

AUDIT OF THE TREN URBANO RAIL TRANSIT PROJECT

Federal Transit Administration

*Report Number: MH-2004-098
Date Issued: September 29, 2004*




Memorandum

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

Subject: ACTION: Report on the Follow-Up Audit of the Tren Urbano Rail Transit Project
Federal Transit Administration
MH-2004-098

Date: September 29, 2004

From: Alexis M. Stefani 
Principal Assistant Inspector General
for Auditing and Evaluation

Reply to
Attn. of: JA-40

To: Federal Transit Administrator

This report presents the results of our third audit of the Tren Urbano Rail Transit Project (Tren Urbano) in San Juan, Puerto Rico. We are providing our findings and recommendations to the Federal Transit Administration (FTA), so it may resolve the issues identified in this report before making further Federal funding decisions concerning Tren Urbano.

Tren Urbano is being constructed by the Puerto Rico Highway and Transportation Authority (PRHTA). It is a 10.7-mile (17.2 km) fixed-guideway rail transit system that will serve existing and projected development within San Juan's metropolitan area. Tren Urbano will include 16 stations, a vehicle maintenance and storage facility, 74 rail cars, operations control center, traction power, train control, and communications systems. The project is expected to provide a solution to the continually rising vehicle traffic levels and bring a new mode of transportation to the most congested sections of the San Juan metropolitan area. Since 1990, the number of registered vehicles in Puerto Rico has increased at an average annual rate of 2.89 percent; this is 2.13 percent more than the population growth rate.

In May 2003, PRHTA applied for an amendment to its full funding grant agreement (FFGA)¹ to increase the project cost estimate from \$1.65 billion to \$2.25 billion, add \$120 million in Federal highway flex and FTA formula funds to help finance the cost increase,² and extend the project completion date to June 2004. Table 1 shows historical cost, funding, and schedule estimates for the project. As of June 30, 2004, PRHTA had incurred \$2.1 billion of the \$2.25 billion in estimated project costs, of which FTA has paid \$599.4 million. In addition, in a letter dated June 24, 2004, PRHTA requested that the June 2004 completion date proposed in the FFGA amendment application be extended to December 31, 2004.

	March 1996 Grant Agreement	July 1999 Amended Grant Agreement	May 2003 Proposed Amended Grant Agreement
Cost	\$1,250.3	\$1,653.6	\$2,250.0
Federal Funding			
5309 New Starts	\$307.4	\$307.4 ^b	\$307.4
5309 Capital Funds	\$0.0	\$0.0	\$5.0 ^c
5307 Formula	\$0.0	\$141.0	\$181.0
Federal High Flex Funds	\$0.0	\$259.9	\$339.9
Subtotal Federal	\$307.4	\$708.3^d	\$833.3
Local Funding	\$942.9	\$945.3	\$1,416.7^e
Total Funding	\$1,250.3	\$1,653.6	\$2,250.0
Scheduled Project Completion (Revenue Operation Date)	July 1, 2001	May 31, 2002	June 30, 2004^f

Source: The March 13, 1996 full funding grant agreement; July 19, 1999 amended grant agreement; and May 2003 amended grant application.

^a Totals may not add due to rounding.

^b Of this amount, \$257.9 million has been appropriated.

^c PRHTA received \$4.96 million (rounded to \$5.0 million) in Section 5309 capital funds in FY 1995 that were outside the original scope of the FFGA.

^d As of August 11, 2004, FTA had paid PRHTA \$599.4 million in Federal funds.

^e PRHTA included \$17.06 million in local funds spent prior to FTA's award of the FFGA in 1996.

^f PRHTA requested this date be changed to December 31, 2004 in a June 24, 2004 letter to FTA.

In our March 2002 audit, we recommended that FTA neither amend the project's FFGA nor accept the updated Finance Plan until PRHTA submits a realistic project schedule, cost estimate, and timetable to resolve significant construction quality problems. Because some of these issues are still outstanding, FTA has not accepted PRHTA's Finance Plan or approved its application for amending the

¹ A full funding grant agreement is the instrument by which FTA awards Federal assistance to a specific grantee to support a particular project. The agreement establishes specific parameters of the project and may include other special conditions, requirements, or provisions.

² The remainder of the increase will be financed with local funds.

FFGA. For the current audit, we determined whether (1) Tren Urbano's schedule was achievable, (2) Tren Urbano's cost estimate was reliable, (3) PRHTA has the financial capacity to complete Tren Urbano, and (4) Tren Urbano's outstanding construction quality problems have been corrected. (See Exhibit A for a summary of our objectives, scope, and methodology and Exhibit B for prior audit coverage.)

RESULTS IN BRIEF

Tren Urbano has been plagued with rising costs, schedule slippages, and construction quality problems since construction began in 1996. These problems continue to prevent the system from opening for passenger service. Tren Urbano was originally estimated to open in July

Tren Urbano's History of Cost Increases and Schedule Delays	
Estimated Project Cost	Proposed Project Completion Date
• March 1996--\$1.25 Billion	July 2001
• July 1999--\$1.65 Billion	May 2002
• December 2001--\$2.036 Billion	September 2003
• May 2003--\$2.25 Billion	June 2004
• Current--\$2.25 Billion	December 2004 ³

2001, at a cost of \$1.25 billion. However, the completion date has been extended over 3 years to December 2004, and the price tag has almost doubled to \$2.25 billion. According to FTA, 40 percent of the cost growth is due to scope changes, such as the addition of rail vehicles and two stations, and other refinements. The remaining 60 percent is due to rising costs, schedule slippages, and construction quality problems. The reliability of the current cost estimate is questionable, however, given the likelihood of future claims and additional costs that may be incurred to resolve outstanding safety and performance issues.

Safety and Performance Issues Need to be Resolved

Although the project is nearing completion, safety- and performance-related issues continue to delay the project opening. With 93 percent of the budget expended, PRHTA has identified 241 safety and performance issues that must be resolved. As of July 2004, PRHTA and FTA's project management oversight consultant (PMOC) recognized 77 of these issues as safety-critical and PRHTA submitted a plan to FTA for resolving issues. However, the plan did not identify actions or establish time frames to address all safety-critical issues before the start of passenger service. FTA stated in its response to our report that PRHTA has disposed of 7 of the 77 safety-critical issues and it will require PRHTA to provide a timetable for completing the safety and performance issues.

