

**REPORT ON THE  
TREN URBANO RAIL  
TRANSIT PROJECT**

*Federal Transit Administration*

*Report Number: IN-2002-085  
Date Issued: March 5, 2002*




# Memorandum

U.S. Department of  
Transportation  
Office of the Secretary  
of Transportation  
Office of Inspector General

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Subject: ACTION: Report on the Tren Urbano Rail Transit Project  
IN-2002-085

Date: March 5, 2002

From: Alexis M. Stefani   
Assistant Inspector General for Auditing

Reply to  
Attn. of: JA-30

To: Federal Transit Administrator

In March 1996, the Federal Transit Administration (FTA) awarded a full funding grant agreement to the Puerto Rico Highway and Transportation Authority (HTA) for the design and construction of Phase I of the Tren Urbano Rail Transit Project (Tren Urbano) in the San Juan, Puerto Rico, metropolitan area. Phase I will provide a new, fixed guideway rail transit system with 10.7 miles of track, and 16 stations strategically located in both residential and commercial areas. Currently, Tren Urbano is the most expensive transit project with a full funding grant agreement.

In its 1996 application for a full funding grant agreement, HTA estimated that the project would cost \$1.250 billion and begin operations in July 2001. However, Tren Urbano has encountered a series of construction problems, cost increases, and schedule delays. By 1999, HTA's estimate of the cost to complete Tren Urbano increased by \$404 million, to \$1.654 billion, and the scheduled operational date was extended 11 months to May 2002. In July 1999, FTA amended the grant agreement to recognize the cost increase and schedule delays, and authorized the use of additional Federal funding—urban area transit formula (\$141 million) and highway flex funds (\$259.9 million). The Federal contribution increased from \$307.4 million to \$708.3 million, or from 24.5 percent to 42.8 percent of the total estimated project cost. In addition, in August 2000, the Department of Transportation approved a federally guaranteed \$300 million loan under the Transportation Infrastructure Finance and Innovation Act (TIFIA) for Tren Urbano. As of December 31, 2001, the project's total expenditures were \$1.5 billion, or 72 percent of Tren Urbano's estimated cost of \$2.036 billion.

In May 2000, we reported that the project was experiencing construction quality and schedule problems.<sup>1</sup> We noted that Tren Urbano lacked an integrated master schedule and the project may experience construction delays that could be as much as 2 years beyond the original revenue operation date.<sup>2</sup> We recommended that FTA ensure that HTA develops an integrated master schedule for Tren Urbano. In November 2000, FTA withheld Fiscal Year (FY) 2000 Federal funds from the project because HTA failed to clarify the status of several construction quality and schedule issues as well as how HTA planned to resolve 507 open nonconformance reports.<sup>3</sup> In May 2001, FTA required project officials to implement a recovery plan to address management, construction quality, financing, and schedule problems, and withheld the FY 2001 Federal funds. To date, FTA has withheld a total of \$165.7 million in Federal funds from Tren Urbano.

Citing unresolved problems meeting schedule milestones and construction quality standards, the House Committee on Appropriations directed the Office of Inspector General (OIG) to continue monitoring the project and to provide a report to the House and Senate Committees on Appropriations.<sup>4</sup> Responding to the Committee's direction, the objective of this audit was to evaluate HTA activity to implement the recovery plan. Our audit focused on determining whether (1) the project's schedule is achievable, (2) the project's cost estimate is reliable, (3) HTA has the financial capacity to complete the project, and (4) the project's outstanding construction quality problems have been corrected. We also followed up on the recommendation from our May 2000 report that FTA ensure that HTA develops an integrated project master schedule. (A full description of our objective, scope, and methodology are in Exhibit B.)

## RESULTS IN BRIEF

We found that FTA has exercised stronger oversight of Tren Urbano and imposed requirements for HTA to complete a recovery plan. HTA has in fact made significant progress implementing a recovery plan that addresses those requirements. (See Exhibit A for the requirements of FTA's recovery plan and actions taken by HTA.) As a result, FTA plans to release a portion of the Federal funds it withheld from the project. However, FTA must continue its close oversight to ensure that HTA revises the project's integrated master schedule to reflect attainable milestones, revises the project's cost estimate to reflect resources

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<sup>1</sup> Office of Inspector General Report No. RT-2000-091, Report on the Finance Plan for the Tren Urbano Rail Transit Project, (May 25, 2000).

<sup>2</sup> Tren Urbano has seven alignment section contracts. An integrated master schedule would merge the seven separate contract schedules into a single project schedule that could be used to monitor the progress of the entire project.

<sup>3</sup> Nonconformance reports are written when construction work does not conform to plans and specification.

<sup>4</sup> House Committee on Appropriations Report 107-108, Department of Transportation and Related Agencies Appropriations Bill, Fiscal Year 2002.

needed to complete the project, provides reliable and supportable revenue projections, and establishes a timetable to correct significant outstanding construction quality problems. *Until HTA has satisfied these requirements, we recommend that FTA neither amend the project's full funding grant agreement nor accept or approve the next finance plan submitted by HTA.* Our specific findings are:

- *The schedule completion date is unlikely to be achieved.* HTA's integrated master schedule forecasts a project completion date of September 2003, although FTA's project management oversight consultant (PMOC) and we estimate that the project may not be completed until as late as September 2004. Until there is tangible and sustained evidence that the rate of trackwork has been accelerated, we think it is unlikely that the project will be completed before September 2004.
- Our assessment of the integrated master schedule indicates that September 2004 is a more realistic completion date. We analyzed the progress of trackwork installation. Maintaining the trackwork installation schedule is critical to achieving the scheduled completion date of the project. However, trackwork installation is already behind schedule due to work interruptions and an installation rate that is only one-third of the projected rate.

Although Tren Urbano's planned installation rate for trackwork is about 300 track meters per week, the actual rate had been approximately 110 track meters per week in 2001. In addition, the contractor responsible for the trackwork has consistently missed key milestones, and in November 2001 its subcontractor stopped work for 3 weeks. *At this point, the project's contractor would need to increase the trackwork installation rate to 400 track meters per week to meet the September 2003 completion date.* Recently, the contractor hired additional work crews, which could increase the trackwork installation rate, but it is highly unlikely that the project could increase trackwork installation rates to 400 track meters per week. As of January 11, 2002, the best observed installation rate, for 1 week, was approximately 244 track meters. Our analysis indicates that trackwork installation would need to increase to a consistent 220 track meters per week in order to complete the project by September 2004.

