

GAO

Report to the Chairman, Subcommittee on
Surface Transportation and Merchant
Marine Infrastructure, Safety, and Security,
Committee on Commerce, Science, and
Transportation, U.S. Senate

March 2012

COMMUTER RAIL

Potential Impacts and Cost Estimates for the Cancelled Hudson River Tunnel Project



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Highlights of [GAO-12-344](#), a report to the Chairman, Subcommittee on Surface Transportation and Merchant Marine Infrastructure, Safety, and Security, Committee on Commerce, Science, and Transportation, U.S. Senate

Why GAO Did This Study

Studies have estimated that transit travel demand between New Jersey and Manhattan will increase by 38 percent by 2030. The Access to the Region's Core commuter rail project was designed to help meet that rising demand. In October 2010, the governor of New Jersey, citing potential cost growth and the state's fiscal condition, withdrew state support and cancelled the project. The New Jersey Transit (NJT) was the lead agency for the project, supported by the Port Authority of New York and New Jersey (Port Authority). The project was to be partially funded under the Federal Transit Administration's (FTA) New Starts program.

GAO was asked to examine (1) what would have been the mobility, economic, and environmental benefits of the project according to major planning studies; (2) the project cost estimates over time; and (3) how, if at all, documents prepared as part of the New Starts process addressed potential cost growth for the project.

GAO reviewed the literature and major project planning studies, FTA reports, and economic and cost estimates by NJT and other planning organizations. GAO interviewed officials from FTA, state and local transit agencies, and local planning organizations. GAO is making no recommendations in this report.

The Department of Transportation provided technical comments, which GAO incorporated in the report.

View [GAO-12-344](#). For more information, contact David Wise at (202) 512-3834 or wised@gao.gov.

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What GAO Found

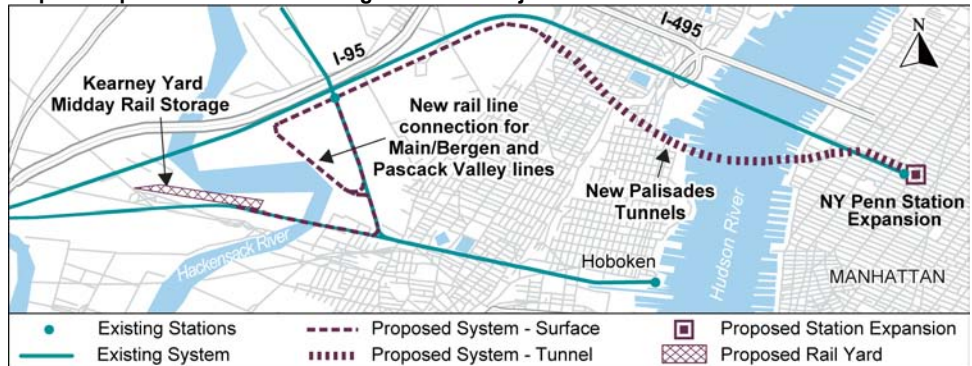
Studies estimated that the Access to the Region's Core commuter rail project would have provided mobility benefits, but other benefits would either have been limited or are difficult to measure. According to various studies:

- The project would have helped meet the projected increase in travel demand and improved mobility by doubling the number of daily peak period trains, and significantly increasing daily trips between New Jersey and Manhattan—from about 174,000 without the project to 254,000 with the project by 2030—while reducing transfers and station crowding and improving reliability of service.
- The project potentially would have generated economic activity in the region in the form of jobs and income, business activity, and increased home values, but many economic effects were hard to predict with certainty. For example, the extent to which the project would shift the location of economic activity, versus providing additional net economic activity, is uncertain.
- The project was estimated to have created limited but mostly positive environmental effects—in particular, improved air quality—and included measures to mitigate negative effects such as noise and storm water runoff.

Over time, the cost estimates for the project increased from an initial estimate of \$7.4 billion in 2006. In 2008 and 2010, FTA performed risk assessments and revised the cost estimate. FTA and NJT agreed upon a baseline cost estimate of \$8.7 billion in 2009. After considering comments from NJT, which projected lower costs than FTA, FTA revised its estimate and issued a cost estimate of \$9.8 billion to \$12.4 billion in October 2010. As of April 2010, federal sources were expected to fund about half the cost, with the remainder divided between New Jersey Turnpike funds and the Port Authority.

Because the project was terminated before FTA and NJT entered into a full funding grant agreement, there was no final agreement by all the parties on the issue of responsibility for project cost growth. While the Secretary of Transportation and the governor of New Jersey held discussions on additional funding options, planning documents did not address the source of funding of potential cost growth for the project.

Map of Proposed Access to the Region's Core Project



Source: DOT.

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Abbreviations

| | |
|----------------|---|
| ARC | Access to the Region's Core |
| FTA | Federal Transit Administration |
| PATH | Port Authority Trans-Hudson |
| Port Authority | Port Authority of New York and New Jersey |
| NJT | New Jersey Transit |

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Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

March 9, 2012

The Honorable Frank R. Lautenberg
Chairman
Subcommittee on Surface Transportation and Merchant Marine
Infrastructure, Safety, and Security
Committee on Commerce, Science, and Transportation
United States Senate

Dear Mr. Chairman:

The Access to the Region's Core (ARC) project was a planned commuter rail project designed to help address the problem of increasing travel demand between New Jersey and New York City. Current tunnel, bridge, and rail infrastructure serving this corridor is already at or near capacity; this increase in travel demand, fueled by population growth in the region west of Manhattan and employment within Manhattan, could result in more congestion and greater delays for commuters. The planned project was to connect existing rail lines, build two tunnels under the Hudson River, and expand New York Penn Station. However, on October 27, 2010, the governor of New Jersey, citing potential cost growth and the state's financial condition, withdrew state support and cancelled the project.

