

ENHANCING SUSTAINABILITY AND WALKABILITY OF A MEDIUM-SIZE CITY: PITTSBURGH, PA AND THE NORTH SHORE LRT CONNECTOR

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ABSTRACT

The City of Pittsburgh is located in southwestern Pennsylvania. Its location, history, and its variegated topography have contributed to its reliance on various forms of transportation from rivers to railways to highways to public transit. Its population has declined significantly over the last 50 years and the city and region have struggled to maintain its transportation infrastructure. Its transit system has remained vital compared to some of its peer cities due to employment that has remained strong in the central city. After losing much of its heavy industry employment in the 1980s, the city and region are currently in the midst of an economic renaissance as its employment base broadens to build upon growing assets such as world class healthcare facilities, universities and cultural attractions. Particularly in the North Shore section of the city, this development is being facilitated by transportation improvements. Significant road and parking improvements have been put into place.

The North Shore Connector is the name given for an extension of Allegheny County's 25-mile light rail system from the central business district to the North Shore section of Pittsburgh. The 1.2-mile North Shore Connector project includes tunneling underneath the Allegheny River with a tunnel boring machine. Precision boring will be required to avoid disturbing existing sewer lines and building foundations and drilling through soft riverbed soils along an alignment with significant horizontal and vertical curvature. The project is expected to play a significant role in creating an enhanced pedestrian and transit environment for Pittsburgh's rapidly developing North Shore area.

1. INTRODUCTION

The North Shore Connector (gateway Line) will extend the light rail system from the downtown central business district in Pittsburgh, Pennsylvania to the North Shore of the city. This complex 1.2-mile project involves tunneling underneath the Allegheny River with a tunnel boring machine. The project could be extended in the future to provide future connections westward to Pittsburgh International Airport or northward to serve vibrant urban neighborhoods in the city's North Side and the growing suburbs of the North Hills.

This project is a key component to the development of Pittsburgh's North Shore. The North Shore is located across the river from the Central Business District in Pittsburgh and in its heyday was a vibrant business and residential community. This project, although only a small addition to the existing 25 miles of light rail in Pittsburgh, has the potential to restore the walkability and accelerate economic development of this important section of the City of Pittsburgh.



Figure 1 - Pittsburgh's Light Rail System and New Gateway Line (North Shore Connector)

2. BACKGROUND

2.1. Pittsburgh's location

Pittsburgh is located among the hills west of the Allegheny Mountains and at the confluence of the Monongahela and Allegheny rivers where they form the Ohio River. Pittsburgh's central location and the Ohio River's junction with the Mississippi make Pittsburgh one of the busiest and largest inland ports in the country. As a result of its geography—mixing mountains, multiple rivers, and a triangular downtown business district—Pittsburgh possesses a unique transportation infrastructure that includes roads, tunnels, bridges, railroads, light rail transit, exclusive busways, funiculars, bike paths and hillside stairways.



Figure 2 – Pittsburgh, Pennsylvania's location relative to the United States

This area where the rivers meet, known as the "Golden Triangle," is Pittsburgh's central business district. This traditional downtown area is 0.9 square miles, with an employment base of 140,000, which makes the Golden Triangle a very high employment density location for a medium size city. Accordingly, the city has pursued an effort now incorporated into its official plans, to re-define and expand the size of its downtown to include the north shore of the Ohio and Allegheny Rivers, and the south shore of the Monongahela River.

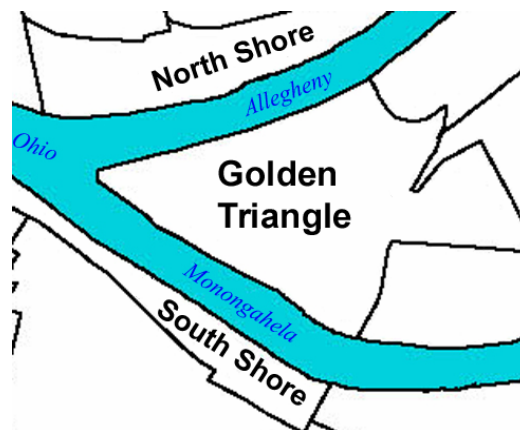


Figure 3- Map showing Golden Triangle, North and South Shores

2.2 Pittsburgh's economic history

Pittsburgh is the second largest city in the state of Pennsylvania. Pittsburgh's location at the intersection of three rivers and the abundance of natural resources surrounding the

city gave it prominence during the "industrial revolution" of the late 1800s and early 1900s. Captains of industry during this period started in Pittsburgh's steel valleys, including Andrew Carnegie, Henry Clay Frick, and George Westinghouse. After the Civil War, European immigrants settled along the river valleys and the city became a center for the steel industry. The city's population continued to grow through World War II reaching an all time high of 677,000 in 1950. Steel and glass industries thrived in Pittsburgh until the 1980s, when heavy industrial production shifted to other parts of the country or moved overseas. Coupled with a decline in heavy industry, the economy began to deteriorate and contributed to a decline in population with today's population hovering around 317,000.