The PMOC forecasts a completion date of March 2004 with a possible slippage to August or September 2004. The PMOC's analysis differed from ours. The PMOC made a straight-line projection of the rate of expenditures over the past 12 months and applied this rate to the estimated cost to complete the project. Using this method, the PMOC identified a 6-month slip in the completion date. Our projection was made using trackwork installation rates.

- *Costs are likely to increase further.* HTA estimates that the cost to complete Tren Urbano will be \$2.036 billion. This represents an increase of \$764 million over the \$1.250 billion in the original 1996 grant agreement, and \$360 million<sup>5</sup> over the \$1.654 billion in the amended July 1999 grant agreement. The majority of the \$360 million cost increase was due to growth in construction contract change orders (\$276 million). HTA plans to request another amendment to Tren Urbano's full funding grant agreement to address the increased cost of completing the project at \$2.036 billion.

HTA's \$2.036 billion cost estimate is unrealistic. The \$2.036 billion estimate is predicated on the project being completed by September 2003, which—in our opinion and the PMOC's—is highly unlikely. The PMOC forecasts that a 6-month delay to March 2004 would add \$90 million in additional overhead costs and \$10 million in additional claims, increasing the estimated cost to complete Tren Urbano to \$2.14 billion. If the PMOC's methodology were used to estimate the cost of a 12-month delay to September 2004, which is likely to occur, it would add \$135 million in additional overhead costs and \$10 million in additional claims, for a total project cost of about \$2.19 billion. This estimating process assumes that staff would be decreasing as the project nears completion.

In addition, unanticipated change orders could further increase project costs. As of December 31, 2001, the construction contracts for the seven alignment sections had increased by 19 percent due to approved change orders. If this rate continues, about \$45 million in contingency funds would be needed to pay for future change orders and, as of December 14, 2001, the budget for contingencies (future change orders) was \$51 million.

HTA has identified sufficient funding for its \$2.036 billion cost estimate, but will need to identify more funding if the schedule slips to March or September 2004.

- *Cost increases and schedule delays have adversely affected HTA's financial capacity to fund planned transportation improvements.* HTA has the resources to fund its number one priority—Tren Urbano. HTA also has the resources to repay its debts, according to Moody's and Standard and Poor's.<sup>6</sup> (See Exhibit C for a summary of HTA's funding sources.) However, Tren Urbano's recent \$360 million cost increase and schedule delays of more than 1 year, coupled with a slight decline in FY 2001 pledged revenues, have adversely affected

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<sup>5</sup> There was an additional \$22 million spent on preliminary corridor studies for Tren Urbano prior to the 1996 grant agreement, which was not included in the project's cost estimates in the 1996 and 1999 grant agreements.

<sup>6</sup> Moody's and Standard and Poor's are bond rating agencies that rated HTA for its January 2002 bond issuance. The bond issuance will be used to finance HTA's transit and highway construction programs.

HTA's planned transportation improvements. For example, HTA eliminated the construction of a transportation office building that was estimated to cost \$99 million. In addition, Federal FY 2002 highway flex and formula funds that were intended for other transportation improvements are now being used to offset the increased cost of Tren Urbano.

At the time of our audit, HTA officials were committed to completing Tren Urbano as well as several major highway construction projects in Puerto Rico. However, for FY 2002, HTA increased funding for Tren Urbano and reduced funding for its annual highway construction program. Our analysis of HTA's Construction Improvement Program (CIP)<sup>7</sup> planning documents for the past two fiscal years showed more funding than previously planned for Tren Urbano and reduced funding for other capital transportation projects. If, as we expect, the total estimated cost to complete Tren Urbano exceeds \$2.036 billion, HTA's highway construction projects could experience delays and additional funding reductions.

HTA's pledged revenues decreased slightly from \$497.9 million in FY 2000 to \$496.5 million in FY 2001,<sup>8</sup> but are expected to increase steadily over the next 5 years. (See Exhibit D for historical data on HTA's pledged revenues.) However, pledged revenues may not materialize as expected. It is questionable whether HTA will be successful in collecting delinquent taxes from a bankrupt gasoline manufacturer (\$10 million) and unlikely that HTA will collect all of the estimated pledged revenues from a new toll road that is scheduled to be completed in FY 2004. Construction of the toll road has been delayed due to pending litigation, environmental issues, contractor claims, and agreement on the final alignment. These revenue shortfalls could delay other planned capital transportation improvements.

- *While HTA has corrected some construction quality problems, the long-term safety and operability of the project remain at risk until all quality problems are corrected.* Project officials have made progress correcting most of the construction quality problems that we identified in our previous report. Specifically, they have (1) repaired a tunnel misalignment in the Río Piedras alignment section, (2) treated all thin concrete column covers in the Hato Rey alignment section with the appropriate anticorrosion product, (3) sealed the

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<sup>7</sup> HTA prepares a 5-year priority Construction Improvement Program, which is updated annually and based on the agency's budget for the Commonwealth's Fiscal Year that starts on July 1<sup>st</sup> and ends on June 30<sup>th</sup>. HTA's Construction Improvement Program is also based on the Puerto Rico Planning Board's 20-Year Master Plan. The Construction Improvement Program includes a summary table of annual investments for each fiscal year of the 5-year program by project category for construction, design, and right-of-way costs. It also includes a table that summarizes the financing by revenue source for each of the fiscal years in the 5-year program.

<sup>8</sup> HTA's pledged revenues consist of excise taxes for gasoline, gas oil and diesel oil, and petroleum; motor vehicle license fees; tolls on traffic facilities; and investment income on its Debt Service Reserve Fund.

cracks in two columns at the Centro Médico alignment section, and (4) submitted a revised Project Management Plan that includes improvements in quality assurance/quality control. The remaining significant items include the closure of 38 nonconformance reports for construction quality problems, testing of steel strands in certain foundation piles, and seismic retrofit of 10 columns. HTA is addressing these items, but has not established a timetable to complete them. The project could begin operations without correcting these problems, but the long-term safety and quality of the project could be jeopardized.

## **RECOMMENDATIONS**

FTA is planning to release a portion of the funds it withheld to recognize HTA's progress in addressing the requirements of the recovery plan. The next logical opportunity for HTA to demonstrate to FTA that it has satisfied all remaining concerns will occur when it requests that FTA amend the grant agreement for the second time, which is expected in the spring of 2002. Although HTA has made significant progress implementing the requirements imposed by FTA's recovery plan, additional actions are needed to ensure the project's budget is reliable, the schedule is realistic, and all significant quality construction problems are corrected.

