are days throughout the course of the year when New Castle experiences a significant parking crunch. Generally, these are the festival days and nice summer days when the use of Battery Park is at a maximum. Most of the days throughout the year, however, there are no notable deficiency of parking spaces, as illustrated in *Figure 5.1.* The key to solving the parking problem is to make recommendations that help to accommodate the parking needs on the peak days while not deteriorating the quality of the New Castle environment on non-peak days. The following sections describe methods in which the parking supply can be increased without creating an overwhelming concentration of dedicated parking facilities.

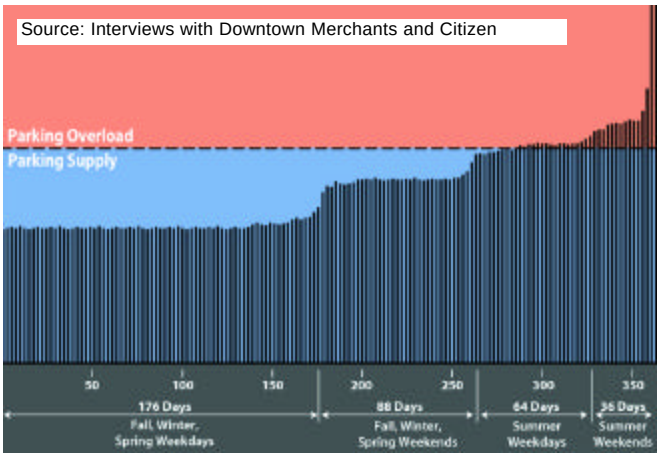

Figure 5.1 Annual Parking Profile in New Castle

5.2 Extend Battery Park Throughout the City

Battery Park is a valued local as well as regional resource because of its location adjacent to the Delaware River. Visitors from throughout New Castle County use Battery Park regularly. A basic strategy to managing traffic and parking activity related to the park would be to extend the park throughout the City so that access to the park is distributed-rather than concentrated in a single location.

The distance that bicyclists and in-line skaters are willing to travel to access the park and the town center is considerably larger than that for pedestrians, assuming that a pleasant, safe connection is provided. This can be best achieved by extending the park along "fingers" to areas of good potential access and supplemental parking, with trails and a "greenway" setting to connect them to the main attraction. This concept is illustrated in *Figure 5.2a.*

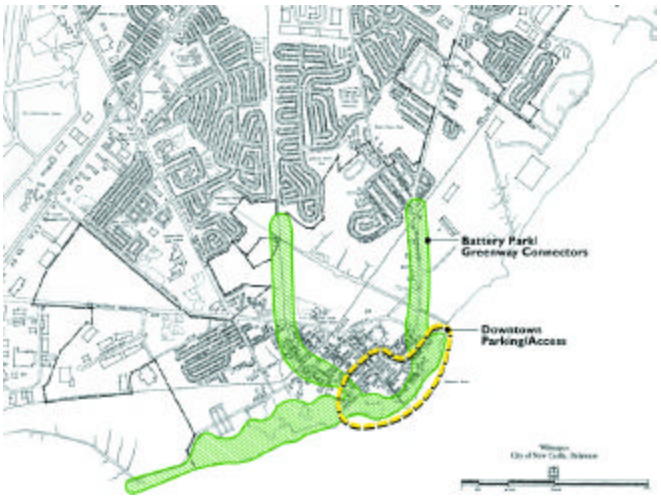

Figure 5.2a Extend Battery Park Throughout City

The connection of distributed trailheads to the existing central section of Battery Park via "greenway corridors" would benefit the parking public in two ways. First, it would provide an attractive parking alternative to bicyclists and skaters, who already comprise a large portion of park users. Second, other park users would benefit from the fact that many bicyclists and in-line skaters would elect to use the trailheads and, hence, free up downtown parking spaces for other users.

One of these possible connections -- to an underutilized existing parking facility off South Route 9 -- is shown in *Figures 5.2b and 5.2c.*

Figure 5.2b Identifies a Potential Trailhead

5.3 Distributed Parking

The question of parking is one of capacity and access. Unfortunately, the creation of large, concentrated parking facilities in a historic residential district often exacerbate traffic problems and damage property values despite helping to solve the parking deficiency. However, widely distributed parking facilities can add parking capacity while not focusing all new traffic toward a single garage or lot.

Possible locations for distributed parking lots throughout New Castle are shown in *Figure 5.3a.* These range from small lots within the City center to larger lots at new "trailheads" connected to Battery Park.