The New Jersey Transit (NJT) and other project sponsors began planning for the project in 1995, and in 2003, completed the first major planning study, which assessed numerous alternative solutions to the problem of constrained capacity and possible routes under and across the Hudson River. The project was further developed through the federal environmental impact review process, completed in 2009.¹ In addition, both NJT and local planning organizations conducted various studies of the expected transportation and economic impacts of the project. Cost estimates were developed throughout the planning process, but the final estimate and funding commitments were still under discussion between

¹The National Environmental Policy Act of 1969 (1) mandates consideration of environmental impacts before any federal action likely to significantly affect the environment is undertaken and (2) establishes the environmental impact process to identify potential environmental impacts and develop plans to mitigate negative ones.

New Jersey and the Federal Transit Administration (FTA) when the project was cancelled.

As requested, this report addresses the following questions: (1) What did major planning studies find would have been the estimated mobility, economic, and environmental impacts of the ARC project? (2) What have been the ARC project cost estimates over time, who developed those estimates, and what sources of funding were identified? (3) How, if at all, did documents prepared as part of FTA's New Starts funding process address potential cost growth for the ARC project?

To address these questions, we reviewed all major planning studies prepared for the project and FTA reports about the project.² We also reviewed planning and economic analyses of the project done by NJT and outside organizations. We examined the methodologies used by the studies and determined that the studies were sufficiently reliable for the purposes of our report. We reviewed documents from NJT and FTA that provided or discussed various project cost estimates. We interviewed officials from federal, state, and local agencies; private planning organizations; and academia; specifically, FTA, Amtrak, Office of the Governor of New Jersey, Office of the Attorney General of New Jersey, NJT, the Port Authority of New York and New Jersey (Port Authority), New York Metropolitan Transportation Council, North Jersey Transportation Planning Authority, Regional Plan Association, Tri-State Transportation Campaign, and Rutgers University. In addition, to determine how potential cost growth was addressed, we reviewed various declarations submitted in connection with NJT's response to FTA's demand for repayment of expended project funds, the general project agreement between NJT and the Port Authority, and FTA's financial assessment of NJT's financial plan that was submitted as part of the application to advance the project to its final design.

We conducted this performance audit from February 2011 through March 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for

²Those studies were the major investment study; draft, supplemental, and final environmental impact statements; and various FTA reports, such as risk assessment reports, financial assessments of NJT's financial plan, and annual reports on funding recommendations.

our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. During our review, we suspended our work for about 6 weeks until the resolution of a dispute between the Department of Transportation and New Jersey concerning the repayment of federal funds already spent on planning the project.

Background

Reason for the ARC Project

Commuter demand and congestion between New Jersey and New York City across the Hudson River is projected to increase as the limited passenger rail infrastructure continues to age, highlighting the need for improvements to the trans-Hudson commuter rail system into Manhattan. Planning agencies have forecasted that, fueled by population growth in regions west of the Hudson River and employment within Manhattan, demand for mass transit service crossing the Hudson River between New Jersey and nearby counties in New York and midtown Manhattan will grow by about 38 percent by 2030. This could result in more congestion and longer delays on existing roads, bridges, passenger rail, and other public transportation modes crossing the Hudson River. At the same time, the aging passenger rail infrastructure—comprising two single-track tunnels under the Hudson River leading to New York Penn Station—limits commuter rail capacity into Manhattan. The 100-year-old tunnels cannot meet the access and mobility demands of the future, given the projected growth in the region.

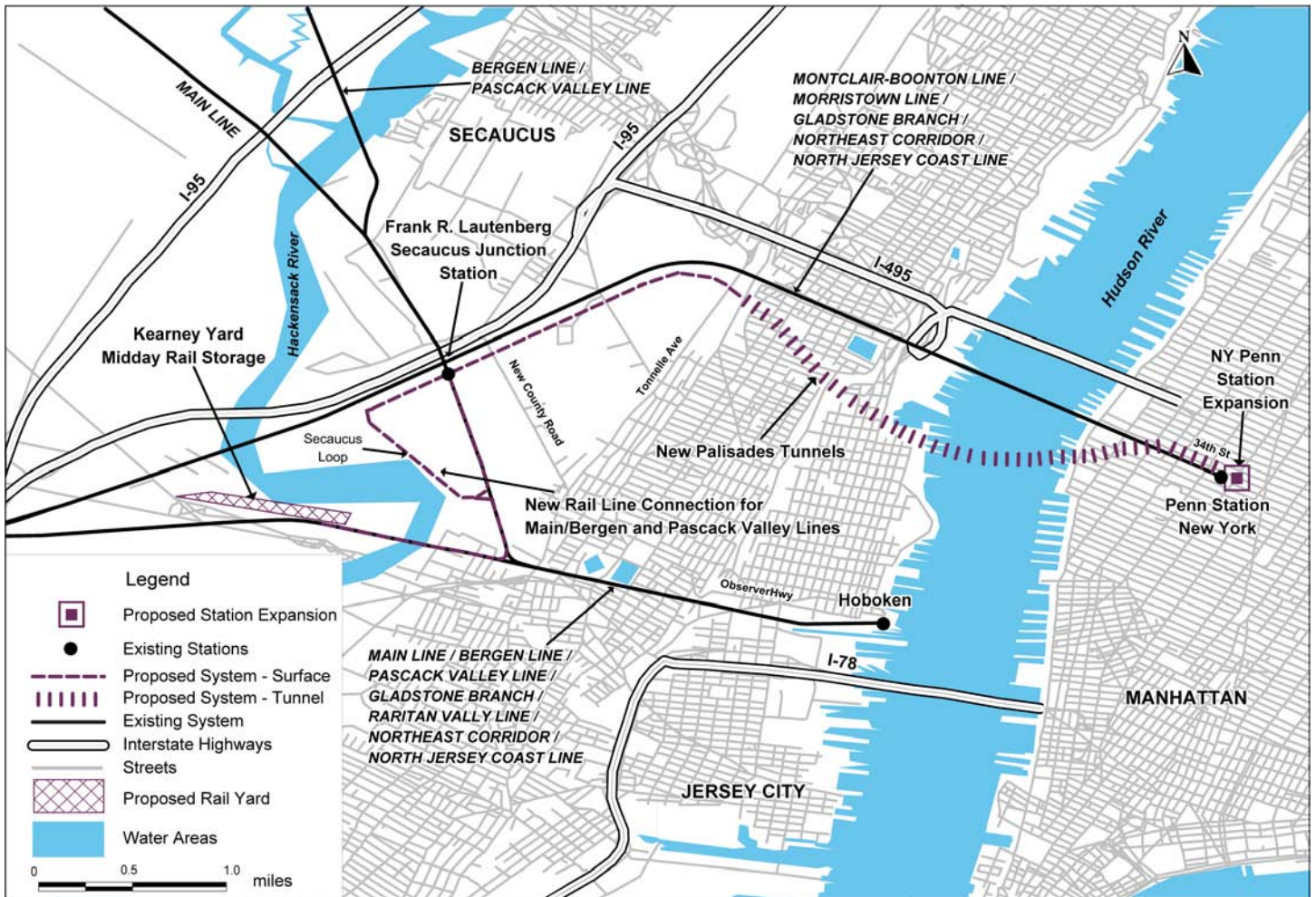
In 1995, the three major local transit agencies—NJT, the Port Authority, and the Metropolitan Transportation Authority³—jointly conducted a major investment study⁴ to consider ways to improve access between midtown