We recommend that FTA neither amend the project's full funding grant agreement nor accept or approve the updated finance plan until it is satisfied that HTA has:

1. Revised the project's integrated master schedule to reflect attainable project milestones;
2. Submitted a cost estimate that is consistent with a supportable project completion date; and
3. Established and adhered to a timetable to resolve significant outstanding construction quality problems.

We plan to monitor HTA's progress in revising the integrated master schedule to reflect attainable milestones, revising the project's budget, and completing the outstanding construction quality problems. We also plan to monitor HTA's preparations to begin revenue operations of Tren Urbano, including operational testing of the rail system. We will review the plans and procedures HTA intends to use to begin Tren Urbano's operations phase, which FTA has recognized must be prepared at least 1 year in advance of revenue operations.

## **MANAGEMENT RESPONSE**

We received oral comments on a draft of this report from FTA. FTA agreed with the findings and recommendations and stated that it would continue to closely oversee the project and would neither amend the project's full funding grant agreement nor accept or approve the updated finance plan until it is satisfied that HTA has taken actions to fully implement these recommendations. We also made other changes to the report as appropriate.



## PROJECT DESCRIPTION

Phase I of Tren Urbano consists of a 10.7-mile (17.2 km.), fixed guideway, double-track, heavy rail transit system (see Figure 1).

**Figure 1.**  
**Map of the Tren Urbano Rail Transit Project**  
**in the San Juan, Puerto Rico, Metropolitan Area**



Sources: CIA—The World Fact Book—Puerto Rico.  
 Puerto Rico Highway and Transportation  
 Authority.

The project is the first mass transit system for Puerto Rico and will serve the San Juan metropolitan area with an L-shaped alignment. Tren Urbano includes 16 stations located between the westerly municipality of Bayamón and Santurce, a community in the municipality of San Juan. The fixed guideway is predominately elevated or at-grade with a 1.12-mile (2 km.) tunnel in the Río Piedras district, near the University of Puerto Rico and high-density residential and commercial

areas. The transit system will have a fleet of 74 cars and one maintenance and storage facility.

HTA officials are using a modified innovative procurement technique, known as the design/build method, to construct Tren Urbano. Phase I of the project includes a Systems and Test Track Turnkey (STTT) contract and six separate design/build contracts for each alignment section. The STTT contract covers the rail cars, train controls, trackwork, traction power and distribution, signals, escalators and elevators, fare collection, and communication system. It also includes the design and construction of 1.67 miles of test track and an alignment section with two stations, a maintenance facility, workshop, and yards for the rail cars. The other six contracts cover the design and construction of the remaining alignment sections. Table 1 provides a description of each alignment section contract, the completion cost, and the percent of completion based on the dollar value of construction completed.

**Table 1**  
**Alignment Section Contracts for Phase I of the Tren Urbano Rail Transit Project**  
**as of December 2001**  
**(\$ in millions)**

Alignment Section Contract	Original Contract Award	Forecast at Completion	Alignment Section Length (miles)	Number of Stations and Other Key Features	Guideway Construction	Contract Percent Complete/Dollars
Bayamón	\$68.3	\$92.9	1.8	2	Elevated	89
Río Bayamón	\$36.7	\$43.8	1.1	1	At grade and open cut*	86
Torrimar/Las Lomas Systems and Test Track Turnkey (STTT)	\$554.2	\$773.6	1.7	2 Operations and maintenance building Storage yard Systems and Test Track Turnkey 74-car fleet	At grade and retained cut*	71
Villa Nevárez	\$71.5	\$82.1	1.2	1	Elevated	82
Centro Médico	\$71.5	\$90.0	1.6	3	Elevated, at grade and retained cut*	73
Río Piedras	\$225.6	\$338.7	1.1	2	Tunnel	72
Hato Rey	\$117.4	\$171.6	2.2	5	Elevated	66

\* In a retained cut, bilateral walls hold the soil in place, in an open cut the soil surface is finished at a slope.

Source: FTA's project management oversight consultant report dated December 2001 and Spot Report Number 36, HTA expenditure reports, and HTA's Updated Project Budget dated December 14, 2001.

## RESULTS

We found that FTA has exercised stronger oversight of Tren Urbano and imposed requirements for HTA to complete a recovery plan. HTA has in fact made significant progress implementing a recovery plan that addresses those requirements. For example, HTA (1) provided additional project oversight by appointing a new Project Manager and Project Director, (2) established a procedure to correct significant outstanding construction quality problems, (3) corrected Buy America violations, (4) submitted required financial information to FTA, and (5) submitted an integrated master schedule. As a result, FTA plans to release a portion of the Federal funds it withheld from the project. We also found, however, that FTA must continue its close oversight to ensure that HTA revises the project's integrated master schedule to reflect attainable milestones, revises the project's cost estimate to reflect resources needed to complete the project, provides reliable and supportable revenue projections, and establishes a timetable to correct significant outstanding construction quality problems. *Until HTA has satisfied these requirements, we recommend that FTA neither amend the project's full funding grant agreement nor accept or approve the next finance plan submitted by HTA.* (See Exhibit A for the requirements of FTA's recovery plan and actions taken by HTA.)

### Schedule

In May 2000, we recommended that FTA require HTA to develop an integrated master schedule, and on December 14, 2001, HTA submitted to FTA an integrated master schedule that forecasts a project completion date of September 2003. Our May 2000 report found that project officials had not prepared an integrated master schedule, which is a fundamental component to manage this project. This schedule monitors the progress of the project and measures the percentage of completion based on the contract value and dollars spent. The integrated master schedule also forecast delays and would serve as a basis for negotiating claims. Tren Urbano has seven alignment section contracts that are managed independently, with each having its own construction schedule for completion. The integrated master schedule merges the schedules of the seven alignment section contracts into a single project schedule.

The integrated master schedule submitted to FTA by Tren Urbano officials forecasts a project completion date of September 2003. However, our estimate, along with that of the PMOC, indicates that the project may not be completed until as late as September 2004.

Our assessment of the integrated master schedule indicates that September 2004 is a more realistic completion date. We analyzed the progress of trackwork installation. Maintaining the trackwork installation schedule is critical to achieving the scheduled completion date. However, trackwork installation is already behind schedule due to work interruptions and an installation rate that is only one-third of the projected rate.