One safety critical issue that PRHTA identified in its reports involves traction power. PRHTA stated that the 750-volt direct current, traction power cables

³ FTA's project management oversight consultant forecasts a January 2005 date.

located throughout the project's elevated guideway were installed without protection that is specified in the contract and the National Electric Code. Without protection, the normal movement of energized power cables against coarse concrete surfaces can degrade the insulation and cause short circuits or explosions.

In addition, proper headways are not being maintained between trains, which will have a direct and significant effect on performance.⁴ Based on Siemens'⁵ March 2004 test (which was the most current at the time of our audit), 6-car trains achieved only 8-minute headways during scheduled peak periods instead of the 2-minute headways required by the Siemens' contract with PRHTA. Two-car trains also failed to maintain 5-minute headways without skipping stations. With time separation between trains of 8 and 5 minutes, PRHTA will not be able to transport as many riders because trains will be less frequent. The system may be safe with greater time periods between trains, but performance would greatly suffer. In its response to our report, FTA stated that an August 2004 system demonstration test, which has not yet been accepted by PRHTA, achieved 5- and 4-minute sustained headways.

Over the past 8 months, there have been conflicting reports regarding the status of safety and performance issues, making it difficult to determine when the system will open. At FTA's suggestion, PRHTA recently arranged to have Washington Metropolitan Area Transit Authority (WMATA) perform a "peer review" of the track system and New York City Transit to review the automatic train control system in order to further assess the performance and safety issues. WMATA stated that these construction deficiencies are significant because they will ultimately affect passenger safety if not monitored closely and would immediately require additional inspection, maintenance, and repair. New York City Transit's review has recently been completed and the results are being assessed by PRHTA and FTA.

FTA has issued letters to PRHTA stating it is not acceptable to open Tren Urbano for passenger service before the safety-critical and performance issues are resolved and the system is safety-certified by Puerto Rico's state safety oversight agency. We agree. Furthermore, at FTA's request, its PMOC is closely monitoring PRHTA's progress in this area. The PMOC will need to also ensure that performance and safety are not individually sacrificed to achieve the other. For example, train speeds should not be reduced to meet safety requirements nor should it be increased unsafely to meet the headway requirements. FTA will need to ensure that all safety requirements are met and the level of performance that

⁴ Headways are the time separation between trains.

⁵ The full name of the contractor is Siemens Transportation Partnership Puerto Rico S. E. and is the Systems and Test Track Turnkey contractor.

justified Federal participation in the project is achieved before FTA approves any FFGA amendment.

Change Orders Are Not Properly Supported

PRHTA executed and/or paid change orders that were not properly supported. Of the 759 contract change orders that were executed from calendar years (CY) 1997 through 2004, we found 377 were irregular, which suggests that overpayments to contractors may have occurred. These 377 change orders added \$226.5 million to the cost of the project. Specifically, we found three types of irregularities in PRHTA's processing of the 377 change orders: (1) 207 change orders valued at \$186.1 million were executed without PRHTA first obtaining a fair cost estimate,⁶ which is required by FTA Circular 4420⁷; (2) 167 change orders were executed for well over their fair cost estimates, and in some cases by as much as 500 to 2,189 percent⁸; and (3) 8 change orders were executed for accelerating construction⁹ even though FTA's PMOC warned PRHTA before the acceleration change orders were executed that the dates were not achievable. (The acceleration dates were not met and the project has now entered into a protracted claims process with one of the contractors.) The majority of these irregular change orders occurred under the previous Tren Urbano project leadership, but the current leadership will have to address these issues.

Since 2000, FTA has made repeated requests for PRHTA to maintain and provide documentation supporting its change orders. PRHTA has shown a flagrant disregard for FTA's requests, and FTA has withheld approval of Federal funds until PRHTA provides the necessary information. In September 2003, FTA informed PRHTA that all current and proposed FFGA funding was suspended until the PMOC completed a review of the change orders and the issues were resolved.

In November 2003, FTA's PMOC completed its review of 167 change orders and FTA declared 52 change orders, valued at \$130 million, to be ineligible for Federal funds because supporting documentation was missing to accurately validate the reasonableness of the contractors' proposals and the value of the work performed. Approximately 10 months from FTA's latest request and funding

⁶ Fair cost estimates are independent assessments of the value of work to be performed and are used to determine the reasonableness of contractor proposals.

⁷ FTA Circular 4220, "Third Party Contracting," requires that a cost analysis or fair cost estimate be prepared on every change order. A fair cost estimate is a detailed estimate of the lowest reasonable cost relative to the contractor's actual working conditions.

⁸ The 167 change orders were settled for amounts 15 percent above the fair cost estimate. The amount paid above 15 percent of the fair cost estimate totaled \$15.3 million.

⁹ To avoid double counting in our analyses, five of these change orders have no fair cost estimate and the associated amounts have been included in the 207.

suspension, PRHTA has yet to provide the necessary documentation to FTA for the 52 questioned change orders.

Further, based on the lack of supporting documentation, it is uncertain what the level of Federal participation has been in the 377 irregular change orders. FTA's PMOC is working with PRHTA to determine which change orders received Federal reimbursement. In our opinion, no Federal funds should be provided to PRHTA for any of the irregular change orders, as PRHTA has been unable to provide the necessary documentation to prove that funds were used appropriately.

FTA should direct PRHTA to provide a full accounting of billings submitted and reimbursements made to ensure that only valid billings and reimbursements were processed. Furthermore, because PRHTA has not complied with the FFGA requirement to obtain fair cost estimates, FTA should not award any additional Federal Highway flex and FTA formula funds for this project until it approves and signs an amendment to the Full Funding Grant Agreement, and FTA determines that PRHTA has provided adequate documentation to demonstrate that the project expenses to which the funds would apply are eligible for Federal reimbursement.¹⁰

PRHTA's May 2003 Finance Plan Did Not Properly Reflect Expenses and Revenue

Unlike other transit authorities, PRHTA manages highways as well as Puerto Rico's one rail transit project. As a result, PRHTA's Finance Plan submitted to FTA supporting its FFGA proposed amendment is an agency-wide plan and must reflect its ability to construct, operate, and maintain all of its highway projects as well as Tren Urbano. The Finance Plan, as a whole, consists of \$21 billion in revenues and costs associated with its highways and transit projects (there is only one transit project) that is projected over a 20-year period, as required by FTA¹¹. In its Fiscal Year (FY) 2003 Finance Plan, which was the most current plan submitted at the time of this audit, PRHTA did not adequately reflect certain costs and included revenue that, at this time, is questionable.