If parking facilities were to be distributed, they need to be located in areas that have a direct and pleasant connection to the main trip generator. This connection needs to be served in one of two ways -- by pedestrian travel or by other "human-powered" modes, such as bicycles and in-line skates.

Figure 5.2c A Trailhead Parking Facility South of Dobbinsville could use an Existing Gravel Lot

Figure 5.3a Parking Concept for New Castle

The circles in *Figure 5.3b* indicate areas of comfortable walking radius based on prospective parking lot locations. Because of the generally consistent pleasant walking character throughout the City, the distance that most people would be willing to walk is approximately 1,000 feet. As can be seen, many of the prospective lot locations do not include the main trip attractor -- Battery Park -- in their 1,000' ft. circle, meaning that they would not serve as effective parking facilities that draw traffic and vehicles away from parkside locations. The Old Ferry Landing would not effectively serve Battery Park parking demand, let alone the City center because of long walks required.

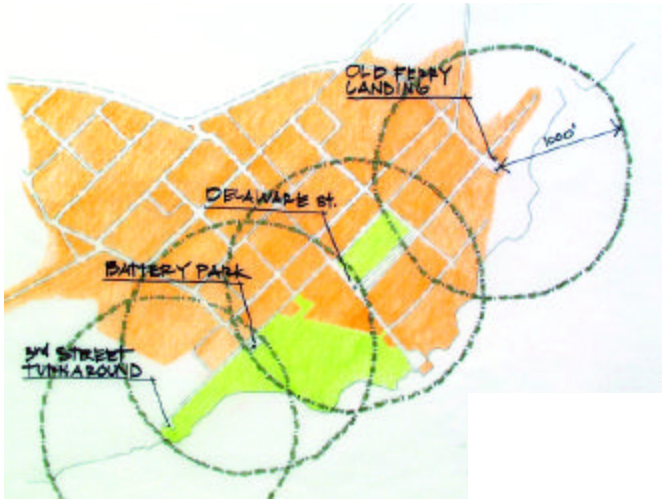

Figure 5.3b Parking/Walk Analysis

The City center is the ideal location for parking because both Battery Park and the historic town center are within 1,000' ft. This is the problem. Only one parking location, downtown, accommodates the park user, the town center resident, and visitor.

The parking strategy for the City should encompass small, strategically placed parking facilities just south of the town center that are within 1,000' of the Battery Park Band Shell. *Figure 5.3c* highlights new or "improvable" parking locations in the City center within a 1,000' walking radius of the Battery Park Band Shell.

Figure 5.3c Parking Opportunities in New Castle

Several location are available. However, before sites are selected, City officials must consider the environment surrounding each location. Parking sites should not be selected if the location is immediately adjacent to residential areas; or if it would obstruct valued sight lines to the Delaware River or historic resources.

Waterfront Parking Opportunities

Site 1: At the southern end of the waterfront park with access from Route 9.
This southern site is ideal for park visitors who seek long-term parking. The site can accommodate one or two hundred cars so long as it is properly screened. It does not affect local traffic or streets as it is accessed directly from Route 9. The location is good for day visitors to the park, especially if they wish to jog or bike, since the path along the river's edge can be extended to this location. New signage will be needed to direct visitors to the site.

Site 2: At the Third Street Turnaround
This location has opportunities for both permanent and overflow parking. The pavement width along South Third Street parking is sufficient for limited long-term parking for park visitors. It currently exists along the west side of the right of way, but is in poor repair, as shown in *Figure 5.3d.* Repaving and striping the parking zone will improve and perhaps increase the supply in this zone. The open field just west of the street right of way is occasionally used on heavy tourist days for overflow parking. This could be enhanced and better controlled by the use of movable barriers along the street edge. On heavy days, the barriers can be removed and temporary parking permitted on the field. Closing the barriers will restrict parking and prohibit random use of the field when demand is low.

Figure 5.3d Poor Parking conditions at the Third Street Turnaround

Site 3: At the Historic School
This location, if carefully done, can increase the supply of parking for park users. The site is adjacent to the historic school on South Street. Approximately 20 spaces could be developed in this location, particularly if it is done in conjunction with the reuse of the school building. Although there are no current plans for the building's renovation, it could be converted to museum or perhaps community use with adjacent parking.

Site 4: Existing Lot at Third and South Streets
This site has spaces for about 50 cars, with a controlled entrance at the foot of South Street. As shown in *Figure 5.3e.* Although it is not in good repair, this lot can be repaved and striped for better utilization. Limited expansion of this lot could be used for special event days when overflow parking is needed. Two plots are suitable for this type use where parking could be permitted on the grass area. One site is immediately north of the existing lot; the other is directly north of the tennis courts across Third Street. These are in residential areas so care must be taken not to interfere with sight lines to the water, and to maintain the grass surface when used temporarily for parking. Movable barriers would need to be installed to control access to these sites, especially when not in use for special event parking.