Although Tren Urbano's planned installation rate for trackwork is about 300 track meters per week, the actual rate had been approximately 110 track meters per week in 2001. In addition, the contractor responsible for the trackwork has consistently missed key milestones, and in November 2001 its subcontractor stopped work for 3 weeks. *At this point, the project's contractor would need to increase the trackwork installation rate to 400 track meters per week to meet the September 2003 completion date.* Recently, the contractor hired additional work crews, which could increase the trackwork installation rate but it is highly unlikely that the project could increase trackwork installation rates to 400 track meters per week. As of January 11, 2002, the best observed installation rate, for 1 week, was approximately 244 track meters. To make the September 2003 date, the trackwork installation would have to maintain a rate of about twice the best observed rate of 244 track meters. Until there is tangible and sustained evidence that the rate of trackwork has been accelerated, we think it is unlikely that the project will be completed before September 2004.

FTA's project management oversight consultant is in general agreement with our forecast. The PMOC forecasts a completion date of March 2004 with a possible slippage to August or September 2004. The difference in our estimate is due to differences in the analytical technique used. The PMOC made a straight-line projection of the rate of expenditures over the past 12 months and applied this rate to the estimated cost to complete. Our projection was made using trackwork installation rates.

## **Cost and Funding**

In December 2001, HTA officials estimated that Tren Urbano would cost \$2.036 billion when completed in September 2003. This cost estimate, however, is unrealistic if the project is not completed by September 2003. Budget items such as project overhead would continue to increase if the schedule slips beyond the September 2003 date. In addition, contractor claims are unpredictable and may exceed the budgeted contingency of \$51 million. HTA has identified sufficient funding for its \$2.036 billion cost estimate, but will need to identify more funding if the schedule slips to March or September 2004.

The \$2.036 billion project cost estimate represents an increase of \$786 million over the \$1.250 billion in the original 1996 grant agreement, and \$382 million over the \$1.654 billion stated in the amended July 1999 grant agreement. However, \$22 million was spent on preliminary corridor studies for Tren Urbano prior to the 1996 grant agreement and was not included in the project's cost estimates in the 1996 and 1999 grant agreements.<sup>9</sup> Thus, the actual cost increases for Tren Urbano during these periods were \$764 million from the 1996 grant agreement and \$360 million from the 1999 grant agreement. (The remainder of this report discusses the current estimated project cost increase of \$360 million.) The majority of the \$360 million increase in the project's cost is attributed to growth in construction contract change orders (\$276 million).

The project's cost estimate of \$2.036 billion is likely to increase to at least \$2.19 billion, primarily because the September 2003 completion schedule may not be met. The PMOC forecasts that a 6-month delay to March 2004 would add \$90 million in additional overhead costs and \$10 million in additional claims, increasing the estimated cost to complete Tren Urbano to \$2.14 billion. If the PMOC's methodology were used to estimate the cost of a 12-month delay to September 2004, which is likely to occur, it would add \$135 million in additional overhead costs and \$10 million in additional claims, for a total project cost of about \$2.19 billion. This estimating process assumes that staff would be decreasing as the project nears completion.

Another item that could impact the cost of Tren Urbano is change orders. As of December 14, 2001, the construction contracts for the seven alignment sections had increased by 19 percent due to approved change orders. If this rate continues, about \$45 million in contingency funds would be needed to pay for future change orders and, as of December 14, 2001, the budget for contingencies (future change orders) was \$51 million. If the construction contracts increase more than 19 percent due to change orders, the budgeted contingency of \$51 million might be insufficient.

HTA has identified sufficient funding for Tren Urbano's budget of \$2.036 billion. HTA plans to fund the \$360 million increase in cost over the 1999 budget of \$1.654 billion by using more local funding (\$227.5 million), and more of its FY 2002 urban area transit formula money (\$42.8 million) and Federal highway flex funds (\$90 million). However, if the project completion date slips to March or September 2004, HTA will have to come up with another plan for funding the additional increase to the \$2.036 billion.

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<sup>9</sup> HTA received \$4.96 million in Section 5309 capital funds for Federal FY 1995 and used \$17.06 million in local money to fund the \$22 million cost.

Because HTA is planning to use more of its formula money and highway flex funds, the total Federal contribution to Tren Urbano increases. When the grant agreement was signed in March 1996, the Federal share of the \$1.250 billion estimated project cost was 25 percent and the local share was 75 percent. When FTA approved the amended grant agreement in July 1999, the Federal and local share of the \$1.654 billion estimated project cost became 43 percent and 57 percent, respectively. Based on HTA's current project cost estimate of \$2.036 billion, the Federal share of Tren Urbano will be 42 percent, but the total Federal contribution will increase by about \$138 million (20 percent). Table 2 shows the history of the project's cost, total funding as well as identified sources of funds and dollar amounts, and scheduled revenue operation date.

<b>Table 2</b>			
<b>Cost, Funding and Schedule for the Tren Urbano Rail Transit Project</b>			
<b>(\$ in millions)</b>			
	<b>March 1996 Grant Agreement</b>	<b>July 1999 Amended Grant Agreement</b>	<b>December 2001 HTA Budget Estimate<sup>1</sup></b>
<b>Cost</b>	<b>\$1,250.3</b>	<b>\$1,653.6</b>	<b>\$2,036.0</b>
<b>Federal Funding</b>			
5309 New Starts	\$ 307.4	\$ 307.4	\$ 307.4
5309 capital funds	0.0	0.0	5.0 <sup>2</sup>
5307 Formula	0.0	141.0	183.8
Federal Highway Flex Funds	0.0	259.9	349.9
<b>Subtotal Federal</b>	<b>\$ 307.4</b>	<b>\$ 708.3</b>	<b>\$ 846.1</b>
<b>Local Funding</b>	<b>942.9</b>	<b>945.3</b>	<b>1,189.9<sup>3</sup></b>
<b>Total Funding</b>	<b>\$1,250.3</b>	<b>\$1,653.6</b>	<b>\$2,036.0</b>
<b>Schedule</b> (Revenue Operation Date)	July 1, 2001	May 31, 2002	September 29, 2003

<sup>1</sup> Totals may not add due to rounding.

<sup>2</sup> HTA received \$4.96 million in Section 5309 capital funds for Federal FY 1995 that were not included in the scope of the full funding grant agreement. We rounded this amount to \$5.0 million for the Table 2.

<sup>3</sup> HTA included \$17.06 million in local funds spent prior to FTA's award of the full funding grant agreement in 1996.

Source: FTA grant agreement dated March 13, 1996, amended grant agreement dated July 19, 1999, and HTA Updated Project Budget as of December 14, 2001.

## Financial Capacity

HTA has the financial resources to fund its number one priority—Tren Urbano—at the estimated cost of \$2.036 billion, according to Moody's and Standard and Poor's. According to HTA officials, in January 2002, HTA issued \$1.104 billion in new bonds to pay for its Construction Improvement Program, with the authorization of the Government Development Bank for Puerto Rico. The new bond proceeds were used to assist in paying for the increased cost of Tren Urbano and the rest of HTA's annual Construction Improvement Program, to repay its line of credit with the Government Development Bank, and to retire existing bonds. In addition, HTA plans to use its Federal FY 2002 highway flex and urban area transit formula funds to offset the increased cost of Tren Urbano. (See Exhibit C for a summary of HTA's funding sources.)