³The Port Authority operates and maintains the region's three major airports, six bridges and tunnels connecting New York and New Jersey, the Port Authority Trans-Hudson (PATH) rapid transit system, and other transportation facilities. The Metropolitan Transportation Authority is the New York transit organization whose agencies are responsible for New York City buses and subways, the Long Island Rail Road and Metro-North Railroad, and various bridges and tunnels.

⁴The intent of a major investment study is to identify and compare the costs, benefits, and impacts of a range of transportation alternatives to provide decision-makers with the information needed to implement the most appropriate solution in a transportation corridor.

Manhattan and the growing population west of the Hudson River. They evaluated more than 100 alternatives, including commuter railroad, bus, light rail, subway, automobile, and ferry. The study, completed in 2003, recommended three alternatives for advancement to the federal environment impact process. While these alternatives would have provided more train capacity and were expected to meet projected demand, they did not share all of the elements of the final ARC project. In the draft environmental impact statement, published in 2007, NJT identified the alternative that became the final ARC project. Project development and refinements continued until completion of the environmental review process and entry of the project into final design in 2009. Figure 1 shows the new tracks, tunnel, and station that the project would have built. In addition, the project would have added a yard in New Jersey for storing trains that are not in service during the middle of the day, five station entrances at the New York Penn Station Expansion, and three elevator entrances that met the Americans with Disabilities Act requirements.

Figure 1: Route of Proposed ARC Project, NJT Lines and Major Highways, 2009



Source: DOT.

Agencies Involved and Their Roles

NJT applied for federal funding for a portion of ARC costs through FTA's New Starts program.⁵ Under this program, funding is directed to public agencies on a largely competitive basis primarily for the construction of new fixed-guideway transit systems and the expansion of existing fixed-guideway systems. Federal funding for the construction of New Starts projects is committed in a full funding grant agreement, which is a

⁵49 U.S.C. §5309(b)(1).

multiyear funding agreement between the federal government and a public agency. Although the ARC project was cancelled prior to obtaining a full funding grant agreement, FTA provided some federal funding for preliminary engineering, final design, and a portion of construction costs for the project. The construction funding was provided through an early system work agreement. Appendix I provides an overview of the New Starts process.

While NJT sponsored the project and would have been the prime operator of services on the completed project, state and local funding for ARC would have come from the New Jersey Turnpike Authority and the Port Authority. As part of the federal planning process for transportation, the region's two metropolitan planning organizations—the North Jersey Transportation Planning Authority and the New York Metropolitan Transportation Council—adopted the project into their metropolitan transportation improvement plans, as required for federal funding.

Termination of the Project

While the New Jersey governor had affirmed support for the ARC project in an April 6, 2010, letter to the Secretary of Transportation, on October 27, 2010, the governor announced the cancellation of the project, citing potential cost growth and the state's fiscal condition. At the time of cancellation, NJT had completed most of the requirements needed to obtain additional federal funding. In particular, NJT had completed an in-depth environmental review and received FTA's commitment of \$601 million in New Starts funds to pay for initial construction activities.⁶ At the time of cancellation, NJT was negotiating the final cost estimate of the project with FTA in order to obtain the full funding grant agreement. This agreement would have provided the commitment for the full federal share of funds for the project.

⁶The \$601 million was obtained through an early system work agreement between FTA and NJT.

Anticipated Benefits of ARC Project

Regional Travel Demand and Mobility

According to the studies we reviewed, the ARC project would have provided a significant increase in rail capacity for moving commuters between New Jersey and New York. NJT and other planning organization officials said that increases in capacity were a key mobility benefit of the project. The tunnel would have added two train tracks under the Hudson River, and as a result:

- The number of trans-Hudson peak hour trains (from 7:30 a.m. to 8:30 a.m.) would have more than doubled—from 23 to 48 trains per hour.
- The peak hour use of passenger capacity would have decreased from a near-capacity 95 percent to 60 percent at completion, providing additional capacity to accommodate future passenger growth.
- The benefits of other planned NJT rail expansions would have been enhanced.

With this increase in capacity, projections made as part of the project's environmental study showed an anticipated increase in transit ridership as follows:⁷

- Daily trips between New Jersey and New York Penn Station would have increased from about 174,000 without the project to about 254,000 (a 46 percent increase) with the project by 2030.⁸
- Considering the effects on other transit facilities, the project would have generated about 32,500 new daily transit trips across the Hudson by 2030.