Site 5: Expand Existing lot at North End of Waterfront Park

This site at the far north end of the Waterfront Park currently has 100+/- spaces, and could accommodate several hundred spaces more for special events. The principal problem with the site is its location. It is more than 1000 feet from the central retail district, and from the active recreation facilities in the park. Permanent paved parking is not recommended in this location primarily because it will not be utilized in non-peak demand periods. For this level of activity, parking on the grass for peak days is sufficient.

Figure 5.3e Existing Parking at South Street could be sensitively expanded East toward the River

5.4 Special Events

In terms of special event parking, the recommendations above would provide additional parking space locations for visitors and locals to utilize. New Castle Day, Separation Day and other major events generate an enormous number of visitors. However, there are only a few "big" days in the year. It is not appropriate for the community to attempt to accommodate the "big" parking demand days within the City. Current traffic management plans and shuttle service plans are appropriate for existing "big" day crowds.

5.5 Residential Parking Permits

One clear problem, particularly on peak summer days and special event days, is the over-utilization of spaces on residential streets by visitors. Specifically, an undesirable situation occurs when visitors park on residential streets for more than a few hours at a time, which sometimes makes it difficult for resident to find spaces near their homes. An effective, inexpensive method of addressing this issue is to institute a residential parking permit program, in which time limits (e.g. 2 hours) are imposed and enforced for vehicles other than those displaying permits. Permits would be distributed to residents of a particular sub-area for each of their vehicles. Costs associated with a parking permit program are limited to signage, permit production and distribution, and enforcement.

6.1 Background

Because of their positive effects on traffic and parking, it is essential that close attention be given to pedestrian, bicycle, and transit facilities throughout the City. As described in the previous chapter, the quality of the pedestrian and bicycle experience can increase the distances that people are willing to park from their main destinations. Moreover, to the extent that pedestrian, bicycle, and transit travel can supplant short local trips by automobile, much of the traffic friction caused by short trips can be removed from the roadways, making the entire transportation network more efficient. The following sections describe methods of enhancing comfortable walking and bicycling distances, improving the attractiveness of transit, and reducing pressure on circulation and parking systems.

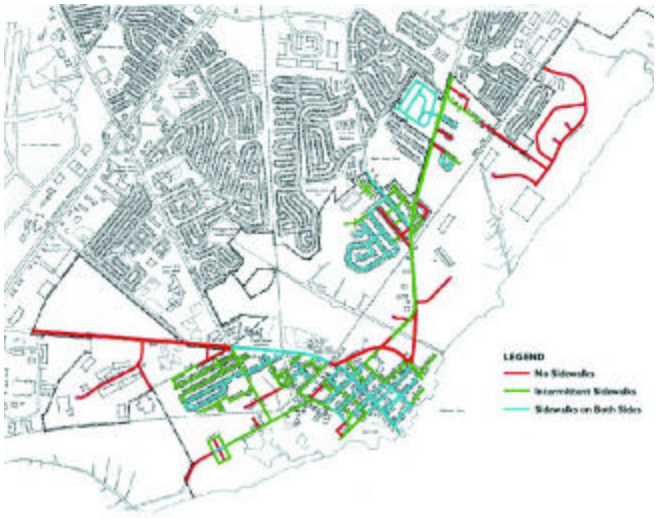

Figure 6.2a New Castle Existing Sidewalk Inventory

6.2 Existing Pedestrian Conditions and Proposed Improvements

Despite the City's pedestrian orientation, New Castle's pedestrian network can be enhanced. *Figure 6.2a* assesses the pedestrian network in the City of New Castle. Shown in the diagram are the characteristics of blocks as they relate to sidewalks and pedestrians. The blue segments indicate that, for the block shown, there are continuous sidewalks on both sides of the roadway. The green segments indicate that the block consists of a sidewalk on only one side of the road, or that the sidewalks are discontinuous or interrupted. The red segments indicate blocks where there are no sidewalks whatsoever.

One clear method of improving the walking environment is to ensure a complete, continuous pedestrian network, particularly in areas where trip generators and attractors are located in close proximity. On major walking routes (or potential walking routes, based upon the distribution of trip origins and destinations), it is important to ensure that the sidewalk network is continuous and in good condition. Because of the walkable scale of most of the City of New Castle and the proximity of its neighborhoods and commercial centers, just about every street in the City is a reasonable candidate for sidewalk completion. A prioritization of such improvements could be based upon the results of an origin-destination study or pedestrian counts. Because there is no requirement in the City codes that requires sidewalks in front of all properties, it is likely that the City would have to fund all new sidewalk segments.