Although HTA appears to have sufficient funding with its new bond issuance, our analysis showed that Tren Urbano's \$360 million cost increase and more than a 1-year delay in the project's revenue operation date have adversely affected HTA's other transportation improvement projects. In addition, all of HTA's pledged revenues—excise taxes for gasoline, gas oil and diesel oil, and petroleum; motor vehicle license fees; tolls on traffic facilities; and investment income—may not materialize as expected. Nevertheless, HTA is committed to completing Tren Urbano as well as several major highway construction projects. However, work on the highway projects is likely to proceed at a slower rate than originally anticipated. This is because, for FYs 2001 and 2002, HTA reduced funding for some of the projects in its 5-year Construction Improvement Program.

Our analysis of HTA's planning documents for FY 2002 showed more funding than previously planned for Tren Urbano and decreased funding for other transportation improvement projects. For example, in its financial plans and assumptions dated October 2001, HTA eliminated its plan to construct a new transportation office building for about \$99 million. In addition, in HTA's most recent planning document,<sup>10</sup> 8 of 12 categories for capital transportation projects for highway improvements were reduced by about \$137 million and 4 categories were increased by about \$29 million, resulting in a net reduction of about \$108 million. The transportation categories with the most funding reductions were congestion relief to roads in metropolitan areas (\$45 million reduction), strategic improvements to roads that connect with the island's expressway system (\$25 million reduction), and other highway projects (\$43 million reduction). At the time of our audit, HTA officials planned to divide certain highway projects into segments, which would permit them to fund some segments immediately and delay funding other segments until later.

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<sup>10</sup> Construction Improvement Program, Fiscal Years 2002 through 2006, HTA, Puerto Rico.

HTA's pledged revenues decreased slightly from \$497.9 million in FY 2000 to \$496.5 million in FY 2001, but are expected to increase steadily over the next 5 years. (See Exhibit D for historical data on HTA's pledged revenues.) However, we identified instances in which some of HTA's projected revenues may not materialize, which could further adversely affect other planned capital transportation projects. For example, in FY 2002, HTA recorded the receipt of an approximate \$10 million delinquent gasoline excise tax from the Capeco-Gulf Company. However, the Capeco tax debt had remained uncollected for the past 3 fiscal years. Although Capeco had filed for bankruptcy, HTA officials assumed the tax debt was collectable and posted \$10 million to pledged revenues for FY 2002. HTA officials have stated that they anticipate another firm acquiring Capeco and agreeing to repay the past due taxes. At the time of our audit, HTA was unable to identify the buyer or provide evidence that such a transaction was being considered.

Another potential revenue shortfall involves HTA's plan to generate additional revenues by completing the Eastern Corridor<sup>11</sup>—a new 9-mile toll road—before FY 2005. However, if HTA does not complete the Eastern Corridor by the end of FY 2004, all of the estimated toll revenues of \$19.9 million will not be collected in FY 2005. HTA officials have stated that they must overcome significant obstacles involving the project's final alignment, legal and environmental issues, and contractor claims before construction on the Eastern Corridor can resume. At the time of our audit, HTA had not provided documentation confirming the resolution of these issues.

## **Construction Quality Assurance**

In May 2000, we reported that Tren Urbano was experiencing construction quality problems. Project officials have made progress by correcting most of the outstanding construction quality problems or developing plans to correct the remaining problems in the near future. To date, they have (1) repaired a tunnel misalignment in the Río Piedras alignment section, (2) treated all thin concrete column covers in the Hato Rey alignment section with the appropriate anticorrosion product, (3) sealed the cracks in two columns at the Centro Médico alignment section, and (4) submitted a revised Project Management Plan that includes improvements in quality assurance/quality control, as a part of FTA's recovery plan.

HTA has not established a formal date for completing the remaining significant items, including the closure of 38 nonconformance reports for construction quality

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<sup>11</sup> Originally conceived as PR-66, this highway project was halted pursuant to an order of the Puerto Rico Supreme Court in April 2000, with HTA expenditures totaling \$130 million.



problems, testing of steel strands in certain foundation piles, and seismic retrofit of 10 columns. The project could begin operations without correcting these problems, but the long-term safety and quality of the project could be jeopardized. Table 3 presents the status of the outstanding construction quality problems. Significant items that have not been completed appear in the shaded rows.

<b>Table 3 Status of Significant Construction Quality Problems As of January 2002</b>	
<b>Problems</b>	<b>Status</b>
Defective spiral steel reinforcement <sup>1</sup> in 44 columns at the Centro Médico and Villa Nevárez alignment section contracts	Columns are being retrofit with an approved method, but the work still needs monitoring. All the columns at Villa Nevárez are finished and 10 columns, which are inside the stations, need to be retrofit in Centro Médico
Misalignment in a segment of the Río Piedras Tunnel	Misalignment repaired and Siemens' analysis confirmed the rail cars could safely operate through the segment at a reduced speed of 28 miles per hour. (Closed)
Thin concrete cover in columns at Hato Rey alignment section contracts	All columns were treated with the appropriate anticorrosion product. (Closed)
Cracks in two columns at Centro Médico	All cracks were appropriately sealed. (Closed)
Insufficient embedment of steel strands in piles	Structural analysis found that most piles have adequate tensile strength. A test will be performed to determine the tensile capacity of the remaining piles. <sup>2</sup>
Closure of 110 significant nonconformance reports (NCRs) that were open for a long time	HTA issued a procedure for closing NCRs to avoid this problem in the future. Of the 110 significant NCRs, 72 are closed, and 38 have a disposition. <sup>3</sup>
Improvement of Quality Assurance/Quality Control (QA/QC) process	HTA submitted a revised Project Management Plan that includes improvements in QA/QC process. (Closed)

<sup>1</sup> The spiral reinforcement as-built did not comply with the seismic specifications for the columns.

<sup>2</sup> The strands or steel tendons inside the piles of the foundations at several piers were cut too short without enough penetration into the foundation and the strands' ability to transfer tension may be insufficient. Structural analysis revealed that in all but a few locations the piles as-built have adequate tensile capacities, but a tension test must be conducted to check the locations with insufficient capacity.