Our review of the FY 2003 Finance Plan disclosed three areas where costs were understated and revenue was questionable. First, we found that the Finance Plan omitted significant future costs. For example, the cost of the bus feeder system to selected rail stations of about \$1.269 billion was omitted. Second, capitalized expenditures related to all of PRHTA (not just Tren Urbano) was understated by \$378 million as a result of assuming an equivalent annual inflation rate of less than

¹⁰ 49 C.F.R. §18.43, "Enforcement," states that "if a grantee or subgrantee materially fails to comply with any term of an award, whether stated in a Federal statute or regulation...or elsewhere, the awarding agency may...withhold further awards for the program."

¹¹ The FTA required Finance Plan for transit agencies seeking an FFGA or an amendment to an FFGA, including PRHTA, incorporates the same elements as a statewide transportation improvement program (STIP). However, it covers 20 years for capital projects versus Puerto Rico's normal 5-year STIP.

a quarter percent. Third, future revenues of \$318 million from FY 2008 through FY 2022 from a petroleum tax are uncertain as it would require a tax law change that has not been enacted. In its response to our report, FTA stated that PRHTA has submitted a FY 2004 Finance Plan, which is under review. In addition, it will not approve this new plan until it appropriately reflects all Tren Urbano capital and operating costs, PRHTA expenditures, and revenue sources.

PRHTA's costs may grow even larger, as the project's construction cost will likely increase. For example, the current \$2.25 billion cost estimate originally was based on a June 2004 project completion date. However, the project completion date was extended to December 2004, and it is uncertain how this new completion date will affect the project's cost. It is also uncertain what additional costs will be incurred to resolve the outstanding safety and performance issues. Finally, the project's contingency reserve of \$50 million (as of May 2004) for offsetting future unknown costs will not be sufficient based on the unresolved construction quality issues and additional claims that may be filed by the project's contractors.

FTA Needs to Designate PRHTA a “High-Risk” Grantee

We believe that FTA should designate PRHTA a “high-risk” grantee under C.F.R. 49 §18.12. Under these regulations, a grantee may be considered “high-risk” if an awarding agency determines that a grantee has a history of unsatisfactory performance, is not financially stable, or has not conformed to the terms and conditions of previous awards. As a result, the awarding agency can apply special conditions and restrictions to future grants that correspond to the high-risk issue. Because of the issues we have identified in this report, we believe PRHTA should be designated “high-risk” and FTA should lay out specific conditions for receipts of future grants, such as establishing prior approvals for expenditures and requiring additional and more detailed, timely financial reports. This will ensure that PRHTA exercises greater accountability over Federal funds received.

In its response to our report, FTA agreed with our recommendation. Consequently, FTA stated it will officially notify PRHTA of this designation and will lay out specific conditions that PRHTA must follow.

Summary of Recommendations

Given the history of cost overruns and construction quality issues on this project, FTA should continue to provide increased oversight of PRHTA's resolution of issues discussed in this report. Of extreme importance is the need to ensure that the system is safe before it opens for passenger service and that system performance levels are achieved to deliver the promised ridership. In addition, FTA should request that PRHTA provide a full accounting of the payment transactions on the irregular change orders.

Further, since the system's safety and performance problems have affected the project's cost and schedule, FTA must ensure that PRHTA resolves these problems before it considers approval of PRHTA's FFGA amendment application. In addition, FTA should not approve any Finance Plan until it is assured that the plan appropriately reflects all Tren Urbano capital and operating costs, PRHTA expenditures, and revenue sources. Finally, because of the issues we identified in our report, FTA should designate PRHTA a "high-risk" grantee and require special conditions that PRHTA must follow in order to receive future grants.

Although these safety, performance, and contract issues have not been fully resolved, PRHTA has requested a release of \$59 million of remaining New Starts funds that has been appropriated to offset an expected cash flow shortfall. FTA is considering the release of the \$59 million that has already been appropriated, but would do so only under certain conditions including limiting the use of the funds to expenses that its PMOC has already identified as reasonable and valid, and for which PRHTA has not been previously reimbursed.

During September, FTA discussed and provided comments to our office on the draft report. In its written comments (see attached), FTA generally agreed with the findings and recommendations, and stated it would continue to closely oversee the project. Further, FTA stated that it will not permit the system to open until all the safety-critical issues are addressed.

RESULTS

Safety and Performance Issues Continue and Need To Be Addressed

FTA's rail transit safety and security program requires that Tren Urbano be certified by a state safety oversight agency.¹² However, as of July 2004, none of the project's nine systems had been safety-certified. Siemens is responsible for all nine systems, which include vehicles, automatic train control, communications, operations control center, power distribution and traction power, track, elevators and escalators, signage and graphics, and fare collection.¹³ (See Exhibit C for an overview of Siemens' contract responsibilities.)

As of July 7, 2004, PRHTA had identified 241 non-conformance reports involving system safety or performance issues. "Non-conformance reports" are reports of contractor non-compliance with contractually-specified requirements that must be resolved before the contract terms can be considered fulfilled. PRHTA classified

¹² 49 C.F.R. Part 659, "Rail Fixed Guideway; State Safety Oversight," requires that all elements critical to safety be tested and in compliance with the transit agency's safety requirements.

¹³ Fare collection has to be safety-certified to ensure easy evacuation of the station in case of an emergency such as fire.

77 of the 241 non-conformance reports as safety-critical, and in its opinion all should be addressed before starting passenger service. Of the 77 safety-critical non-conformance reports, 9 involve traction power and other high voltage cables, 7 relate to the automatic train control system, 33 involve track work, and 28 relate to other aspects of the 9 systems.¹⁴ FTA's PMOC stated that resolving track and traction power non-conformance reports is the critical path to system start-up, and has requested PRHTA to develop a summary report (updated once a month) to assist in tracking the resolution of these outstanding non-conformance reports. Examples of the major systems' safety and performance issues involving traction power, automatic train control, and the track system are described below.