Beyond the simple completion of the sidewalk network is the enhancement of trip quality. This applies particularly in the urban core where, despite a relatively complete and continuous network of sidewalks, the deterioration over time has begun to detract from the otherwise enjoyable pedestrian experience. *Figures 6.2b and 6.2c* show examples of locations where sidewalks have deteriorated to an unpleasant and somewhat hazardous state. The persistence and worsening of these conditions threatens the 1,000' comfortable walking distance essential to easing the parking and traffic crunches in the downtown area, as discussed in Chapter 5.

Figure 6.2b Poor Sidewalk condition on Delaware

Figure 6.2c Deteriorated Curbing at Delaware Street and Third Street

This degeneration of sidewalk quality can be addressed by revisiting the policies through which sidewalks are rebuilt and refurbished. Presently, it is the owner's responsibility to maintain the sidewalks in front of their properties. However, because a continuous, safe sidewalk network is vital to the health of the City and the quality of the New Castle experience, it is recommended that the City take a more active role in sidewalk maintenance. At the least, the City should enforce its sidewalk maintenance rules and begin to ensure that property owners fulfill their obligations to the public realm.

However, because the rules that are in effect have not been referred to in many years, it may be very difficult politically and legally to persuade property owners to fix up their sidewalks in a timely manner. For this reason, a variety of financial incentives should be explored, from property tax credits to subsidies. Because of the wide range of sidewalk types throughout the City, a cooperative arrangement between the City and property owners, in which each pays a share of sidewalk rehabilitation cost, would be the most promising alternative. For instance, all property owners could be required to spend up to a specified amount to rehabilitate their sidewalks, with the City paying the rest. Similarly, the City could offer a "matching" grant as incentive for property owners to have their sidewalks refurbished. These types of programs limit the degree to which certain property owners are burdened by the character of the sidewalks in front of their buildings, hence reducing the temptation to replace historic sidewalks with cheaper materials.

After such a city-wide rehabilitation program is implemented -- and the sidewalks are once again in good condition -- then a specific set of maintenance standards can be applied and enforced to prevent future deterioration.

6.3 Existing Bicycle Conditions and Proposed Improvements

As mentioned in the discussion of potential parking areas, there is considerable opportunity for the improvement of bicycle facilities throughout the City. The park "extensions" discussed as potential solutions to the parking problem could be directly connected with the proposed East Coast Greenway via a direct connection or via neighborhood streets along a signed bicycle route. See *Figure 6.3* for a map of potential bicycle trails and routes through the City.

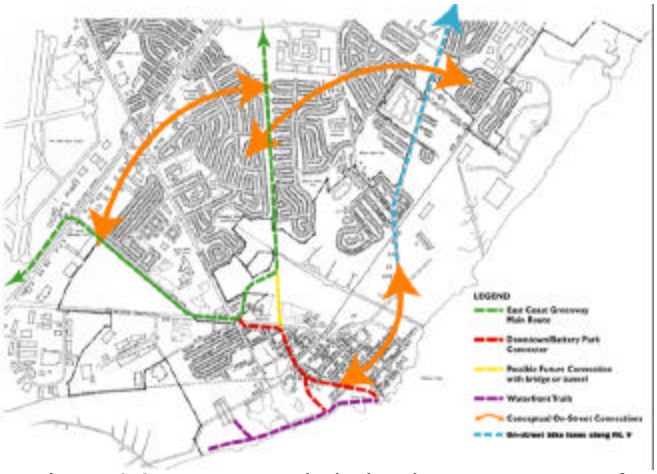

Figure 6.3 Recommended Bicycle Improvements for New Castle

The East Coast Greenway would likely enter the City from two sides: from the north along the abandoned CSX rail corridor, and from the west along School Lane. Where School Lane intersects Route 273, there is considerable room available on the north side of the roadway for a continuation of the Greenway's eight- to ten-foot trail up to the intersection at Washington Street. Here it would intersect with the trail from the north, which would likely depart the rail corridor several hundred yards north of the school. This would form a continuous East Coast Greenway alignment through the northwestern side of the City and encourage the crossing of Route 141 at a signalized intersection.