<sup>3</sup> Disposition of an NCR means that a decision has been made to reject, use-as-is, rework, or repair the nonconforming item. Repair is when the specified procedure or material can be changed to make the item conform to the design; rework means that the item is so out of compliance that it has to be redone in accordance with the original design.

Source: FTA's project management oversight consultant in San Juan, Puerto Rico.

## **RECOMMENDATIONS**

FTA is planning to release a portion of the funds it withheld to recognize HTA's progress in addressing the requirements of the recovery plan. The next logical opportunity for HTA to demonstrate to FTA that it has satisfied all remaining concerns will occur when it requests that FTA amend the grant agreement for the second time, which is expected in the spring of 2002. Although HTA has made significant progress implementing the requirements imposed by FTA's recovery plan, additional actions are needed to ensure the project's budget is reliable, the schedule is realistic, and all significant quality construction problems are corrected.

We recommend that FTA neither amend the project's full funding grant agreement nor accept or approve the updated finance plan until it is satisfied that HTA has:

1. Revised the project's integrated master schedule to reflect attainable project milestones;
2. Submitted a cost estimate that is consistent with a supportable project completion date; and
3. Established and adhered to a timetable to resolve significant outstanding construction quality problems.

We plan to monitor HTA's progress in revising the integrated master schedule to reflect attainable milestones, revising the project's budget, and completing the outstanding construction quality problems. We also plan to monitor HTA's preparations to begin revenue operations of Tren Urbano, including operational testing of the rail system. We will review the plans and procedures HTA intends to use to begin Tren Urbano's operations phase, which FTA has recognized must be prepared at least 1 year in advance of revenue operations.

## **MANAGEMENT RESPONSE**

We received oral comments on a draft of this report from FTA. FTA agreed with the findings and recommendations and stated that it would continue to closely oversee the project and would neither amend the project's full funding grant agreement nor accept or approve the updated finance plan until it is satisfied that HTA has taken actions to fully implement these recommendations. We also made other changes to the report as appropriate.

**ACTION REQUIRED**

FTA agreed with the findings and recommendations in the draft report; however, it did not provide planned completion dates. In accordance with DOT Order 8000.1C, we request that, within 30 days, FTA provide target dates for completing each recommendation.

We appreciate the courtesies and cooperation of representatives of the Federal Transit Administration and the Puerto Rico Highway and Transportation Authority. If you have any questions concerning this report, please call me at (202) 366-1992 or Theodore Alves, Deputy Assistant Inspector General for National Transportation Infrastructure Activities, at (202) 366-0687.

**Exhibit A**

**FTA's 10-Part Recovery Plan  
As of December 14, 2001**

Recovery Plan Requirement	Actions Taken by HTA
Additional HTA oversight of Tren Urbano, including the designation of a HTA Project Manager	A new Project Manager and Project Director have been appointed, with oversight duties including active participation in the processes for change orders and claims. (Done)
An updated project budget	Submitted to FTA on December 14, 2001. However, FTA has concerns about HTA's total estimated project cost.
An integrated Master Schedule (IMS)	Submitted to FTA on December 14, 2001. However, the IMS needs to be updated and modified to accurately monitor the project's construction progress.
Prepare an accurate "Expense to Date" table for monthly reports that include HTA staff costs	Submitted to FTA and is under review by FTA's project management oversight consultant
An Interim Draft Financial Plans and Assumptions, October 2001	Submitted to FTA in October 2001. (Done)
An updated Project Management Plan (PMP) that reflects new personnel and new reporting responsibilities, and emphasizes functional duties of safety, Quality Assurance/Quality Control (QA/QC) and project controls	Submitted PMP Revision Number 10 to FTA on December 14, 2001. However, the PMOC raised relevant comments in the sections for QA/QC and safety that HTA needs to address.
A plan for a staged opening of Tren Urbano	HTA has no plans for staged openings and continues to work towards achieving a September 2003 completion date. (Done)
Conclude the "Buy America" issue of imported steel	HTA has executed change orders to pay for the imported steel with local funds and prepared a receiving inspection procedure with emphasis on compliance with Buy America requirements. (Done)
A plan to deal with outstanding future and "significant Nonconformance Reports" (NCRs)	HTA issued a procedure for closing NCRs that formalized the process. However a timetable for the disposition and closure of NCRs has not been established.
A schedule for implementing a State Safety Oversight Agency, selection of Puerto Rico emergency management personnel, and approval of safety certification for Tren Urbano.	FTA's Office of Safety has reviewed all the submissions from HTA and found that the requirements have been met. (Done)

Source: Federal Transit Administration.

**Exhibit B**

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**Objective, Scope, and Methodology**

Citing unresolved problems meeting schedule milestones and construction quality standards, the House Committee on Appropriations directed the Office of Inspector General (OIG) to continue monitoring the Tren Urbano Rail Transit Project and provide a report to the House and Senate Committees on Appropriations. Responding to the Committee's direction, the objective of this audit was to evaluate HTA activity to implement FTA's 10-part recovery plan, which required HTA to address Tren Urbano's management, construction quality, financing, and schedule problems. FTA also withheld Federal funds in FYs 2000 and 2001 until HTA addressed all parts of the recovery plan. Our audit focused on determining whether (1) Tren Urbano's schedule is achievable; (2) Tren Urbano's cost estimate is reliable; (3) HTA has the financial capacity to complete Tren Urbano; and (4) Tren Urbano's outstanding construction quality problems have been corrected. Specifically, we:

- reviewed Tren Urbano's current cost estimate, and identified risks that could cause additional cost increases;
- identified factors that contributed to Tren Urbano's cost increases after the full funding grant agreement was awarded, particularly the approximately \$360 million increase that occurred subsequent to the Inspector General's May 2000 report;
- determined whether sufficient funding had been identified to pay for Tren Urbano;
- determined the extent to which the current cost of Tren Urbano will affect HTA's ability to construct, operate, and maintain other transportation priorities; and repay its current and future obligations;
- reviewed the current project schedule for completion and identified any potential risks to the completion schedule;

**Exhibit B**

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- assessed actions taken by HTA and FTA to resolve construction quality assurance issues (such as the tunnel misalignment, inadequate protection of steel reinforcements, and compliance with seismic criteria for steel reinforcements) and Buy America issues; and
- followed up on actions taken by FTA and HTA to implement the OIG's May 2000 recommendation to establish an integrated master schedule for the project.