Traction Power and Other Cables Were Unprotected

Throughout the project's elevated guideway, 750-volt direct current, traction power cables connected to the third rail were installed without protection from chafing against the sharp edges of the coarse concrete guideway structures and steel straps. Without protection, the normal movement of energized power cables can degrade the insulation and cause short circuits or explosions. Figure 1 shows 750-volt direct current, traction power feeder cables bolted to the third rail and in contact with the coarse concrete rail right-of-way.

Figure 1.

Unprotected 750-volt traction power cables bolted to contact rail.

Grounding cables in contact with the concrete.



Source: Photograph taken by the Office of Inspector General (OIG) Engineer May 11, 2004.

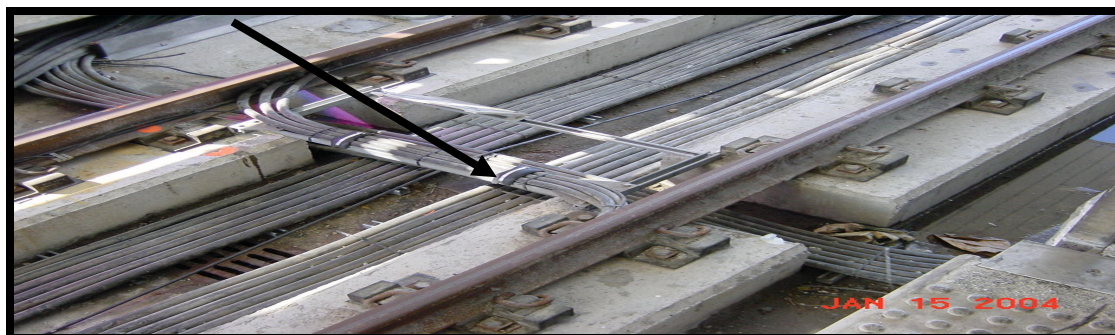
In some cases, unprotected traction feeder cables were co-located with unprotected track grounding, nearby communication, and other cables, as shown in Figures 2 and 3. Siemens' contract requires that it will comply with the National Electric Code, which directs that communications conductors not be placed near electrical power connectors to prevent damaged power cables from damaging other co-located cables. In advance of receiving PRHTA approval, Siemens began placing 750-volt direct current, traction power feeder cables within plastic cable

¹⁴ These 28 relate to station areas, the maintenance shop, operations control center, communication, and supervisory control and data acquisition systems that remotely monitor and control power substations.

trenches to provide greater protection from insulation degradation. There is no stated completion date for this activity.

Figure 2.

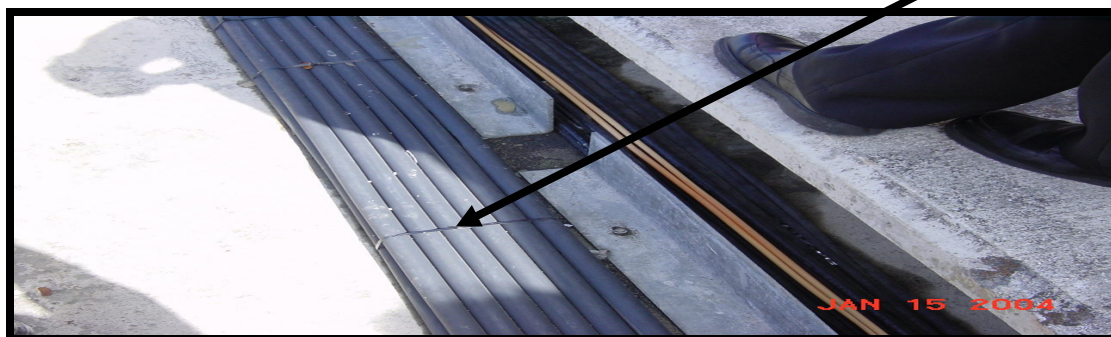
750-volt traction power co-located with track grounding cables



Source: Photograph taken by OIG engineer on January 15, 2004.

Figure 3.

750-volt direct current traction power cables co-located with fiber optic cables



Source: Photograph taken by OIG engineer on January 15, 2004.

Automatic Train Control Continues to Show Problems

According to FTA's PMOC, Tren Urbano's automatic train control system, which maintains appropriate time separations between trains and monitors their location, continues to show problems. PRHTA officials state that the automatic train control system does not meet contractually-specified standards of the American Association of Railroads.¹⁵ Critical system components of this automatic system, such as the relay that applies the brakes and the circuit board that controls the track switches, could compromise the ability of trains to brake properly, switch tracks, and maintain appropriate time separations between trains. FTA's PMOC

¹⁵ The American Association of Railroads developed and published design criteria, specifications, and test standards for rail signal systems.

noted in its May and June 2004 monthly reports to FTA that Tren Urbano's automatic train control system has not reached the contractually required level of reliability. Based on our review of the PMOC's monthly reports and PRHTA's quality assurance reports, we found the following:

- **Emergency braking incidents are exceeding the permitted incident rate.** Emergency braking incidents for Tren Urbano are contractually required not to exceed one incident for every 419 hours of train operations. However, during 12,400 train test hours recorded from October 14, 2003 until June 21, 2004, the automatic train control system experienced 1,566 emergency brake applications, or an average of 1 emergency brake application for every 8 hours of train operations. Within the first 21 days of June 2004, emergency brake occurrences still continue to greatly exceed the specified, minimum permitted incident rate. This excessive braking has caused severe damage to the train's wheels and has shortened the useful life of brake pads, as well as reduced the number of rail cars available to operate at a given time.
- **Proper headways are not being maintained.** The automatic train control system maintains safe time separations or headways between trains. This function is also a key performance element of the project, which could affect the achievement of the project's future ridership goals. During Siemens' latest recorded test of the rail system held in March 2004, the project failed to meet the contractually specified 2-minute headways with 6-car trains. For example, trains operated between 5:00 a.m. and 10:00 p.m. achieved only 8-minute headways during scheduled peak periods. Two-car trains also failed to maintain 5-minute headways without skipping stations. At this current time separation between trains of 8 and 5 minutes, PRHTA will not be able to transport as many riders because trains will be less frequent.