The intersection of Routes 273 and 141 would also be a good location for a spur into the heart of the City, again utilizing the traffic signal to accommodate the crossings of major roadways. At this point, the trail could continue eastbound along the south side of Route 273 until it re-intersects the rail corridor. (A straight connection from the rail corridor across Route 273 is not advisable -- due to the lack of signal -- unless a costly tunnel or bridge was included as part of the project.) At this point, the trail would once again pick up the rail corridor and follow it southbound to downtown and Battery Park, where it would connect to the other proposed "fingers" of the park and hence create a vast integrated network of trail and parkway facilities.

As Route 9 is improved, it is important to provide bicycle facilities north of 3rd Street. The traditional street network of New Castle south of 3rd street provides numerous routes to Battery Park and the historic town center. North of 3rd Street, Route 9 is the only viable transportation corridor for cyclists accessing Wilmington. On-street striped bicycle lanes are needed to improve bicycle safety along the corridor.

6.4 Existing Transit Service and Recommendations

Presently only one regional DART bus route (#15) penetrates the City boundaries, traveling along Moores Lane, Wilmington Road, 6th Street, South Street, 7th Street, and Basin Road. Route 15 operates on headways that generally range from twenty minutes to forty minutes between buses, depending upon the time of day. The two major activity generators that anchor the route are downtown Wilmington and Christiana Mall. The first and last buses to downtown Wilmington arrive at the intersection of Delaware Street and 6th Street at 5:43 AM and 9:55 PM, respectively. The first and last buses to Christiana Mall reach this same location at 6:14 AM and 11:06 PM.

Although the Route 15 bus very well serves several of New Castle's clusters of neighborhoods -- particularly those in the historic core and those along Moores Lane and Basin Road -- it does not directly serve the City's major industrial complexes. DART has applied for funding for a “Port of Wilmington/Industrial Park” route that would serve Centerpointe Industrial Park. Submitted as part of FY 2001 Service Plan with funding coming from Welfare to Work/Access to Jobs grant money. Service is expected to begin in the year 2001.

On another issue, it is highly recommended that New Castle continue to utilize shuttle bus service to circulate people between outlying parking facilities and the core area on the City's big special event days. In order to promote this service, it might be worthwhile to offer small financial incentives to those who utilize it, such as handing out coupons for New Castle establishments or festival goods.

As stated in the regional issues that influence New Castle’s transportation system, long-term development of fixed guideway transit in the north-south corridor of New Castle County is important to providing additional needed capacity without hindering the livability of communities along the corridor. Several residents of New Castle also suggested the implementation of possible ferry service along the river to connect with Wilmington.

7.1 Background

New Castle's historic urban pattern and architecture makes it a unique and attractive place to live and visit. Historic multi-story buildings front on small streets with ample sidewalks, street trees, and on-street parking. New Castle is an ideal urban environment. The compact mix of uses creates a lively atmosphere where residents have pleasant walks to parks, shops, restaurants, and offices. One of the reasons that make this urban form possible is that the needs of automobiles have been balanced with the desire to preserve the character of New Castle.

There is no reason not to extend this philosophy to future transportation improvements and new development. *Figure 7.1a* illustrates a transportation/urban design concept that frames the proposed transportation improvements in the context of the future growth of New Castle. The "Town & Country" concept proposes that the unique natural features of the area ("country") are identified and protected, such as creeks and wetlands, while the remaining developable areas ("town") are designed and planned in a manner consistent with the unique urban character already established in New Castle.

This concept establishes a new approach to development that extends the urban fabric of historic New Castle to areas of current development and/or future redevelopment. *Figure 7.1b* shows the hypothetical impact of this approach on the area surrounding the proposed improvements to Route 9. The reconfigured intersections at Delaware Street and 6th Street are designed as gateways to downtown New Castle while future redevelopment along Route 9 is organized as an extension of the New Castle urban pattern of buildings that front on streets with parking hidden behind.

An aerial sketch view of Route 9 at the Delaware Street intersection illustrates a potential build-out redevelopment scenario *(Figure 7.1c)*. This sketch shows the effect of applying land development standards that establish traditional development patterns like those found in historic New Castle. The hypothetical redevelopment along Route 9 has buildings placed close to the street, two and three stories high, parking is behind buildings in landscaped lots, and streets are amenitized with sidewalks and street trees. The resulting new development establishes a defined and attractive "town" edge along the suburban fringes of New Castle that reinforces and strengthens the historic center.