Between 100,000 and 150,000 heavy industry jobs disappeared in the region during the 1980s. The regional economy partially absorbed this loss as its economic base changed from iron and steel to "eds and meds" and high technology. Most of the lost jobs have been replaced, but at lower wage rates. Pittsburgh's local universities, including Carnegie Mellon University and the University of Pittsburgh, amongst others, spawned new and exciting innovations that demonstrate promising financial potential. Growing businesses in the region now include Westinghouse's nuclear development headquarters and Google's regional offices. Several multinational corporations such as Alcoa, Heinz, U.S. Steel and Mellon Financial are headquartered in the center of the city. The City of Pittsburgh has made the transition to a new economy more successfully than many of the riverfront industrial communities in the region because it diversified its economic base. Approximately one-half of the people working downtown arrive by transit. In recent years, there has been a surge of people choosing to live in this area as residential real estate prices are historically low compared to other city centers. Its exceptional quality of life, strong transportation infrastructure and overall low cost of living contribute to Pittsburgh's consistent ranking as one of the best places to live in the United States.

Pittsburgh experienced the same "hollowing out" during the latter part of the 20th century as other northeast cities and towns in the United States. Residents left the city and adjacent suburbs for newer homes in the newer suburbs and outer ring areas. The consequential decline in property values and declining tax base left the city struggling to fund infrastructure and other services. Although recent new urban development and redevelopment has reversed this trend in parts of the city, the City of Pittsburgh overall continues to struggle financially. In 2003, it was declared a "distressed" city and continues to require state assistance to achieve fiscal stability.

3. HISTORICAL CONTEXT OF TRANSPORTATION AND LAND DEVELOPMENT IN PITTSBURGH¹

Southwestern Pennsylvania is a prime example of the relationship of transportation and land use. Development of transportation was initially shaped by the region's topography and subsequently, transportation systems influenced the region's land use patterns. The heavy industry that emerged in this region in the 1800s relied upon the rivers and railroads for transportation of raw materials and finished products. Development of streetcars and commuter rail helped shape the urban corridors and provided transportation to rural areas, as well as connections to other towns and cities via the interurban rail cars and intercity trains. Automobile transportation has had a great impact on urban form accelerating in the 1950s and continuing today. Construction of expressways in the Pittsburgh region has contributed to the hollowing out of the city and has led to the decline of the walkable character of the city and its neighborhoods.

3.1 Public Transportation in Pittsburgh

The first public transit lines date back to 1840 when horse-drawn omnibuses provided service to City of Pittsburgh's East End neighborhoods. Inclined planes and cable cars permitted transit service to and through neighborhoods situated on Pittsburgh's hills. By 1902, when the Pittsburgh Railways Company was formed, electrically-powered streetcars were the predominant transit technology in Pittsburgh.

The new transit lines opened up large areas for development. Houses were built along or within easy walking distance of transit lines. Retail uses were either close to the homes or on the ground level of multi-story buildings which had residential units on the upper floors. Streets were built with sidewalks to facilitate pedestrian movements, and, in wealthier communities, shade trees were planted to enhance the quality of the pedestrian experience.

Meanwhile, railroads entered Allegheny City (location of the current North Shore neighborhood today) in 1851 and the City of Pittsburgh during the following year. Initially, the railroads were built for long distance transportation, but local passenger services were soon added to bring commuters into Pittsburgh from surrounding residential communities. The higher speeds of the commuter trains allowed people to travel even further to and from their place of work. Development clustered around stations located in city neighborhoods and residential suburbs.

Some of the early steam railroad and electric traction companies actively promoted development on their lines in order to generate more riders. Kennywood amusement park, located five miles downstream from downtown Pittsburgh along the Monongahela river, was built by the Monongahela Street Railway Company to stimulate usage of its line. The Pittsburgh & Castle Shannon Railroad (predecessor to the current Overbrook LRT Line) planned and advertised home lots in city neighborhoods and inner suburbs, and later developed a picnic grove, a Methodist summer camp and a zoo.

The current transit system operator, known as Port Authority of Allegheny County, was formed through acquisition of the assets of Pittsburgh Railways Company and 33 other transit companies in 1964. It soon began planning for major new transit investments. This effort culminated in what was known as the Early Action Program which proposed a new rapid transit line linking the downtown Pittsburgh with the South Hills and the South and East Busways.

The Early Action Program, developed in the 1960s, included three new investments to upgrade transit service in southwestern Pennsylvania. The Transportation Research Board report, "Bus Use of Highways," had just been published. Accordingly, the Early Action Program included two exclusive busways for the Pittsburgh region, which subsequently became the South Busway (1977) and the Martin Luther King Jr. East Busway (1983). In addition, the Program included a rubber-tired Automated Guideway Transit (AGT) line for the South Hills of the region. Perhaps this was a too-early adoption of new technology, because uncertainty about the technology led to the AGT proposal being replaced in the 1970s by an upgrade of Pittsburgh's South Hills trolley system to Light Rail Transit (LRT) standards. The AGT technology was subsequently developed, and is in use at many airports including Pittsburgh International Airport.

The South Hills LRT and the Martin Luther King, Jr. East Busway are the two most heavily used fixed guideway transit facilities in the region. An important factor in their high level of

use is that they were built along established transportation corridors around which communities developed.