As indicated in our April 2004 testimony,¹⁶ ridership is the single most critical element supporting project justification. It is crucial to determining project-related benefits, such as mobility improvements and congestion relief. These benefits will fall short if ridership estimates are not materially attained. Therefore, Tren Urbano must achieve its ridership forecast to fully realize the intended benefits of congestion relief.

FTA will need to ensure that the contractually-required levels of performance are achieved. Otherwise, it will not deliver the user benefits that justified the Federal investment in the system.

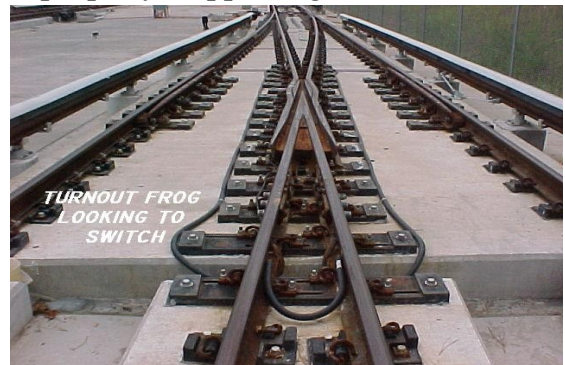
¹⁶ OIG Testimony Number CC-2004-021, "The Rating and Evaluation of New Starts Transit Systems," April 28, 2004.

The Track System Was Not Properly Installed

Another issue requiring resolution involves the track system (specifically, the direct-fixation track system, as it is known in the industry). This system, which secures the rails directly to the elevated and tunnel sections of the guideway, was not properly installed. The system includes tracks, track plates, steel clips, anchor bolts, and reinforced concrete pads. Throughout the elevated and tunnel segments of the alignment, PRHTA and FTA's PMOC found that anchor bolts used to safely secure track plates to the concrete pads were corroded, not tightened to specifications, installed on uneven, reinforced concrete guideway pads, and secured by inadequate epoxy. These deficiencies can cause the tracks to dislodge. For example, contract specifications require anchor bolts to be torqued (fastened) to a specified strength; however, numerous bolts had either insufficient or excessive torque.

FTA's PMOC reported that the major track-related non-conformance report issues included excessive shimming of rail fasteners and damaged or broken contact rail components. In recognizing PRHTA's lack of experience as rail transit system operators and maintainers, FTA suggested that PRHTA seek technical advice from experienced United States rail transit system experts. Subsequently, FTA's PMOC encouraged PRHTA to obtain a peer review of the system.¹⁷ Therefore, PRHTA invited WMATA track and structural experts to conduct a technical assessment of repair work on four track system areas that Siemens reported to be near completion. In mid-June 2004, the WMATA team found deficiencies in repairs that Siemens had completed throughout the system in the following areas.

- **Track switching deficiencies.** Structures located under track intersections that permit trains to switch tracks (known in the industry as “frogs”) were not resting correctly on the concrete pads, and therefore, had excessive gaps that prevented the structures from properly supporting the rail. These structures were also bowed upwards, causing undue stress that could crack the structures or shear the bolts attaching the structures to the concrete pads. This condition could also cause significant future maintenance problems, such as rail warping, which was observed at a double



Source: L. B. Foster Company

¹⁷ A peer review is recognized by FTA as a structured, independent review of an organization or project by a team of transit experts. Typically, these reviews are limited to special topics or situations with a specified purpose, scope, format, and duration.

crossover location. It can also lead to the premature loosening of applicable switches, alignment and gauge¹⁸ problems, deterioration of the concrete pads, and other unsafe conditions for future rail vehicle traffic.

- **Track plate deficiencies.** WMATA observed that track plates, which keep the tracks safely resting on concrete supports, were not leveled or properly placed. This improper placement causes high stress on portions of the plates, which could deform and ultimately break the track plates. Similarly, the WMATA team observed that other track plates were unevenly fastened, and a number of steel clips that secure the rails to the track plates were charred by fire exposure, which may have reduced the strength of those clips. Improperly installed or loosened track plates and steel clips of questionable structural integrity pose future problems because these deficiencies impair the track system from keeping the rails permanently fixed to safely support the travel of rail vehicles.
- **Rail deficiencies.** Rail misalignments and uneven elevations have caused unnecessary switch wear and damage to the third rail that supplies power to the rail. WMATA observed that more than half of the insulators supporting the third rail were cracked. It also observed rail surface defects, including severe corrosion and pitting from improper storage, that will require grinding to remove. These deficiencies will cause additional maintenance expenses, affect the smooth operation of rail traffic, and may pose safety problems, including derailments when railcars switch tracks.

According to the WMATA peer review team, these three construction deficiencies are significant because they will affect passenger safety if not maintained more frequently than normal and could cause additional operating and maintenance expenses. However, WMATA reported to PRHTA that despite the track deficiencies, trains can run safely, provided additional inspection and maintenance is implemented.

Passenger Operations Should Not Occur Before Safety-Critical Issues Are Resolved

To remedy the safety and performance issues, PRHTA and Siemens presented FTA with a management action plan on April 21, 2004. The plan identified and prioritized the most critical remaining tasks to complete Tren Urbano. However, the plan did not provide the necessary detail on the work to complete all of the critical tasks or a schedule to remedy the safety-critical, non-conforming reports. Having a detailed work plan and corresponding time frames is a critical step before the system can open for revenue operations. Without a detailed plan that

¹⁸ Gauge is the distance between the inside face of the two rails of a track.

clearly lays out the critical path to resolving the safety and performance issues, it is unclear when revenue operations will begin. Regardless, PRHTA has now set that date as December 2004.

Although many safety-critical, non-conformance reports remain outstanding, PRHTA has made multiple announcements of Tren Urbano's opening for passenger operations. As a result of these announcements, FTA issued letters on April 29, 2004 and May 14, 2004 notifying PRHTA that providing transportation to the public was not acceptable before completing the safety certification process. FTA's actions are important first steps, but it should continue to withhold approval of the FFGA amendment until PRHTA resolves all outstanding safety-critical, non-conformance reports to FTA's satisfaction.