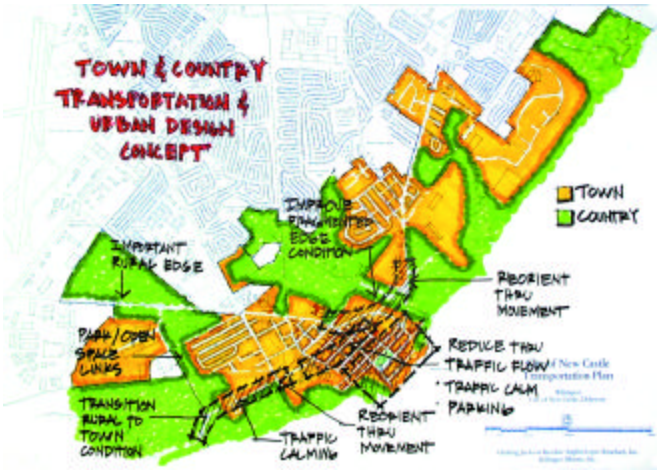

Figure 7.1a Town and Country Transportation Urban Design Concept

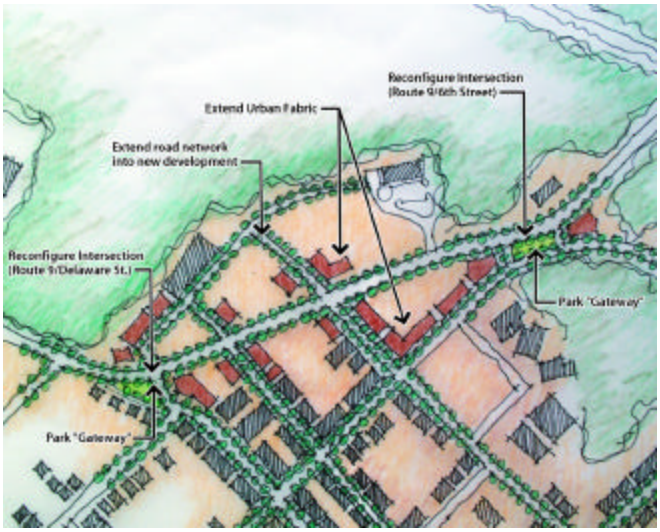

Figure 7.1b Urban Design Concept

Figure 7.1c Aerial View of Route 9 Urban Design Concept

7.2 Case Study: The Evolution of Route 9

The proposed transportation improvements are designed to work together with urban design and land development guidelines to create attractive and livable environments. Historic New Castle, as shown in *Figure 7.2a,* reflects some simple urban design principles that should be carried forward in new development.

- Multi story buildings close to the street to create a "street wall"
- Windows and doors that open to the street
- Architectural character and detail
- Ample sidewalks and street trees that provide shade
- Adjacent on-street parking
- Street furnishings and plantings that add detail and create interest.

Figure 7.2a New Castle Street Scene

By contrast, Route 9, just blocks away from the New Castle Green, exhibits none of these characteristics, illustrated in *Figure 7.2b.* Single-story buildings are pushed back from the street behind large parking lots. Windows and doors open onto parking lots away from the street. The architecture lacks any character or interesting detail. Sidewalks, street trees, and street furnishings are non-existent.

Figure 7.2b Existing Route 9

Figure 7.2c illustrates the visual impact of the proposed improvements to Route 9. The improvements do not require any additional pavement and the conversion from a rural cross section (grass swale with no curb) to a urban cross section (curb and gutter) allows for the planting of street trees and placement of a sidewalk within the existing right-of-way.

Figure 7.2c Route 9 with Street Improvements

With some additional design criteria the design of the streetscape could include a small architectural wall and lighting that reflects the design character of New Castle as illustrated in *Figure 7.2d*. Adjacent power lines could be relocated underground in conjunction with the reconstruction of the road. Additionally, adjacent commercial signs and lighting could be regulated requiring lower and more attractive signs and light poles.

Ultimately, adjacent property along Route 9 will redevelop. *Figure 7.2e* illustrates a redevelopment scenario where new commercial buildings are placed up to the right-of-way of the street along the sidewalk like the streets in historic New Castle. Here building entrances and windows face directly on the street and sidewalk to create an interesting pedestrian environment of shop windows and courtyard spaces. The width of the road and the lack of on-street parking, however, limit the pedestrian friendliness of the streetscape.

Figure 7.2f illustrates an alternative redevelopment scenario where new multi-story buildings are placed closer to the street to create an attractive pedestrian environment. The partially setback buildings are buffered from the road with small outdoor courtyards that link the buildings to the street. All parking is located behind the buildings and screened from the road. Architectural design standards can be adopted that will guide the design of new buildings including material choices and architectural detail, ensuring the design of new development will reflect the design characteristics of historic New Castle.