The LRT system extends for 25 miles from Pittsburgh serving the South Hills communities of Pittsburgh and Allegheny County. The system was a former trolley system whose development dates back over 100 years, and which was re-built to light rail standards over a 20-year period, culminating in the opening of the Stage II Overbrook line in 2004.

The East Busway opened from downtown Pittsburgh to the adjacent suburb of Wilkinsburg in 1983, and was extended by one-third in length in 2003. The busway was built along a railroad corridor that used to be a commuter rail corridor serving long-established eastern city neighborhoods and suburbs. A ramp of the busway provides access to Oakland, the educational, museum and medical center of the Pittsburgh region.

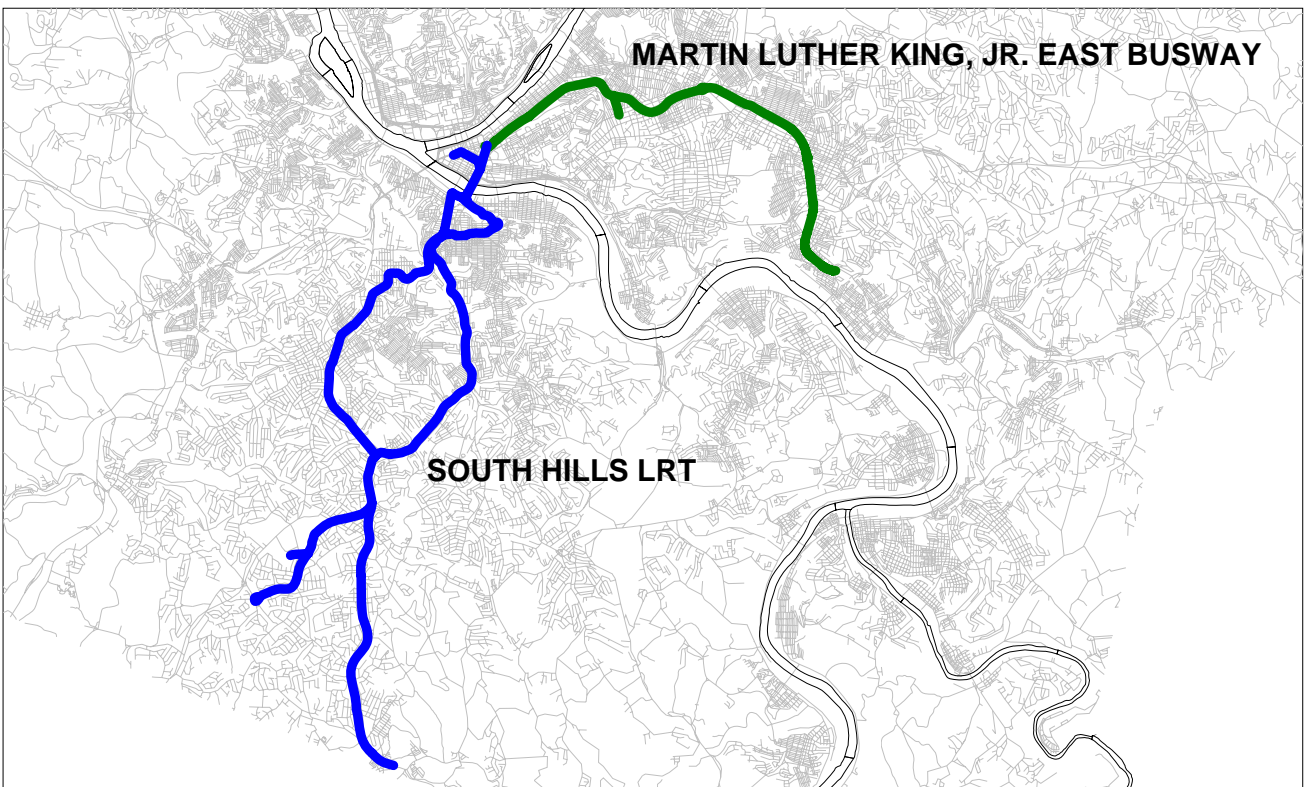


Figure 4 – Map of South Hills LRT and MLK East Busway



Figure 5 - South Hills LRT



Figure 6 - Martin Luther King, Jr. East Busway

4. THE NORTH SHORE CONNECTOR PROJECT

Port Authority of Allegheny County is the public transit agency that serves a 775-mile area in and around Pittsburgh. Today, Port Authority provides service on three exclusive busways: the 4.3-mile South Busway; the 9.1-mile Martin Luther King, Jr. East Busway; and the five-mile West Busway. Port Authority also operates the four light rail lines that make up the 25-mile light rail system called the "T" that provides access for portions of the county located south of the central business district. While Port Authority is reconstructing its existing fixed guideways, the North Shore Connector will be the first rail expansion since the light rail opened in the South Hills in 1984.

The North Shore Connector is a complex, underground and above-ground extension of the light rail system that will be completed in 2011. It consists of a tunnel under the Allegheny River, and two aerial stations emerging on the North Shore near the PNC Park baseball stadium and Heinz Field football stadium. The project required five years to receive necessary federal authorization and garner political and public support. Port Authority's Board awarded the first construction contract in July 2006. A full funding grant agreement with the Federal Transit Administration (FTA) for the project was executed in September 2006.