Recent problems with other train systems illustrate the importance of ensuring that system start-up does not occur before safety-critical items are resolved. For example, in September 2003, a Seattle Sound Transit train derailed on a section of commuter rail tracks, which was opened prematurely by the Central Puget Sound Regional Transit Authority.

Change Orders Were Not Properly Supported or Justified Before Payment

Since the start of the project, PRHTA has executed 759 change orders to add, delete, or otherwise amend construction work, increasing costs by \$471.4 million. Our review disclosed that 377 of the 759 change orders, valued at \$226.5 million, were either executed and/or paid by PRHTA without a fair cost estimate, well in excess of the fair cost estimate, or for unearned acceleration fees.¹⁹ FTA has its PMOC determining the extent to which FTA may have participated in the payments of these change orders.

Change Orders Were Paid Without Fair Cost Estimates

Of the 759 executed change orders, 207 (27 percent) valued at \$186.1 million were processed without fair cost estimates from CYs 1997 to 2004. Fair cost estimates (independent assessments of the value of work to be performed) are required by FTA, under the terms of FTA Circular 4220.1E, to determine the reasonableness of contractor proposals. However, PRHTA executed change

¹⁹ FTA follows Government acquisition regulations, which require that fair cost estimates be obtained before execution of a contract or change order to determine the reasonableness of the contractor's proposal. The rationale for this requirement is based on the Federal Acquisition Regulation which states that the "reasonableness of specific costs must be examined with particular care in connection with firms or their separate divisions that may not be subject to effective competitive restraints. No presumption of reasonableness shall be attached to the incurrence of costs by a contractor." Such is the case at Tren Urbano because change order request and contractor price quotes are, in effect, not competitive and should not be presumed to be reasonable on their face.

orders without independent cost assessments. For example, a June 2002 change order to redesign and relocate utilities for the Hato Rey contract had a contractor-proposed value of \$281,162 and was settled for \$888,000.²⁰ Without a fair cost estimate, it is unclear whether the settlement was excessive and the contractor's proposed price was reasonable. Therefore, FTA should not fund change orders that have been executed without independent assessments of the value of the work to be performed.

On five occasions between December 2001 and August 2003, FTA's PMOC reported a lack of supporting documentation for processing Tren Urbano change orders and recommended to FTA that PRHTA provide the necessary support for its change orders.²¹ In response to these recommendations, FTA requested several times throughout the 2-year period that PRHTA provide the necessary support and follow its documentation procedures. Despite these requests from FTA, the number of change orders lacking supporting documentation continued to increase during this period. As a result, FTA periodically withheld funds from PRHTA.

In August 2003, after reviewing FTA's PMOC reports and analyzing the project's change order logs, we questioned FTA concerning the disposition of its PMOC's findings and recommendations made in the five reports and the response from PRHTA. We were told that PRHTA had not responded to the PMOC's recommendations and the May 2003 FFGA amendment would not be processed by FTA until all outstanding change order issues were resolved.

In September 2003, FTA again directed its PMOC to conduct a more extensive review of the change order records to determine whether certain change orders should be deemed ineligible for Federal participation. FTA also informed PRHTA that all current and proposed FFGA funding was suspended until the PMOC completed its review and the issues were resolved. FTA indicated in its September 2003 letter to PRHTA that there was a "pattern of unresponsiveness and delay regarding FTA's recommendations."

In November 2003, FTA's PMOC completed a review of 167 (22 percent) of the 759 change orders with the largest dollar values and found that 52 lacked independent fair cost estimates. These 52 are part of the 207 change orders that we identified as lacking fair cost estimates. As a result of its PMOC's review, in December 2003 FTA declared the 52 change orders as ineligible for funding. FTA also cited its intent to reduce the amount of Federal funds promised in the amended FFGA by approximately \$48 million, unless PRHTA provides

²⁰ Hato Rey is one of the seven alignment section contracts to construct Tren Urbano. See Exhibit C for a description of the contract.

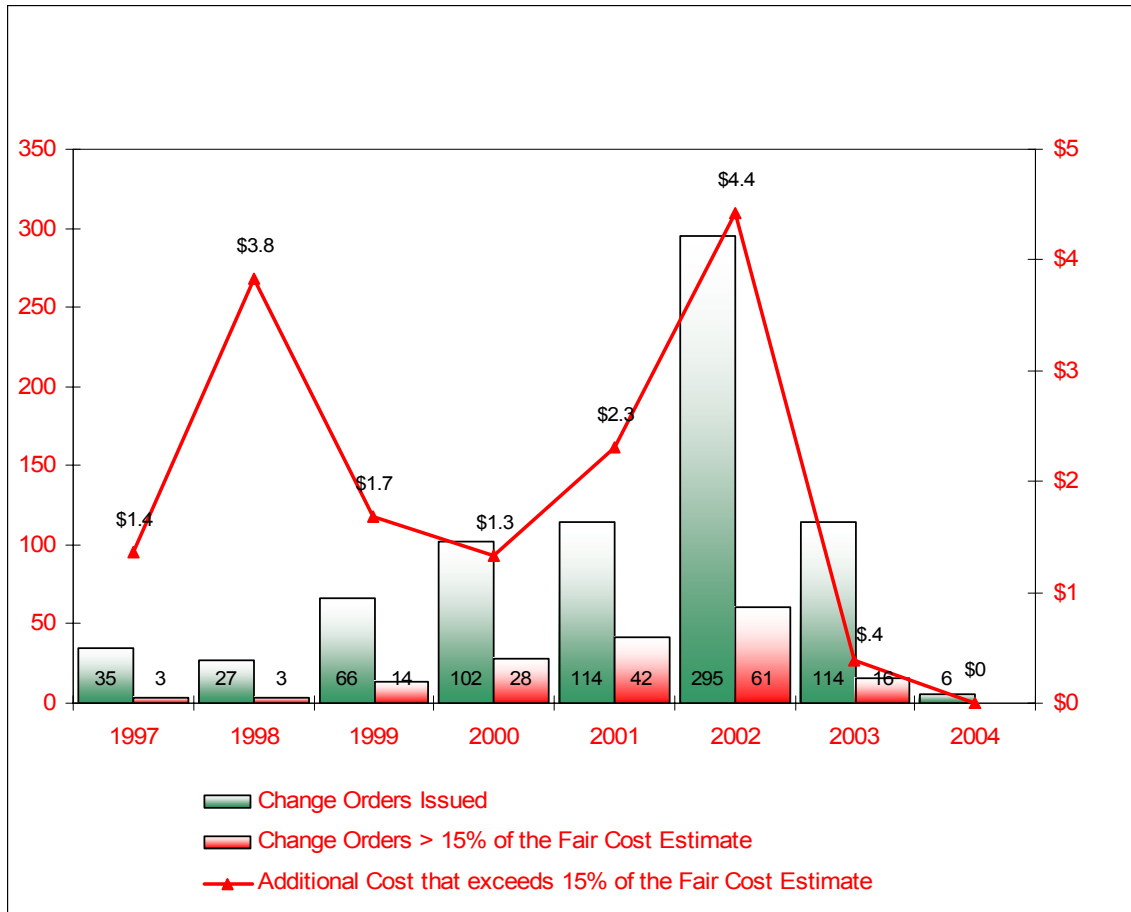
²¹ "PMOC Spot Report 35," December 2001, "PMOC Spot Report 44," January 2003, "PMOC Spot Report 44A," April 2003, "PMOC Spot Report 44B," July 2003, and "PMOC Spot Report 44C," August 2003.