Figure 7.2d Route 9 with Hardscape Improvements

Figure 7.2e Route 9 with Pedestrian Accommodating Development

Figure 7.2f Route 9 with Alternative Pedestrian-Scale Development

7.3 Land Development Regulations

The prototypical site plan shown in *Figure 7.3a* and illustrated in *Figures 7.3b and 7.3c* outline the potential redevelopment of commercial property along Route 9. The site plan illustrates how specific land development regulations can be used to create pedestrian friendly streetscape and site design as well as development patterns that are consistent with the historic character of New Castle.

- Parking behind buildings, attractively landscaped and screened from the road
- Buildings pushed up to the street to create attractive "street walls"
- Street trees and low walls that screen parking lots from the street
- Architectural design and details that reflect the character of New Castle
- Block and street patterns that provide multiple access ways to and through new development

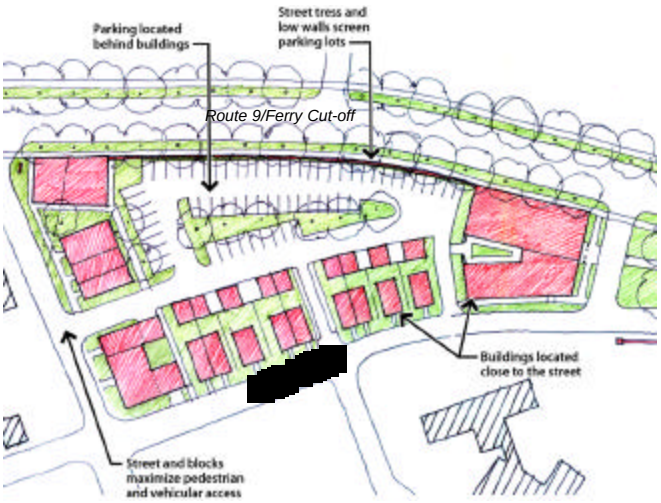

Figure 7.3a Prototypical Site Plan

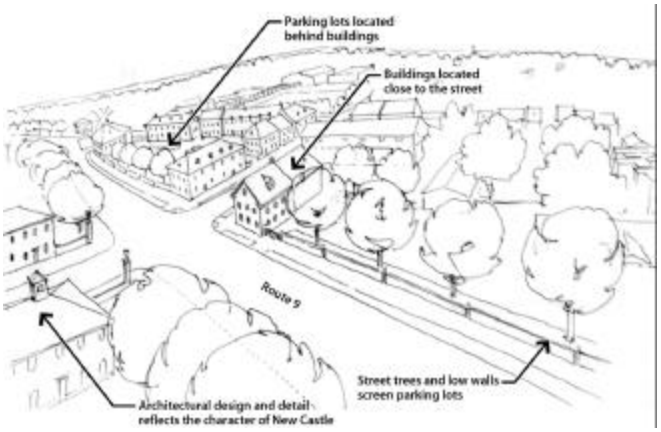

Figure 7.3b Aerial Perspective of Route 9 Urban Design Plan

Figure 7.3c Eye Level Sketch of Sixth Street and Ferry Cut-off Intersection

8.1 Background

The analysis presented and the conclusions reached in this study provide the City of New Castle a transportation blue print that is able to ensure a sustainable balance between the livability of New Castle and the growing transportation challenges facing all of New Castle County.

8.2 Action Plan

This transportation study will be a key vehicle assuring that the City's transportation system is a contributor, not a burden, to New Castle's quality of life and corresponding economic vibrancy. An action plan has been outlined to show the sequence in which the various recommendations in this report can be implemented. Items highlighted in *Table 8.2* are organized into the two major themes: short-term tangible improvements and long-term policy initiatives.

Short-term improvements are straightforward and have been discussed in detail earlier in this report; the long-term recommendations entail coordination with multiple policy documents 8.3. The actual time that will elapse for each of these phases depends upon the aggressiveness of the players involved and the ability to fund certain aspects (see Section 8.3).