Since its earliest phases, the project drew significant criticism. It is a large-scale construction effort for its length -- projected to cost \$435 million at completion -- in a region that has seen little population growth. Nevertheless, leaders from all levels of government, federal, state and local, saw the need to spur the use of transit and transit-oriented development in the North Shore. The Pittsburgh region has a long history of reliance on the "trolley" (the precursor to the modern light rail vehicle), dating back to the earliest days of the industrial revolution. The geography of Pittsburgh, with its narrow streets, numerous bridges, tunnels and intersecting rivers, long ago rendered heavy reliance on automobiles unrealistic. Light rail and busways, as the existing fixed-guideway modes, are investigated when grade-separated transit is being considered in the region. Light rail lines and busways have been selected to address increased congestion that accompany new development.

4.1 History of Project

The idea of a transit tunnel under the Allegheny River dates back to 1910 when the Report on the Pittsburgh Transportation Problem called for a subway under the Allegheny River linking Downtown Pittsburgh to the North Side. A map in the 1923 document, *Transit - A Part of the Pittsburgh Plan*² illustrated a potential alignment for such a subway with a line to the North Side passing under Stanwix Street and the Allegheny River. Forty years later, the final report of the Pittsburgh Area Transportation Study also proposed a rapid transit line to the North Side with an alignment under Stanwix Street and the Allegheny River.

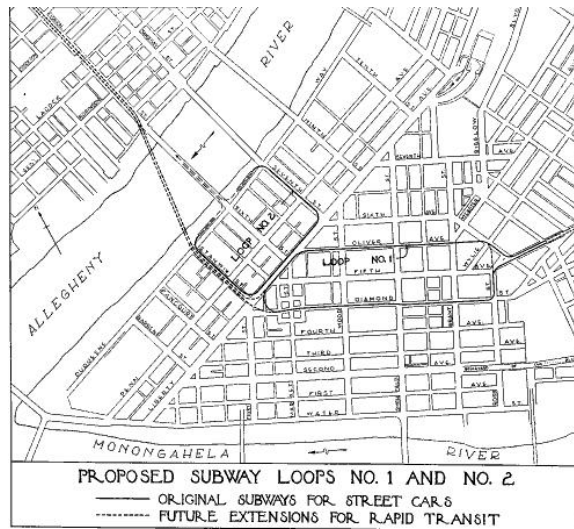


Figure 7 - 1923 Map of Proposed Subway

During the period from the first study to the end of the twentieth century, downtown Pittsburgh was defined as the Golden Triangle. The Allegheny River formed the northern boundary, the Monongahela River formed the southern boundary and 11th and Ross Streets formed the approximate eastern boundary of the Central Business District (CBD).

In 1997, the City of Pittsburgh initiated the Pittsburgh Downtown Plan which proposed a strategy for revitalizing Pittsburgh's CBD. The plan envisioned a Downtown Pittsburgh expanded from into the Strip District, Station Square and North Shore. Instead of the rivers being a barrier to movement throughout the expanded Downtown, there would be a Downtown with rivers running through it. The plan proposed, as a key element to achieving this vision, a new rapid transit line linking the Golden Triangle with the North Shore.



Figure 8- Perspective of Downtown Pittsburgh from the *Pittsburgh Downtown Plan*

While the Pittsburgh Downtown Plan was being developed, the City of Pittsburgh and the regional planning agency, Southwestern Pennsylvania Commission (SPC), initiated the

Downtown Pittsburgh North Shore/CBD Transportation Corridor Major Investment Study (MIS). In January 1999, Port Authority of Allegheny County assumed responsibility for the project when it began the North Shore Connector Draft Environmental Impact Statement (DEIS) which evaluated various alignments and technologies for linking the Golden Triangle and the North Shore. Through the planning process, the Gateway LRT Alternative was identified as the preferred alternative to serve the Downtown - North Shore Corridor.

The Gateway LRT Alternative was endorsed by key stakeholders in the corridor as well as North Side community groups representing neighborhoods adjacent to the North Shore. Based on public input and the results of the DEIS analyses, Port Authority's Board of Directors selected the Gateway LRT Alternative as the preferred alternative in August 2000.

The Federal Transit Administration (FTA) approved entry of the North Shore Connector into preliminary engineering and the Final Environmental Impact Statement (FEIS) in January 2001. This phase of the study was completed in July 2002 when FTA issued the Record of Decision signifying FTA's agreement that the project met the planning and environmental assessment requirements of the National Environmental Policy Act and specifying the environmental mitigation measures that would be required.

In April 2003, FTA approved entry into final design, the last phase of project development before construction. During the following year, FTA recommended the North Shore Connector for a Full Funding Grant Agreement (FFGA) which committed FTA to provide a specified level of funding for the project and committed Port Authority to build the project for the level of funding received. However, it took another two years for FTA and Congress to review and approve the FFGA. In July 2006, the Port Authority Board of Directors authorized awarding the first contract of the project and construction began at the end of 2006.

4.2 Funding

The funding structure of the North Shore Connector project mirrors the levels of support for the project and is consequently a mixture of federal, state and local funding sources. Rail projects in the US have a difficult time meeting federal criteria for funding. FTA has determined that the project will spur future development and therefore agreed to be a funding partner. The North Shore Connector is one of only a handful of new projects to receive federal funding. The Commonwealth of Pennsylvania will provide nearly 17% and Allegheny County 3% of project funding.