reasonable support showing that the 52 change orders are reasonably priced. To date, FTA has not reduced PRHTA's funding. However, as FTA's PMOC stated in its July 2003 report, it would be of no value to recreate the fair cost estimates. Because FTA's policy clearly requires fair cost estimates to support contract modifications, these change orders should be ineligible for Federal reimbursement.

Change Orders Were Settled for Well Over Their Fair Cost Estimates

Our analysis of the change order log showed that 167 change orders (of 552 change orders with fair cost estimates) were settled for amounts that were more than 15 percent above, and frequently double, the value of their fair cost estimates. In some cases, change orders were settled for as much as 500 to 2,189 percent over their fair cost estimates. This is highly irregular as, historically, PRHTA has settled most of its change orders on Tren Urbano for no more than 15 percent above the fair cost estimate. Figure 1 shows the results of our analysis of change orders for FYs 1997 through 2004.

Figure 1. Number and Additional Cost of Change Orders Issued Above 15 Percent of Fair Cost Estimates (\$ in Millions)



Source: OIG analysis of the project's change order log as of May 7, 2004.

The amounts paid above 15 percent of the fair cost estimate totaled \$15.3 million for the 167 change orders. For example:

- A February 19, 2002 change order for community relations in Rio Piedras had a fair cost estimate of \$769,544, but was settled for \$1,596,000.
- Another February 19, 2002 change order for the Rio Piedras contract regarding an additional entrance had a fair cost estimate of \$520,792 and was settled for \$1,160,000.
- A February 21, 2002 change order for a pedestrian canopy for the Bayamón contract had a fair cost estimate of \$127,600 and was settled for \$220,000.

- A March 19, 2002 change order for foundation, site finishing work, and fencing for the Siemens contract had a fair cost estimate of \$110,466 and was settled for \$299,685.

To date, PRHTA has not provided an explanation for why the 167 change orders were settled for more than 15 percent above their fair cost estimates. FTA needs to determine whether PRHTA made excessive payments on these change orders and the extent to which PRHTA received Federal reimbursement for them.

PRHTA Paid Acceleration Costs Even Though FTA Warned That Dates Could Not Be Met

Eight change orders, valued at \$65.9 million, were issued from May 9, 2002 through March 6, 2003 to accelerate construction. This was done to meet a September 2003 opening date (previously set for May 2002) stipulated by an agreement between three alignment section contractors and PRHTA.²² The change orders were paid even though the date was not achieved. These eight acceleration change orders included five without fair cost estimates.²³

In March 2002, FTA warned PRHTA that the September 2003 date was not achievable and concluded that a June 2004 date was more realistic. FTA's PMOC also advised FTA not to participate in the acceleration change orders because of these unrealistic dates.

Despite these warnings, PRHTA paid the acceleration change orders. In February 2004, PRHTA re-examined the change orders and reduced the acceleration amount for one contractor²⁴ by approximately \$14 million for failure to make the acceleration milestone, leaving a revised acceleration cost for all three contracts of approximately \$51.4 million. While PRHTA is now assessing the contractor liquidated damages, the contractor is counter-claiming with further costs.

FTA Plans to Strengthen Its Policies Concerning Unjustified Change Orders

To reduce the likelihood that unjustified change orders are paid on this and other projects, FTA will develop a new FFGA requirement directing grantees to develop a recovery plan whenever total project costs exceed baseline cost estimates. FTA

²² There are six separate sections of the Tren Urbano alignment, each with its own contractor. The project also includes a Systems and Test Track Turnkey contract with Siemens to design and build a seventh alignment section and to provide and operate rail transit cars and all track, traction power, and train control systems. The three contracts with acceleration change orders were the Bayamón, Hato Rey, and Systems and Test Track Turnkey contracts. See Exhibit C for a description of the alignment section contracts.

²³ To avoid double counting in our analyses, these five change orders have been included in the 207 change orders without fair cost estimates.

²⁴ The Siemens Systems and Test Track Turnkey contract.

will also develop a new requirement that the PMOC and FTA regional staff thoroughly review the first change order occurring on all projects to ensure that grantees have adequate processes in place for meeting all Government acquisition requirements. This initial review will include determining whether there is an adequate cost analysis on file, the change order is within the scope of the project, and plans and procedures are in place to properly process the change orders. While this management control will be important to ensuring the integrity of the payment process, by itself, it will not guarantee that change orders are adequately supported, nor will it serve as an adequate control for fraud prevention and deterrence. FTA will need to have strong PMOC oversight that examines the reasonableness of change orders to ensure the process is not bypassed in the future.

Because FTA has not resolved what the level of Federal participation has been or should be in the 377 irregular change orders, it should require PRHTA to provide a full accounting of the billings submitted for reimbursement and the reimbursements made to-date. This information will be critical to determining whether FTA has reimbursed PRHTA for any irregular change orders and the amount of funds that should be withheld if ineligible costs were reimbursed.