Our audit was conducted at the Tren Urbano Project Office and HTA headquarters in San Juan, Puerto Rico; FTA and Federal Highway Administration (FHWA) headquarters in Washington, D.C.; FTA Region IV in Atlanta, Georgia; and FHWA Division Office in San Juan, Puerto Rico. We conducted our audit from August 2001 to January 2002. We reviewed information to assess the status of the project and HTA's financial capacity, which covered the period from the May 2000 OIG report on Tren Urbano<sup>12</sup> to January 17, 2002. To address the Committee's concerns, we identified FTA's 10-part recovery plan as the scope for our independent analysis, which included following up on the recommendation from the OIG's May 2000 report. The OIG recommended that FTA ensure that HTA develops an integrated master schedule for the project.

To assess Tren Urbano's cost and schedule status, and HTA's financial capacity, we reviewed and analyzed budget data estimates, change order logs; contractor change request logs; earlier finance plans as well as the interim draft October 2001 plans and assumptions; financial records; engineering data estimates, project management and financial management oversight reports; construction improvement program planning documents, audited financial statements, Transportation Infrastructure Finance and Innovation Act loan records, official statements for past bond issues, preliminary official statement for the 2002 bond issue, and various legal documents.

We met with project staff to determine how they developed the estimated cost to complete the project and its key assumptions. We held extensive discussions with Tren Urbano's managers and engineers regarding progress and problems experienced on the project. We also interviewed FTA, FHWA, and HTA officials as well as officials in the Puerto Rico financial and planning communities.

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<sup>12</sup> Office of Inspector General Report No. RT-2000-091, Report on the Finance Plan for the Tren Urbano Rail Transit Project, (May 25, 2000).

**Exhibit B**

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For data verification, we completed the following.

- To verify the cost increase from the amount identified in our May 2000 report, we identified the predominant factors that increased the project's costs. In this case, change orders were the main factor. We took a simple random sample of the executed and pending change orders and verified that the computerized information on change orders was correct and reliable by reviewing source documents.
- We relied on the pledged revenue data presented in the Ernst and Young LLP, Audited Financial Statements for the Puerto Rico Highway and Transportation Authority for FYs 1993 through 2001 to provide historical data on HTA's pledged revenues. We reviewed pledged revenue data for gasoline taxes, gas oil and diesel oil taxes, petroleum taxes, and vehicle license fees provided by the Puerto Rico Treasury Department, and toll revenue data provided by Banco Popular. We used estimated pledged revenues for FY 2002 that were reported in the financing schedule of HTA's Construction Improvement Program for FYs 2002 through 2006.
- We reviewed HTA's preliminary official statement in its 2002 bond prospectus and interviewed officials of the Government Development Bank for Puerto Rico to determine and verify the amount of bond issuance HTA would qualify for to fund its transportation infrastructure programs.
- We performed this audit in accordance with the Government Auditing Standards of the Comptroller General of the United States.