Both dedicated and discretionary funding make up the federal portion of the capital funding. The Federal Transit Administration has committed, through a Full Funding Grant Agreement (FFGA), to provide \$235,700,000 (54%) from the Capital Investment Program New Starts Program. The remaining federal funding will be provided from a combination of federal transit and flexible highway funds. Federal transit and highway funding which Port Authority receives annually will provide \$52,300,000 (12%). Through the efforts of the Pennsylvania Department of Transportation, as well as the local commitment of the City of Pittsburgh and Allegheny County, an additional \$60,000,000 (14%) in federal highway funding is being provided to round out the federal share of the project. The 20% non-federal share of the project will be provided by the Pennsylvania Department of Transportation (\$72,500,000) and Allegheny County (\$14,500,000). Although this amalgam of partners has at times created tension during the development of the project, it

has likewise given each stakeholder a keen interest in seeing this project to its successful conclusion.

4.3 Project Alignment

In the downtown area, the light rail system is grade separated, operating in a subway alignment in the Golden Triangle. The North Shore Connector (Gateway Alternative) alignment will extend service from the existing LRT Gateway Center Station in the central business district through a tunnel under the Allegheny River to the North Shore. A new platform for the northbound North Shore service will be constructed under the triangular grass median bounded by Penn Avenue, Liberty Avenue, and Stanwix Street. Beginning at the Gateway Center Station, the alignment will travel north beneath Stanwix Street under the Allegheny River. The tunnels will rise to become at-grade at Art Rooney Avenue, and then transition to an aerial alignment to cross over Allegheny Avenue. The line will terminate west of Allegheny Avenue. New stations in the North Shore would be located under a new parking garage near PNC Park and along Allegheny Avenue near Heinz Field and the Carnegie Science Center.