The ARC project would have reduced the need for passengers to transfer between trains, meaning many riders could commute on only one train.

⁷The ridership data presented are comparisons of the project's effect on estimated ridership to the "no-build" alternative. The no-build alternative includes the effects of other future transportation projects currently planned for the region.

⁸New Jersey Transit and Federal Transit Administration, *Access to the Region's Core Final Environmental Impact Statement (FEIS)*, October 2008.

Passenger transfers lengthen commuting times and avoiding transfers provides a benefit to riders. As a result of the ARC project, it was estimated that:

- Five existing NJT lines would no longer require passengers to transfer trains to get to Manhattan.
- Daily passenger transfers would have declined from about 32,100 without the project to 1,000 with the project, a 97 percent reduction, as estimated in the environmental study.
- Riders travelling between New Jersey and Manhattan would have experienced an average of 23 minutes of travel time savings per trip.

By building a second rail tunnel between New Jersey and Manhattan, the ARC project would have increased the overall reliability of rail service and added flexibility during service disruptions. A disruption of service in the existing NJT tunnel for any reason can result in major delays. Currently, one 15-minute train disruption in the existing tunnel can delay as many as 15 other NJT and Amtrak trains.⁹ The ARC project would have provided:

- Flexibility to reroute trains from one tunnel to the other, if necessary.
- Continuous weekend service as new tunnels could remain open during tunnel maintenance. (Currently, with only one tunnel, traffic must be limited to perform necessary maintenance.)
- Better reliability, allowing for faster transit. Average scheduled time from Newark, New Jersey, to Manhattan would decrease by 5 minutes during peak times and 3.5 minutes off-peak.

Even with the added trans-Hudson commuters, the environmental study found that the new station would have reduced crowding at the adjacent New York Penn Station:

- Average passenger egress time from New York Penn Station would have decreased from 80 to 60 seconds (a 25 percent decrease).

⁹Amtrak currently uses the existing tunnel as part of its Northeast Corridor service.

-
- The new station would have resulted in a projected decrease in peak hour ridership at New York Penn Station of 37 percent—from about 27,800 passengers without the project to 17,200 with the project in 2030—thus alleviating crowding.

Additionally, the environmental study estimated that, in general, the increased rail capacity across the Hudson River would have reduced the amount of travel by automobile that would otherwise occur. Port Authority officials told us that this increased rail capacity would help ease road congestion for trans-Hudson commutes. Specifically, the study projected that by 2030:

- Daily trans-Hudson automobile trips would be reduced by about 22,100 trips, or 4.9 percent, compared to the number of automobile trips without the project.
- Daily automobile vehicle miles traveled would have been reduced by about 590,000 miles compared to vehicle miles traveled without the project.
- Daily automobile vehicle hours traveled would have been reduced by about 22,000 hours compared to vehicle hours traveled without the project.

According to the environmental study, mobility may further deteriorate without the ARC project. The New York City region faces serious mobility issues and, as we have mentioned previously in this report, travel demand is projected to increase significantly. Environmental study forecasts estimated that trans-Hudson transit travel demand would rise from about 550,000 riders in 2005 to about 760,000 in 2030, an increase of about 38 percent. Without the tunnel, the environmental study projected that demand would not be met, and congestion and delays would increase. All the major trans-Hudson crossings—NJT, the Port Authority Trans-Hudson (PATH), and vehicular tunnels and bridges—are at or near capacity.¹⁰ According to the environmental study, the increased demand would stress the entire transportation network, including roadway, bus, ferry, and commuter rail systems.

¹⁰PATH is a rapid transit system between New Jersey and Manhattan operated by the Port Authority.

However, it is difficult to precisely determine the long-term effects of not building the tunnel because various other agencies are building, planning, or exploring the possibility of transportation improvements that could affect overall mobility in the region. Local transportation officials cited a number of projects that could affect congestion and commutes in the region, although some are at the conceptual phase, and may or may not be built. Possible projects include the extension of a subway line from New York City to New Jersey, Amtrak's proposal to add a train line from New Jersey into New York City, bridge and transit tunnel improvements, a new bus terminal, and improvements to help freight flows into New York. Thus, the overall effect of canceling the ARC project must be understood in the regional context, and the effect is dependent on what transpires with these other projects.

Economic Activity

Studies estimated the ARC project would have generated economic activity in the region that would have affected jobs and personal income, business activity, and home values, among other things. Most of the economic effects were expected during the building phase of the project. The studies we reviewed used regional economic models to measure the economic effects. However, the results of these models depend on larger economic conditions, such as the level of unemployment. The results cannot be regarded as certain in all economic conditions. The studies addressed several aspects of economic activity as follows:

- *Jobs and personal income.* The environmental study estimated that during construction the ARC project would have provided about 59,900 jobs directly onsite and total additional employment in the region of about 98,300 jobs.¹¹ The environmental study also suggested that over the longer term, the rail line would have required an estimated 410 jobs directly in transportation. Another study estimated that the project would generate about 5,700 construction-related jobs each year during the 9-year construction.¹² In addition, 10 years after completion of the project, the same study estimated the region would gain 44,000 new jobs as a result of improved access, which would make the region more competitive compared to other

¹¹A job is defined as one year of work for one worker.

¹²NJT, *Economic Benefits of the Trans-Hudson Express Tunnel* (2006).

regions.¹³ The same study estimated that 10 years after completion, the project would have added almost \$4 billion in personal income to the region, in 2006 dollars.