Table 8.2: ACTION PLAN

Time Frame	Short-Term Tangible Improvements	Recommended Policy Initiatives
Years 1-3	**Route 9 Reconstruction** Reconstruct Ferry Cutoff as 4 lanes. Rebuild Delaware/Route 9 intersection. Rebuild 6th Street/Chestnut/Route 9 intersection w/signal. Traffic calm/rebuild 7th Street. Introduce new intersection on Wilmington Road and the new entrance to the Chicago Bridge and Iron Site with signal. **Pedestrian Improvements** Reconstruct Ferry Cutoff w/Pedestrian improvements. **Bicycles and Trails** Reconstruct Ferry Cutoff w/Bicycle improvements. Support East Coast Greenway. Designate safe, signed, on-street routes. **Parking** Fund resident parking permit and enforcement program. Pave and re-stripe 3rd Street Turnaround Parking Area. Expand South Street Parking Area. Implement a city wide “way-finding program” to illustrate available parking at the end of Third Street.	**Land Development/Redevelopment** Establish sidewalk maintenance standards. Initiate incentive/shared rehab program. Expand Aesthetic Standards throughout City. Develop Transit Accommodating Design Standards.
Years 4-6	**Route 9 Reconstruction** Rebuild 3rd Street/Route 9 intersection. Rebuild Moores Lane/Route 9 intersection w/signal. Rebuild 7th/Washington intersection w/signal. **Pedestrian Improvements** Complete city-wide shared rehab program. Begin enforcing maintenance standards. **Bicycles and Trails** Build ECG downtown connection. Rebuild trail to S. Route 9 and Dobbinsville. **Parking** Create/Expand trailhead parking facility on S. Route 9. Construct new distributed lots as needed.	

8.3 Cost Estimates

Table 8.3 shows preliminary planning-level cost estimates for the tangible recommendations made in this report. Actual costs will depend on site-specific conditions, design features, utility configurations, operational arrangements, and methods of implementation.

The largest cost item is the reconstruction of Route 9 and five of its intersections. Included in this cost category are both the reconstruction of Ferry Cutoff as a four-lane urban section and traffic calming on 7th Street through the southern portion of the city. The total cost of Route 9 reconstruction is estimated at $8 million to $9 million although, as stated, actual costs could differ substantially pending detailed site inspections and final design. In terms of phasing, the intersections at Moores Lane and 3rd Street could be reconstructed individually, but the remaining intersections would ideally be "packaged" with main-line reconstruction to minimize costs and construction redundancies:

1. 6th/Chestnut/Route 9 and Delaware/Route 9, with the reconstruction of Ferry Cutoff.
2. 7th/Washington with traffic calming and reconstruction along 7th Street.

For bicycles and trails, an total estimate of $500,000 is indicated for the construction of the East Coast Greenway downtown connector, the upgrade of the riverfront trail from Battery Park to Dobbinsville, and the designation and signing of safe on-street routes through the city. Costs for additional trails and park extensions cannot be estimated until specific alignments are identified.

To expand and enhance the trailhead parking facility on South Route 9 and to upgrade parking along 3rd Street, approximately $100,000 to $200,000 will be needed. Costs for further improvement and expansion of parking facilities can be determined only after the locations and scale of these improvements are determined.

The enhancement of the waterfront trail and the upgrade of the South Route 9 parking facility are directly related and should be conducted concurrently. The improvement of parking along 3rd Street and the implementation of a parking permit system are also short-term actions the hold the promise of immediate results. The East Coast Greenway downtown connector and the expansion of additional parking facilities are longer-term actions that should be pursued when needed.

Notes:
1. Bicycle trail calculated as $350,000 per mile (Source: Liz Holloway, DelDOT)
2. Cost estimates are preliminary. Actual cost must be dtermined through detailed study.
3. Source: DelDOT

Table 8.3: COST ESTIMATES

General Activity	Specific Actions	Costs
Route 9 Reconstruction	Rebuild Delaware/Route 9 intersection.*	$800,000
	Traffic calm/rebuild 7th Street.	$800,000
	Reconstruct Ferry Cutoff as 4 lanes.	$4,000,000
	Rebuild 6th/Chestnut/Route 9 intersection.	$800,000
	Rebuild 3rd Street/Route 9 intersection.	$800,000
	Rebuild Moores Lane/Route 9 intersection.	$300,000
	Rebuild 7th/Washington intersection.	$800,000
	Total	**$8,300,000**
Bicycles and Trails	Support East Coast Greenway.	N/A
	Designate safe, signed, on-street routes.	$10,000
	Rebuild trail to State Route 9 and Dobbinsville.	$70,000
	Build ECG downtown connection.	$380,000
	Total	**$460,000**
Parking	Expand trailhead parking facility on State Route 9.	$75,000
	Improve condition of 3rd Street parking.	$50,000
	Expand/optimize existing facilities.	N/A
	Construct new distributed lots as needed.	N/A
	Total	N/A
	Develop way-finding program.	$125,000
TOTAL ESTIMATED PROGRAM COST:		**$8,885,000**