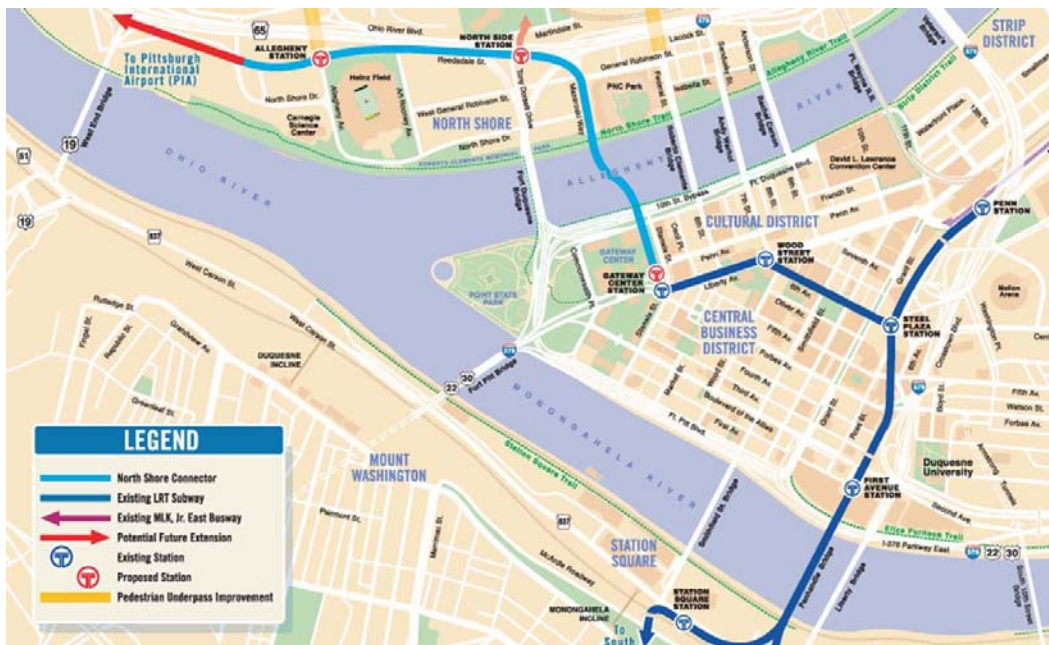


Figure 9 - North Shore Connector Alignment

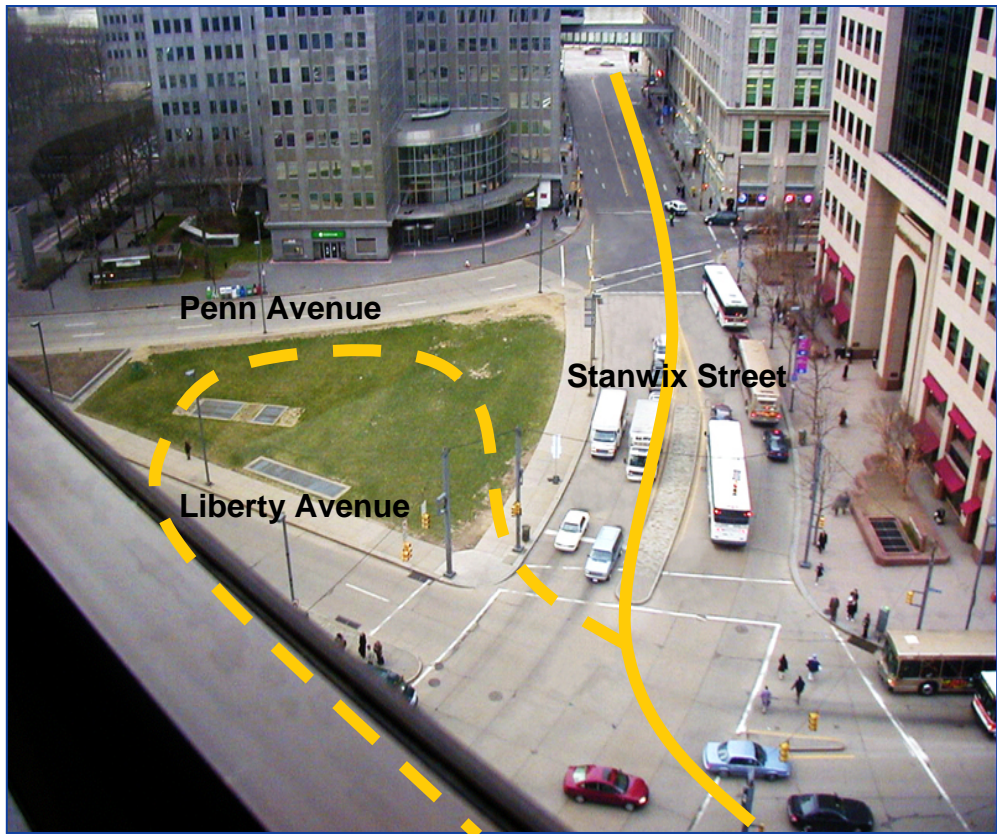


Figure – 10 – Gateway Square Alignment



Figure 11 – Alignment of North Shore Connector on North Shore

4.4 Construction

The original project design called for a tunnel structure to be constructed aboveground, floated into place and then submerged into the Allegheny River. Upon further study, however, it was determined that submerging a pre-constructed tunnel would have a negative impact on existing and future development, traffic flow in the construction area, and could alter or even damage the marine environment. The project now calls for a bored tunnel which would be built nearly twenty-five feet below the river bed at its lowest point. The tunnel walls will be constructed simultaneous with the boring excavation, with fixed concrete sections placed continuously behind the boring machine as it progresses through excavation.

To prepare for placement of the boring machine, two large pits will be excavated on either side of the Allegheny River – a launch pit and a combination receiving/launching pit. On the north side of the river, the boring machine itself will be placed in the launch pit and excavation begun. Once it reaches the receiving/launching pit near Gateway Station, the machine will be lifted, turned, and will proceed to excavate the second, parallel tunnel. After the tunnel excavation is completed, the boring machine will be disassembled and removed from the site.



Figure 12 - Tunnel Boring Receiving/Launching Pit

The project construction includes three passenger stations. The first station, Gateway Station, will be a below grade station built by conventional cut and cover construction. It will feature a center platform and a glass entry structure to allow natural light to enter the station. The second station, North Side Station, will also be a below grade station constructed by conventional cut and cover methods. North Side Station has a mezzanine and will share an entrance with an existing parking garage. The final station, Allegheny Station, is an aerial station located near Carnegie Science Center. It will be constructed on a steel box beam bridge structure.

The two below grade stations will be connected by twin bored tunnels beneath the Allegheny River. The tunnels will be mined using a slurry pressure balance tunnel boring machine (TBM) suitable for mining in a mixed face environment manufactured by

Herrenknecht Tunneling Systems. The nominal outside diameter of the tunnels will be 22 feet. The tunnels exterior liner will be made up of pre-cast concrete segmental liner which will be installed at the trailing end of the TBM as mining progresses. The exterior pre-cast concrete liner will be 11-inches thick gasketed segments which are bolted together to create a watertight tunnel. A secondary waterproofing membrane will be installed to the inside face of exterior pre-cast tunnel liner and then a 6 inch thick cast in place concrete liner will be place to finish the interior of the tunnel. The interior diameter of the finished tunnels will be 19 feet.