- *Business activity.* The ARC environmental study estimated the project would have produced an additional \$9 billion in business activity during construction and \$120 million per year in business activity over the long term.
- *Home values.* Another study estimated that houses in New Jersey communities served by the ARC project would see an average increase in home value of \$19,000, or 4.2 percent, resulting from more efficient local travel and improved access to high paying jobs in New York City.¹⁴
- *Tax revenues.* Studies also indicated that increased tax revenues would have resulted from the increases in economic activity from the ARC project. The environmental study estimated that during construction, \$1.5 billion in federal, state, and local taxes would have been generated, as well as an additional \$16 million annually after the project was completed. Another study estimated that the project would result in an additional \$375 million each year in property taxes generated by local governments.¹⁵

While economic benefit would accrue to the region as a result of the project, the net magnitude of the benefit is unclear and would be difficult to assess, for several reasons. First, the closer the economy is to full employment, the less net effect the project would have on total economic activity. During the planning and development of this project, the level of employment dropped as a result of the recession, which should have increased project benefits, but given the duration of construction, employment levels could have varied again if the economy rebounded. This makes assessing the net employment benefits difficult. Second, the project's effects could be limited to shifting the location of economic activity, rather than providing additional net benefits. If there is less local economic growth in New Jersey as a result of canceling the project, this

¹³Ibid.

¹⁴Frank Hebbert, Juliette Michaelson, Andrew Turco, Jeff Zupan, *The ARC Effect* (New York, NY: Regional Plan Association, 2010).

¹⁵Ibid.

growth may simply shift to another part of the region or nation. Third, the project's economic impact also depends on how it was financed. Deficit financing—borrowing—provides an increase in the total amount of spending, which will have economic effects. In contrast, financing the project through taxes means that existing government and household spending to some extent is simply directed a certain way, rather than increasing the total amount of such spending. Analyzing the impact of the project in the context of these variables—the unemployment rate when the project is being built and project financing—was beyond the scope of the studies we reviewed.
















The net impact on housing prices is also difficult to assess. First, the analyses—done several years ago—may not fully capture the effects of recent declines in the housing market. Second, impacts on the housing market throughout the metropolitan area would, to some extent, reflect population shifts—some house prices may go up as a consequence of improved access to transit, while prices in other less desirable locations may go down. However, shifting the location of households and business activity does not necessarily expand the overall economy. Also, benefits to homeowners and commuters from the project would significantly overlap, since they are to some extent the same people; that is, the change in a homeowner's real estate value is the result of the improvement in travel time.

Finally, even though the project was cancelled, all of the anticipated economic activity was not necessarily lost. For example, according to Port Authority officials, the Port Authority redirected funds it had allocated to the ARC project to other projects in the region, which could increase employment and economic activity tied to those projects. Likewise, funds that New Jersey planned to allocate to the ARC project were reallocated to the state's highway trust fund, which would then support economic activity related to highway projects. However, these highway projects would not necessarily be in the New York City region.

Environmental Effects

The ARC environmental study estimated the project would have created limited, but mostly positive environmental effects. (See fig. 2.)

Figure 2: Selected Long-term Environmental Effects of ARC Project

| Environmental area | Long-term effect |
|---|--|
| Air quality |  Positive: automobile trips diverted would decrease emissions that contribute to existing air quality problems |
| Land use, zoning, and public policy |  Positive: land use and zoning policies would support economic development |
| Energy |  Positive: permanent reductions in fuel consumption |
| Environmental justice ^a |  Positive: enhanced accessibility to jobs |
| Parklands |  Positive: increased access to parklands |
| Soils and geology |  Positive: productive reuse of soils excavated at sites |
| Utilities |  Positive: improvements in quality and condition of utility lines |
| Demographics, neighborhoods, and community facilities |  Positive: improved access to employment, community, educational, and recreational facilities |
| Noise and vibration |  Negative: more noise and vibration from increased train service |
| Contaminated materials |  Negative: existing contaminants in the river could be disturbed |
| Ecology |  Negative beyond project area: need for additional land to provide access to parking, station, and roadway; minor loss of wetlands at the New Jersey Meadowlands |
| Water resources |  Mixed: positive for increased controls on discharges to waterways, negative for increased runoff |
| Visual and aesthetic conditions |  Mixed: positive aesthetic impacts within rail corridors, negative aesthetic conditions as a result of parking and station access |
| Archaeological and historic resources |  Not fully determined in study |
| Electric and magnetic fields |  None |

Sources: NJT and GAO.

^aEnvironmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

The primary positive effect would have been a long-term reduction in air pollution, although it is difficult to predict how much this reduction in pollutants would affect the entire New York City region. Air quality effects

are of particular relevance in the development of transit projects. FTA, pursuant to law, includes whether a project is in an area that has not attained air quality standards required by the Clean Air Act as a factor in selecting projects for the New Starts program.¹⁶ According to the Environmental Protection Agency, the entire New York City region is out of compliance with certain ambient air quality standards that are designed to protect public health. The project would reduce automobile trips and thereby decrease emissions that contribute to existing air quality problems in the region and related public health problems. According to the Environmental Protection Agency, adverse health effects associated with air pollutants include increased respiratory symptoms, hospitalization for heart or lung disease, and premature death. Local transportation agency officials told us that air quality factors were important when considering the potential environmental effects of the ARC project. Over the long term, air quality would have been positively affected due to an estimated overall daily decrease of about 590,000 in vehicle miles traveled in the region and about 22,100 fewer trans-Hudson vehicle trips. While longterm air quality effects were generally positive in nature, the results of these changes would be dispersed over the entire metropolitan area, and were too difficult to estimate for the New York region, as noted in the environmental study.

According to the environmental study, other adverse environmental effects would have been short term and mitigated. Among the environmental effects were negative effects on air quality, mainly related to dust created by excavation and construction and exhaust emissions from equipment, noise, potential storm water runoff, vibration, potential soil erosion, and potential disturbance of various contaminated sites. FTA determined that these short-term negative effects were adequately addressed by mitigation plans.¹⁷

¹⁶49 C.F.R. §611.3(c)(1).