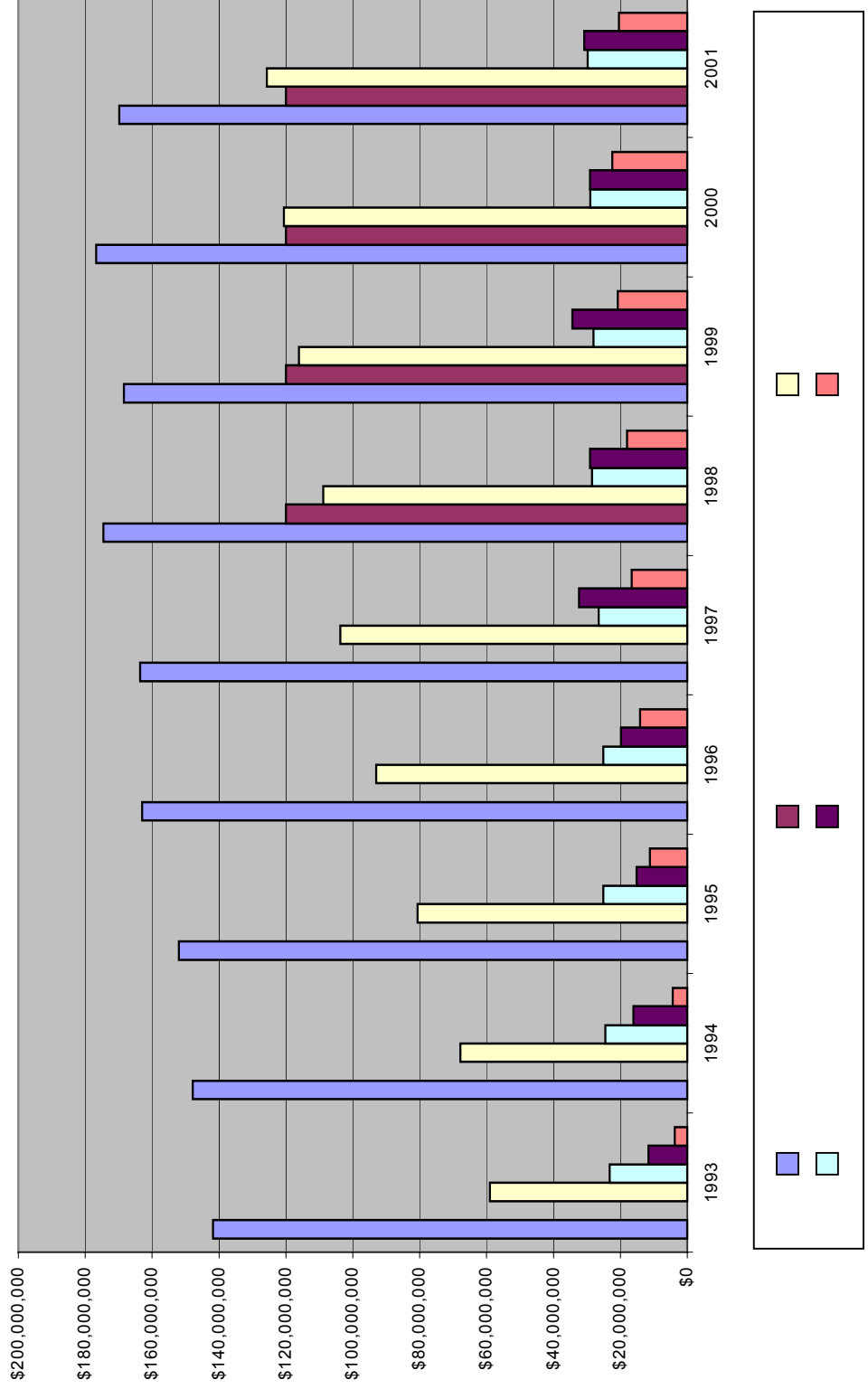
# Exhibit C

<b>PUERTO RICO HIGHWAY AND TRANSPORTATION AUTHORITY SUMMARY OF FUNDING SOURCES FOR COMMONWEALTH FISCAL YEARS 2001 AND 2002 (\$ in millions)</b>				
<u>Source</u>	<u>Description</u>	Funds Received in FY 2001	Percent of Total FY 2001 Funds	Funds Expected in FY 2002
Gasoline Taxes	The gross receipts of a \$0.16 per gallon excise tax on gasoline.	\$169.8	16.0%	\$ 181.2
Gas Oil and Diesel Oil Taxes	\$0.04 of the \$0.08 per gallon excise tax on imported motor oils.	20.5	1.9	22.4
Petroleum Taxes	Up to \$120 million a year from excise taxes on petroleum products.	120.0	11.3	120.0
Tolls on Traffic Facilities	All revenues generated by toll facilities operated by HTA.	125.7	11.8	131.8
Motor Vehicle License Fees	The gross receipts from a \$15 per vehicle increase in annual motor vehicle license fees.	29.8	2.8	30.6
Interest Income on Investments	Interest earned on the Debt Service Reserve Fund for HTA's senior and subordinated revenue bonds.	30.8	2.9	17.5
Line of Credit	Credit assistance from the Government Development Bank for Puerto Rico.	40.8	3.8	325.0
Long-Term Bonds	A debt instrument with a maturity rate of between 10 and 30 years.	0.0	0.0	1,104.0
Transportation Infrastructure Finance and Innovation Act Loan	Credit assistance from the U.S. Department of Transportation, HTA will not have to repay the principal for the first 7 years of the loan's 35-year term. Interest payments are about \$17 million per year.	300.0	28.2	0.0
FTA Section 5307 Funds	A formula grant program for urbanized areas, which provides capital, operating, and planning assistance for mass transportation.	48.2	4.5	46.0
FTA Section 5309 Funds	Discretionary funding for the establishment of new rail or busway projects (New Starts), the improvement and maintenance of existing rail and other fixed guideway systems, and the upgrading of bus systems.	76.3	7.2	42.0
FHWA Funds	Federal Highway Administration Formula Funds.	96.8	9.1	79.3
Other Federal Funds	Sections 5303, 5310, 5311, 5311(b), 5311 (b)(2), and 5313(b) Funds	4.9	.5	5.3
<b>TOTAL FUNDING</b>		<b>\$1,063.6</b>	<b>100.0%</b>	<b>\$2,105.1</b>

Sources: HTA, Ernst and Young Audited Financial Statement for FY 2001, FTA, and FHWA.

# Exhibit D

**PUERTO RICO HIGHWAY AND TRANSPORTATION AUTHORITY (HTA)  
PLEDGED REVENUES FOR COMMONWEALTH FISCAL YEARS 1993 - 2001**



Source: Ernst and Young Audited Financial Statements for HTA, Fiscal Years 1993 through 2001.

**Exhibit E****Major Contributors to This Report**

The following individuals contributed to this report.

<b>Name</b>	<b>Title</b>
Theodore Alves	Deputy Assistant Inspector General for National Transportation Infrastructure Activities
Leslie Smith	Program Director
Sarah Batipps	Project Manager
Brenda James	Senior Analyst
Oleg Michalowskij	Senior Analyst
Kyle Miller	Analyst
Dale Potts	Analyst
Rodolfo Pérez	Engineer Advisor

## **Appendix 1**

This appendix contains textual versions of the graphs and charts found in this document. This appendix was not in the original audit.

### **Exhibit D: Puerto Rico Highway and Transportation Authority Pledged Revenues for Commonwealth Fiscal Years 1993 – 2001**

#### **Fiscal Year 1993:**

Gasoline Taxes:	\$141,845,954
Gas Oil and Diesel Oil Taxes:	\$3,683,491
Tolls on Traffic Facilities:	\$59,027,880
Motor Vehicle License Fees:	\$23,169,349
Interest Income on Investments:	\$11,649,218

#### **Fiscal Year 1994:**

Gasoline Taxes:	\$147,868,060
Gas Oil and Diesel Oil Taxes:	\$4,364,747
Tolls on Traffic Facilities:	\$67,780,142
Motor Vehicle License Fees:	\$24,390,891
Interest Income on Investments:	\$16,153,366

#### **Fiscal Year 1995:**

Gasoline Taxes:	\$152,052,340
Gas Oil and Diesel Oil Taxes:	\$11,128,784
Tolls on Traffic Facilities:	\$80,702,957
Motor Vehicle License Fees:	\$25,015,697
Interest Income on Investments:	\$15,193,150

#### **Fiscal Year 1996:**

Gasoline Taxes:	\$163,004,783
Gas Oil and Diesel Oil Taxes:	\$14,083,134
Tolls on Traffic Facilities:	\$92,994,312
Motor Vehicle License Fees:	\$25,138,506
Interest Income on Investments:	\$19,805,016

Fiscal Year 1997:	
Gasoline Taxes:	\$163,579,819
Gas Oil and Diesel Oil Taxes:	\$16,552,138
Tolls on Traffic Facilities:	\$103,707,672
Motor Vehicle License Fees:	\$26,532,806
Interest Income on Investments:	\$32,351,733

Fiscal Year 1998:	
Gasoline Taxes:	\$174,632,120
Gas Oil and Diesel Oil Taxes:	\$17,888,337
Petroleum Taxes:	\$120,000,000
Tolls on Traffic Facilities:	\$108,802,872
Motor Vehicle License Fees:	\$28,531,571
Interest Income on Investments:	\$29,117,530

Fiscal Year 1999:	
Gasoline Taxes:	\$168,397,018
Gas Oil and Diesel Oil Taxes:	\$20,711,303
Petroleum Taxes:	\$120,000,000
Tolls on Traffic Facilities:	\$116,029,782
Motor Vehicle License Fees:	\$28,088,672
Interest Income on Investments:	34,361,549

Fiscal Year 2000:	
Gasoline Taxes:	\$176,737,461
Gas Oil and Diesel Oil Taxes:	\$22,519,978
Petroleum Taxes:	\$120,000,000
Tolls on Traffic Facilities:	\$120,524,243
Motor Vehicle License Fees:	\$28,996,477
Interest Income on Investments:	\$29,120,984

Fiscal Year 2001:	
Gasoline Taxes:	\$169,782,206
Gas Oil and Diesel Oil Taxes:	\$20,491,248
Petroleum Taxes:	\$120,000,000
Tolls on Traffic Facilities:	\$125,694,514
Motor Vehicle License Fees:	\$29,772,129
Interest Income on Investments:	\$30,770,398