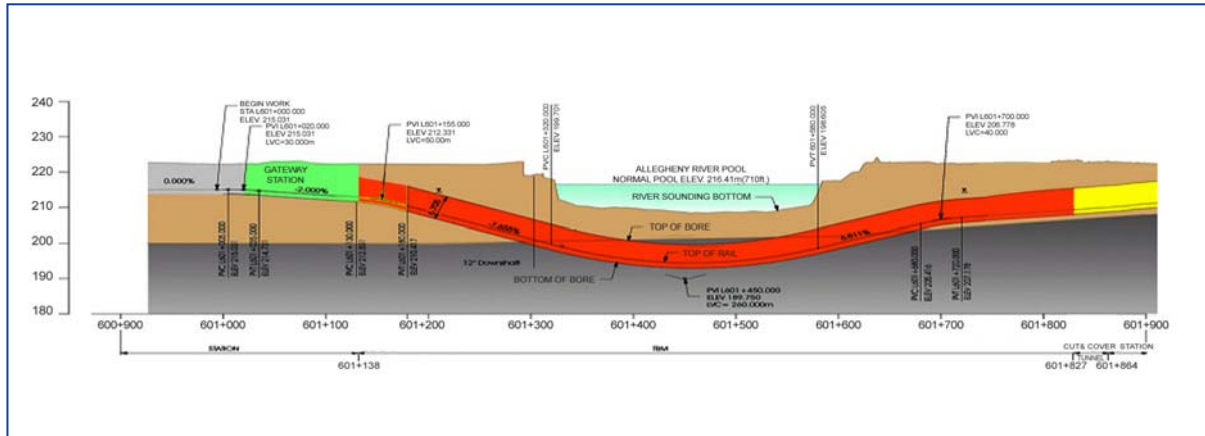


Figure 13 - Tunnel Profile Under Allegheny River

Construction is relatively complicated. The varied alignment incorporates cut and cover within a narrow downtown street, bored tunnel under a river, and elevated construction, all in a short 1.2-mile project. The project’s three stations are quite distinct; one is located under a street plaza in the central business district, another is incorporated within a new parking garage, and the third is an elevated station located in an area serving major stadium and science center events (with the nearby casino to be added to the mix in the future).



Figure 14 - Gateway Station Rendering

5. DOWNTOWN AND NORTH SHORE REVITALIZATION

The downtown Golden Triangle of Pittsburgh has undergone three “renaissances,” intensive series of development that occurred in the 1970s, 1980s and 1990s. These were public-private development programs that focused on transportation improvements, office towers, and cultural attractions. The current focus of downtown development is on

residential projects that are occurring in response to market demand. The transportation aspects included highway improvements, but transit was a key element as a number of transit projects were implemented.

A previous period of development took place within North Shore in the 1960s, culminating in the 1970 opening of Three Rivers Stadium which served both professional baseball and football. Three Rivers Stadium was built in the middle of surface parking lots, surrounded on two sides by elevated highways, without a grid street system and without much consideration of pedestrian access. Prior attempts to develop around the stadium did not meet with success.



Figure 15 - Former Three Rivers Stadium (1970) surrounded by highways and surface parking

Over the last several years, development activities in the North Shore area of the city have taken off. New development has been drawn to the area because of the large amount of relatively undeveloped land located so close to the central business district. In 1994, a deal was struck between the city, the two professional sports teams and the state to redevelop the North Shore and construct two sports facilities—a football field and baseball stadium—as the anchor for future development. In 2001, the two new professional sports venues opened. Heinz Field is home to the Pittsburgh Steelers professional football team and has stadium seating of 68,000. PNC Park seats 38,000 fans and is the home of the Pittsburgh Pirates. Located between the two stadiums are dozens of acres of bare land used for parking that were primed for redevelopment. Development is now occurring; examples are provided in Figure 16.