¹⁷FTA issued a Record of Decision for the ARC project in 2009, signaling the project had satisfied National Environmental Policy Act of 1969 requirements. In it, FTA determined that the project's negative effects were adequately addressed by mitigation plans.

Project Cost Estimates Increased Over Time and about Half the Planned Funding Was from Federal Sources

In 2003, the first cost estimates for the concept of a new commuter rail tunnel between New Jersey and New York—developed by NJT and other local agencies in the major investment study—ranged from \$2.9 billion to \$3.6 billion (in year 2000 dollars).¹⁸ These estimates were for a project that was largely conceptual and did not rely on significant engineering design work. Further, not all project costs and elements were included in these estimates.

In 2006, after the sponsoring agencies selected a locally preferred alternative, FTA accepted \$7.4 billion as the first cost estimate for the project. This estimate included an expanded New York Penn Station as well as construction, engineering, oversight, and management costs; operational systems; rolling stock; real estate; startup cost; and environmental mitigation. ARC project cost estimates increased over time as shown in table 1.

Table 1: Selected Cost Estimates for the ARC Project, 2006-2010

| Estimate source | Source agency | Amount (dollars in billions) | Date | Comments |
|---|---------------|--|------------|--|
| FTA approval for entry into preliminary engineering | FTA | \$7.4 | 8/4/2006 | Included elements, such as a tunnel to serve both the existing New York Penn Station and a station expansion that was not part of the major investment study alternatives. A locally preferred alternative was approved in early 2006. |
| Draft Environmental Impact Study | NJT | \$7.4 | 2/9/2007 | Re-examined the preferred alternative as a result of public comments and preliminary engineering effort. |
| Supplemental Draft Environmental Impact Study | NJT | \$7.6 | 3/14/2008 | Modified the preferred alternative, which resulted in slight cost increase. |
| 2008 FTA Risk Assessment | FTA | Range of \$9.5-12.4 | 8/7/2008 | Established a baseline cost estimate. |
| 2008 FTA Risk Assessment Revised | FTA | Range of \$8.4-12 | 8/26/2008 | FTA estimate considering comments from NJT. |
| 2008 FTA Risk Assessment Final | FTA | \$9.1 for New Start evaluation purposes \$8.7 accounting for railcar depreciation | 9/3/2008 | FTA estimate after discussions with NJT and assurances by NJT on addressing risks. |
| Final Environmental Impact Statement | NJT | \$7.6 | 10/27/2008 | Issued after 2008 FTA Risk Assessment, and was unchanged from earlier estimates. |

¹⁸In 2011 dollars, the cost estimates ranged from \$3.69 billion to \$4.58 billion.

| Estimate source | Source agency | Amount (dollars in billions) | Date | Comments |
|---|---------------|---|-----------|---|
| Approval of Entry into Final Design | FTA | \$8.7 (baseline for the full funding grant agreement) \$9.2 (including additional cost through 2030) | 1/27/2009 | The \$8.7 billion estimate includes only vehicles needed in opening year, and was to be used as the basis of the full funding grant agreement. The \$9.2 billion estimate includes vehicles for operation through 2030. |
| Early System Work Agreement Approval Letter | FTA | \$8.7 | 8/14/2009 | Used estimate from FTA's 2009 approval of entry into final design. |
| Estimate at Entry into Final Design | NJT | \$8.7 | 1/20/2010 | Calculated an estimate similar to FTA's 2009 approval of entry into final design. |
| Revised Estimate at Final Design | NJT | \$8.7 | 4/1/2010 | Calculated an estimate similar to FTA's 2009 approval of entry into final design. |
| Section 5309 New Starts Application Update | NJT | \$8.7 | 4/29/2010 | Calculated an estimate similar to FTA's 2009 approval of entry into final design. |
| 2010 FTA Risk Assessment | FTA | \$10.878 (low) \$12.232 (medium) \$13.736 (high) | 8/16/2010 | Risks include higher cost for design services, construction, and risks to stakeholders. |
| NJT ARC Projected Cost Range | NJT | \$8.7 (low) \$9.5 (medium) \$10 (high) | 8/17/2010 | NJT response to FTA's 2010 risk assessment. |
| 2010 FTA Risk Assessment Revised | FTA | \$9.775 (low) \$10.847 (medium) \$12.432 (high) | 10/4/2010 | FTA's response to NJT comments. |

Source: FTA and NJT.

Note: Costs are in year of expenditure dollars.

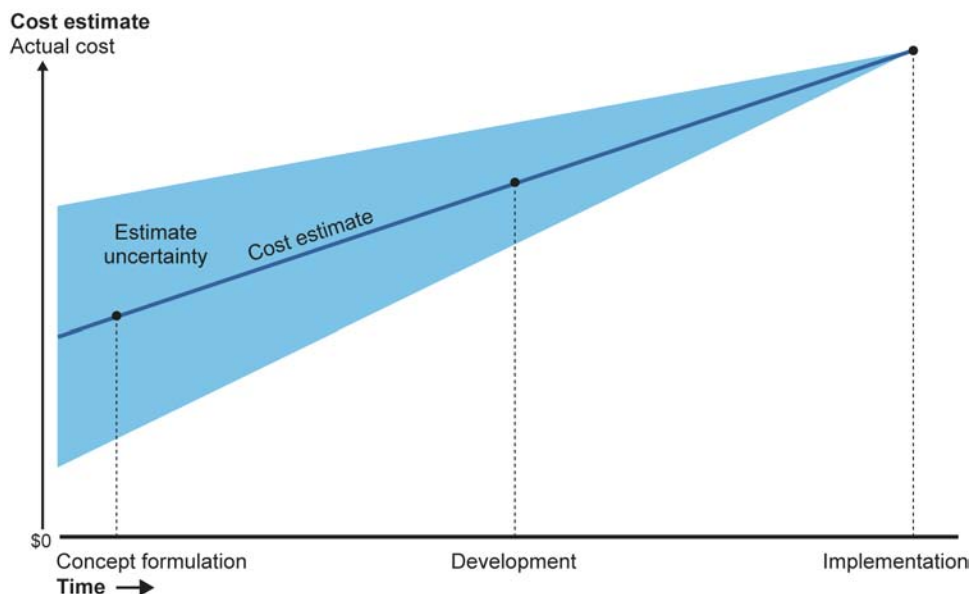
Cost Estimate Increases

In general, changes in cost estimates throughout the process of planning and designing a transportation project are normal and may happen for a number of reasons.¹⁹ First, as a project progresses from a concept on paper to final design and construction, a more accurate understanding of what a project entails may evolve. The change in cost estimates may reflect a more accurate understanding of what actually constitutes the