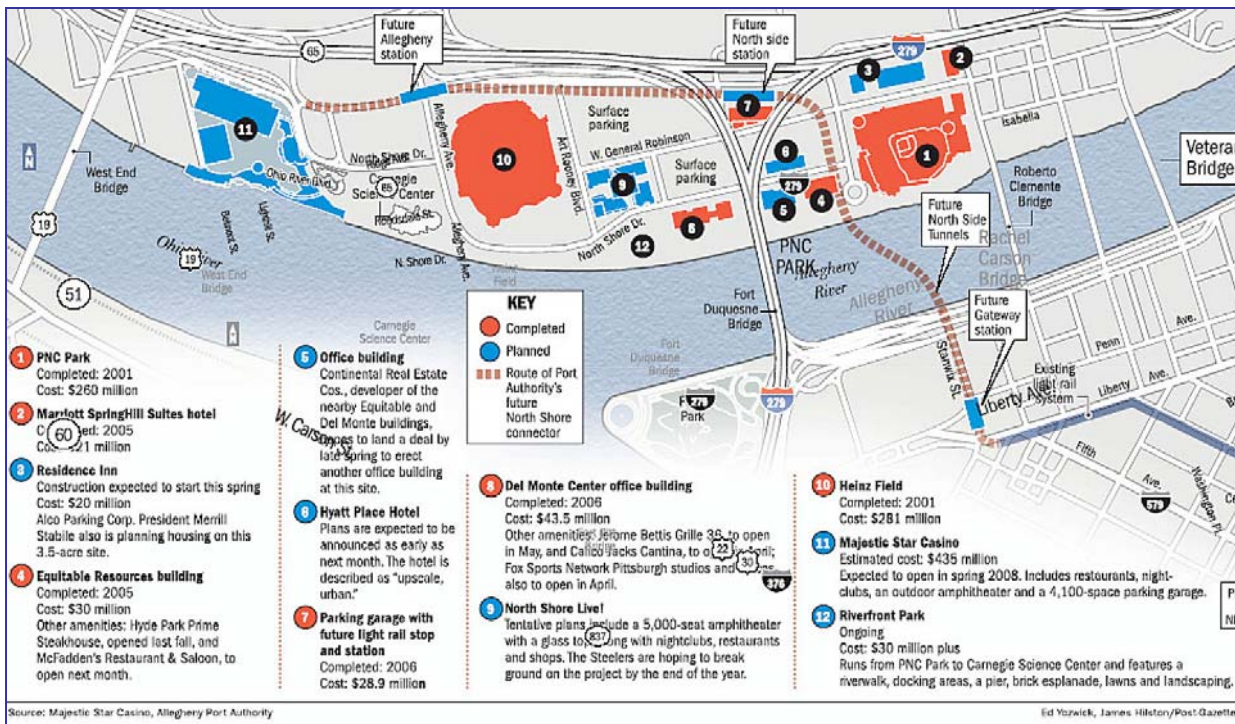


Figure 16 - North Shore Development Growth

In addition to the stadiums, the Carnegie Science Center and Community College of Allegheny County are located in or adjacent to the North Shore. The Carnegie Science Center is a multi-purpose interactive museum that draws thousands of visitors each weekend. The Center is a 2003 recipient of the National Award for Museum Service, and it offers visitors a wide range of different, "hands-on" projects and exhibits. A companion facility known as Sportworks is located on an adjacent property and provides visitors with experiences related to the science of athletic activities. The main campus of the Community College of Allegheny College is based in an area adjacent to the North Shore that is accessible from the North Shore Connector. Offering a range of degrees and interdisciplinary courses, the Community College is one of the major regional institutions of higher learning.

In 2001, a \$47 million riverfront promenade was completed giving pedestrians access to the waterfront along a landscaped walking trail. Automobiles access the area via the Roberto Clemente Bridge and the Fort Duquesne Bridge from the south and State Routes 28 and 65 from the north and west, respectively. In addition, river access is provided via the Gateway Clipper riverboat fleet.

With this existing backdrop, a number of other business recently opened offices on the North Shore. Del Monte and Equitable Resources expanded and relocated their operations to the North Shore. A 300-room hotel, the Marriot Spring Hill Suites opened in 2005. Other professional medical and legal offices located throughout the area. Several restaurants have already opened in the area and there are plans for others as more and more people begin to work and live in the area. Recently announced plans for a slot machine casino are expected to spur further development, including plans for a 300-unit apartment complex, outdoor amphitheater, parking and a hotel.

6. INTERMODALITY AND WALKABILITY

The national trend that has generated interest in walkable, transit-oriented communities has influenced development of the North Shore Connector. There is great and growing interest in transit-oriented design and communities. Transit-oriented communities are compact and walkable areas that offer a mixture of land uses and housing options within proximity of a transit stop or station. They are development on a pedestrian scale, i.e., they include sidewalks and other amenities that facilitate access by pedestrians.

The interest in these communities is being experienced in southwestern Pennsylvania as well as across the United States. A study³ by the organization Reconnecting America, and Federal Transit Administration, showed that demand for compact housing near transit in the United States is likely to more than double by 2025.

Examples abound regionally. In southwestern Pennsylvania, there are major redevelopment projects taking place in the downtown county seats of the 10-county region. The \$50 million second phase of Southpointe in suburban Washington County will be pedestrian friendly, unlike the first phase developed in the 1990s which was auto-oriented. Southside Works is a \$450 million pedestrian and transit-oriented major expansion of the South Side neighborhood of the City of Pittsburgh. Over \$500 million of development has occurred along the East Busway since it opened in 1983. Opportunities to pursue transit-oriented development along the LRT are being pursued along much of the 25-mile system.

The North Shore's proximity to downtown can only heighten the value of the North Shore Connector project to the walkability and intermodality of downtown Pittsburgh and beyond. Places Rated Almanac rates Pittsburgh as the second best city in the United States to travel in because of its transportation infrastructure. The Urban Mobility Report in 2003, using ratings of public transportation, carpooling and other methods, including biking and walking, rated Pittsburgh as the second least congested city in the nation.⁴

7. CONCLUSION

Long-term strategic planning exercises focused on the Pittsburgh region placed a high priority on transit for continued growth in the future. Highway investments alone will not prove adequate accessibility to serve the regions educational, business and medical centers. Public transportation is needed to expand the core capacity of downtown and Oakland (near the central universities).⁵ The North Shore Connector will contribute to providing additional access to these areas already served by other important modes of transportation.

Most importantly, the North Shore Connector project will provide a vital link to the North Shore, central business district, and points beyond. Pittsburgh's relatively moderate northern climate provides a wide range of weather; and pedestrian traffic, although desirable, is not always a realistic alternative during many months of the year. The light rail extension will provide a vital link between the growing North Shore area and the Golden Triangle, with a resulting decrease in congestion and ease of accessibility for residents and business people alike. Outside the immediate area, the light rail system will also connect downtown Pittsburgh with the suburbs to the far south, and make commuting into and through the downtown area not only possible, but preferable, over other forms of transportation.

¹ Historical information obtained from: Joel A. Tarr, "Transportation and Changing Spatial Patterns in Pittsburgh, 1850 – 1934" Public Works Historical Society, 1978.

² Citizens Committee on City Plan of Pittsburgh, Transit: A part of the Pittsburgh plan (1923).

³ Reconnecting America, Center for Transit Oriented Development and Federal Transit Administration, Hidden in Plain Sight (2005).

⁴ Texas A&M University, Urban Mobility Report (2003).

⁵ Southwestern Pennsylvania Commission, A Regional Strategic Vision for Public Transportation Serving Southwestern Pennsylvania (2006), pp. 32.