¹⁹Reasons for changes in project cost estimating can be found in GAO, *Cost Estimating and Assessment Guide*, [GAO-09-3SP](#) (Washington, D.C.: Mar. 2, 2009).

project. For example, according to Port Authority officials, early in the project they learned that there were no existing surveys of New York Penn Station, and they had to survey the station before detailed designs could be developed. As shown in figure 3, cost estimates are more uncertain at the beginning of a project (the range is wide), because less is known about its detailed design and construction requirements, and therefore the opportunity for change is greater.

Figure 3: Relationship of Estimated Cost and Uncertainty During Project Planning and Implementation



Source: GAO.

Second, costs can appear to change if they are not expressed in a consistent manner, that is, in constant year dollars (to eliminate any inflationary effects) versus year of expenditure dollars (that may mask any changes in real terms because of inflation). Third, project cost estimates are sensitive to factors such as changes to the scope of the project. In some cases, a sponsor may reduce the scope or add more features to the project as the design progresses. Uncertainty of the costs is reduced, as the project scope is better defined, but costs also may increase. Fourth, cost estimates can change as risks are assessed and reassessed throughout project development, resulting in the amount FTA requires project sponsors to set aside for project contingency to increase or decrease. For example, FTA officials said risk factors could include changes in real estate costs, new information involving surface or

subsurface ground conditions and materials, or the degree of competition among contractors. According to FTA officials, risks like these can affect the cost of a project, and sponsors may never adequately address all of them, but at a minimum both the sponsor and FTA must be aware of what those risks are.

The ARC project cost estimates increased from the \$7.4 billion estimate in 2006 for a number of reasons:

- In 2008, FTA's cost estimates ranged from \$9.5 billion to \$12.4 billion, based on potential scenarios in its 2008 Risk Assessment, which not only assumed different levels of risk but also included \$1.7 billion set aside for contingency.²⁰ After discussions, FTA and NJT agreed upon a baseline cost estimate of \$8.7 billion in 2009.
- FTA's 2010 Risk Assessment contained the next estimated cost—as high as \$13.7 billion—as the engineers developed a more accurate understanding of what the project entailed. However, NJT did not see costs rising to this level and projected a lower expected cost range, including a maximum \$10 billion final cost. After considering comments from NJT, FTA revised the cost range to \$9.8 billion to \$12.4 billion. This estimate included a more refined cost estimate of potentially higher construction and other work costs. In addition, the contingency amount was increased due to reassessment of risks related to delays in awarding project contracts.

Federal, State, and Local Funding Sources

Federal, state, and local sources would have funded the ARC project, as shown in table 2. As of April 2010, about half the estimated cost of about \$8.7 billion would have come from federal sources with the remainder divided at the local and state levels between the Port Authority and the New Jersey Turnpike Authority. In addition to New Starts funds, New Jersey was planning to use certain federal highway funds that may be used for transit capital purposes. New Jersey planned to use part of its federal Congestion Mitigation and Air Quality Improvement and National Highway System funding for the ARC project. State and local funds included \$3 billion from the Port Authority, which formally approved this

²⁰FTA performs an assessment of cost and schedule risk of a New Starts mega-project (those with \$1 billion or more in capital costs) when the project enters into the preliminary engineering phase. For all New Starts projects, FTA performs a risk assessment before a project enters final design and before approving a full funding grant agreement.

funding commitment. The state of New Jersey planned to add \$1.25 billion that was to have come from increased tolls on the New Jersey Turnpike.

Table 2: Proposed Funding by Source, as of April 2010

| Source of funds | Total funds (dollars in millions) | Percentage of total |
|---|-----------------------------------|---------------------|
| <i>Federal</i> | | |
| New Starts | \$3,000 | 34.5% |
| Flexible federal highway funds (Congestion Mitigation and Air Quality Improvement Program, National Highway System) | 1,319 | 15.2 |
| American Recovery and Reinvestment Act ^a | 130 | 1.5 |
| Total federal | \$4,449 | 51.1% |
| <i>Local</i> | | |
| Port Authority | 3,000 | 34.5 |
| <i>State</i> | | |
| New Jersey Turnpike Authority | 1,250 | 14.4 |
| Total project | \$8,699 | 100.0% |

Source: FTA.

Note: Totals may not add due to rounding.

^aAmerican Recovery and Reinvestment Act of 2009, Pub L. No. 111-5.

In August 2009, FTA entered into an early system work agreement with NJT. This agreement, which FTA and NJT amended in 2010, made available about \$910.3 million for certain project activities, such as tunnel construction contracts, property and easement acquisitions in New York, professional services related to the project's final design, construction permits, insurance, and a contingency reserve.²¹ As of 2010, NJT expended about \$271 million of the \$910.3 million. When the project was cancelled, the Department of Transportation claimed that the \$271 million in expended federal funds should be recovered by the federal government, and New Jersey disputed this claim. On September 30,

²¹The early system work agreement committed \$601 million in New Starts funds, and authorized the use of about \$179.2 million in Congestion Mitigation and Air Quality Improvement funds and \$130 million from the American Recovery and Reinvestment Act of 2009.

2011, the Department of Transportation and New Jersey agreed that New Jersey would return \$95 million, which included \$51 million in New Starts funds and \$44 million in American Recovery and Reinvestment Act funds. In addition, New Jersey agreed to spend about \$128 million in Congestion Mitigation and Air Quality Improvement funds on transit projects approved by the Department of Transportation. Because the project was terminated before FTA and NJT entered into a full funding grant agreement, there was no final commitment by all the parties to fully fund the project.

Planning Documents Did Not Determine the Source of Funding of Potential Cost Growth

The general project agreement, which was a document prepared as part of the New Starts process and signed by NJT and the Port Authority in 2009, addressed potential cost growth. According to the agreement, if costs exceeded \$8.766 billion (or if less than \$3 billion was provided by FTA), both parties agreed to work together to obtain additional funding sources. According to Port Authority officials, although both parties signed the agreement, there was no commitment of assistance from the Port Authority in the event that the project experienced cost increases. Port Authority officials told us that the agency's existing \$3 billion commitment was the maximum the agency could provide to the project, given the constraints of their overall capital program. In the weeks preceding the project's cancellation, the Secretary of Transportation and the governor of New Jersey held discussions on additional funding sources for the ARC project or a reduction in project scope. The additional funding options discussed included increased funding by the federal government, New Jersey, and the Port Authority; a federal railroad loan; or a public-private partnership contribution.²² Because the project was terminated before a full funding grant agreement was entered into between FTA and NJT, there was no final agreement by all the parties on the issue of responsibility for ARC cost growth.

Agency Comments

The Department of Transportation reviewed a draft of this report and provided technical comments, which we incorporated in the report.

²²The term "public-private partnership" refers to a scenario in which the private sector assumes a greater role in the planning, financing, design, construction, operation, and maintenance of a transportation facility compared to traditional procurement methods.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to interested congressional committees, the Secretary of Transportation, and the Administrator of the Federal Transit Administration. In addition, this report will be available at no charge on GAO's website at <http://www.gao.gov>.

If you or your staff have any questions or would like to discuss this work, please contact me at (202) 512-2834 or wised@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Individuals making key contributions to this report are listed in appendix II.

Sincerely yours,

A handwritten signature in black ink that reads "David J. Wise". The signature is written in a cursive style with a large, prominent "D" and "W".

David J. Wise
Director, Physical Infrastructure Issues

Appendix I: Federal Transit Administration's New Starts Process

The Federal Transit Administration (FTA) provided federal funding for a portion of the Access to the Region's Core costs through its New Starts program. Under this program, funding is directed to public agencies on a largely competitive basis primarily for the construction of new fixed-guideway transit systems and the expansion of existing fixed-guideway systems.¹ Federal funding for construction of New Starts projects is committed in a document that is called a full funding grant agreement—a multi-year agreement between the federal government and a public agency that is subject to the availability of appropriations.² The agreement establishes the terms and conditions for federal financial participation, including the maximum amount of New Starts funding being committed. To obtain this grant agreement, a project must be approved by FTA for final design and construction and have gone through a series of steps that make up the New Starts approval process. Among the phases of the New Starts planning and development process are: systems planning, alternatives analysis, preliminary engineering, and final design.

- *Systems planning.* Systems planning involves the continuing regional transportation planning process carried out by metropolitan planning organizations in urban areas throughout the United States. This process produces long-range transportation plans and shorter-range transportation improvement programs, along with environmental and other analyses.
- *Alternatives analysis.* The analysis of alternatives examines the benefits and costs of different options, such as light rail or bus rapid transit, in a specific transportation corridor or in a regional sub-area. It concludes with the selection of a locally preferred alternative and adoption of that alternative into a fiscally constrained long-range transportation plan. The project sponsor submits the proposed project to FTA for evaluation so as to gain approval to enter preliminary engineering, the next phase of development.³ FTA evaluation does

¹49 U.S.C. §5309(b)(1).

²See Congressional Research Service, *Public Transit New Starts Program: Issues and Options for Congress* (Oct. 5, 2010).

³FTA's rating process is applied at each development phase in order for the project to move forward. Also, for mega-projects (those with \$1 billion or more in capital cost) FTA performs risk assessments on such projects prior to approval into preliminary engineering.

not include a full cost-benefit analysis, but does consider cost-effectiveness and other benefits of the proposed project.

- *Preliminary engineering.* Preliminary engineering involves the project sponsor refining the project by examining the costs, benefits, and impacts of different design alternatives, and completing an analysis of environmental impacts as required by the National Environmental Policy Act of 1969.⁴ Once preliminary engineering is complete, FTA evaluates and rates the project to determine whether it can be approved into final design.
- *Final design.* In the project's final design phase, the project sponsor prepares final construction plans and cost estimates, and, if needed, includes right-of-way acquisition and relocation of utilities.

After final design is complete, FTA may approve the project for a full funding grant agreement, at which point the project may move into the construction phase. In some cases, FTA may obligate some of the funding expected to be provided in the full funding grant agreement through an early system work agreement. Although not a guarantee of full funding, an early system work agreement provides funding so that work can begin before full funding is awarded.

⁴New Starts projects must fulfill the requirements of the National Environmental Policy Act of 1969 because they involve a proposed major federal action significantly affecting the environment. FTA requires a project to have moved beyond the environmental scoping phase before entering preliminary engineering. National Environmental Policy Act of 1969 scoping involves identifying the alternatives that will be examined in the environmental documents and the significant environmental issues that arise from the proposed project.

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

David J. Wise, (202) 512-2834 or wised@gao.gov

Staff Acknowledgments

In addition to the contact named above, Teresa Spisak (Assistant Director), Robert Ciszewski, Alexander Lawrence, David Hooper, Hannah Laufe, Joshua Ormond, Amy Rosewarne, and Max Sawicky made key contributions to this report.

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