PRHTA's May 2003 Finance Plan Needs Did Not Properly Reflect Expenses and Revenue

FTA requires that the agency with the authority over the transit project provide a description of its financial health, 20 years of projected costs and revenues, and key assumptions used in the projections. Because PRHTA has authority over both highway and rail transit projects, the Finance Plan that it submits to FTA covers 20 years of current and future highway and transit construction and operating costs, including the construction costs of its sole rail transit project, Tren Urbano. The submitted plan contained \$21 billion in revenues and costs. Thus, our review sought to determine the reasonableness of PRHTA's 2003 Finance Plan, which was the most recent plan submitted at the time of our audit.

In our review of the Finance Plan, we focused on risks to future revenue streams and the reasonableness of planned costs. We identified \$318 million in uncertain revenues and a potential \$1.65 billion in understated expenses. (Both of these

figures are quoted in 2003 present value terms.²⁵) Our findings on the Finance Plan are discussed below.

In addition, in our review of the project's construction budget, we found that the current estimated cost of \$2.25 billion to complete Tren Urbano will likely increase if the project completion date continues to slip. In particular, as of May 2004, the project's contingency reserve was \$50 million and is not adequate to cover all existing and future claims that may be placed on this reserve.²⁶ This amount also does not reflect future project costs that can be expected from unresolved construction quality issues.

PRHTA's Finance Plan Understates Expenses by a Potential \$1.65 Billion

In our examination of capitalized expenditures, we found that PRHTA had accounted for inflation by simply adding \$200,000 per year.²⁷ For example, it determined the amount of capitalized expenditures for 2008 by taking the figure for 2007, \$85,000,000, and increasing it to \$85,200,000. This is equivalent to assuming an annual inflation rate of less than a quarter percent. In the last 10 years, Puerto Rican inflation has never fallen below 1.33 percent, and has been as high as 6.36 percent.²⁸ Comparing PRHTA figures with those derived using more realistic inflation assumptions, we estimated that PRHTA understated capitalized expenditures for highway and transit projects by approximately \$378 million in 2003 present value terms.²⁹

²⁵ The following is an explanation of what is meant by "2003 present value." In choosing between whether to pay \$1,000 in 2003 or \$1,000 in 2022, it makes more sense to pay the \$1,000 in 2022. First, inflation will reduce the real value of the \$1,000 20 years on. Second, an individual can invest the \$1,000 today and keep the interest earned over the intervening years, or alternatively if short on cash, the individual could avoid having to borrow to pay the entire costs upfront. If the cost is paid in 2003 from either cash or borrowed funds, the individual is out the interest on the \$1,000. If we could determine an amount, reduced to compensate for the inflation and interest differential between 2003 and 2022, that an individual would be as willing to pay in 2003 as it is to pay \$1,000 in 2022, that would be the 2003 present value of the 2022 \$1,000 payment. The interest rates used to derive the present values in this section were those from the most recent Tren Urbano bond prospectus.

²⁶ The purpose of the contingency is to account for a possible future event or a condition arising from presently known or unknown causes that cannot be precisely quantified. For example, on our audit of the Central Artery 2003 Finance Plan, the project's sponsors assessed the maximum amount contractors would propose for claims settlement and determined the amount needed in contingency to cover what it thought the amount would be.

²⁷ Capitalized expenditures include items such as rent, salaries, automotive costs, and telephones for all of HTA.

²⁸ All of the inflation rates used to calculate our results in this section were based on the Gross Domestic Product Deflator Series for Puerto Rico produced by the World Bank.

²⁹ To derive the present value, we used a more realistic inflation rate to generate the stream of expenditures to be discounted. The exact estimate of the understatement is sensitive to the particular inflation assumption made. We derived our estimates using three different inflation assumptions: (1) an average of inflation rates for the last 5 years, 3.52 percent; (2) an average of inflation rates for the last 10 years, 3.19 percent; and (3) that inflation rates would continue to repeat the pattern they have followed over the last 10 years. The understatement of capitalized expenditures was estimated to be \$460 million, \$407 million and \$378 million, respectively. We chose the most conservative estimate for this report.

Our examination also found that the FY 2003 Finance Plan omitted significant future operating costs for Tren Urbano. An example of this was the omission of the cost of the bus feeder system to selected Tren Urbano rail stations. This single omitted cost alone could reach \$1.269 billion in 2003 present value terms.³⁰ Further, the operating cost estimate excludes various expenses that have yet to be quantified, such as subsidies for publicos (low-cost taxis), fire emergencies, other emergency services, and security. These costs need to be quantified and addressed in the FY 2004 Finance Plan.

\$318 Million in Finance Plan Revenues Are Uncertain

PRHTA's FY 2003 Finance Plan forecasts billions in revenues from gas taxes, license fees, toll revenues, investment income, Federal funds, long- and short-term bonds, and a line-of-credit. However, \$318 million (in 2003 present value terms) of these future revenues is uncertain. These questionable revenues consist of an assumed increase in petroleum taxes between FY 2008 and FY 2022 that would require a change in the tax law enacted by the Puerto Rico Legislature and approved by the Governor. No such tax law change has been enacted.

On November 11, 2003, FTA's financial management and oversight consultant also reported to FTA on PRHTA's May 2003 Finance Plan. FTA's financial management and oversight consultant also questioned some of PRHTA's revenue projections including this tax increase. The report stated that PRHTA's revenue projections were optimistic in the near term, and in some cases, uncommitted in the long term.

The Project's \$2.25 Billion Cost Estimate Will Likely Increase Further

Based on PRHTA's cost estimate, the project is anticipated to cost \$2.25 billion, which is almost double its original price tag. However, this cost will likely increase further due to the demands and challenges that are expected to be placed on the project's contingency reserve. As of May 2004, PRHTA reported the project's contingency reserve as approximately \$50 million. This contingency may not be sufficient to cover existing and future claims against the project for the following reasons:

³⁰ Again, we used a range of inflation assumptions to generate the cost stream to be discounted. Using an average of inflation over the last 5 years produced an estimate of \$1.304 billion. Using an average of inflation over the last 10 years or the assumption that inflation would continue to replicate the pattern it has exhibited over the last 10 years resulted in estimates of \$1.269 billion and \$1.286 billion, respectively, for the present value of this omitted cost. Again, we chose the most conservative estimate. Also, note that although the plan covers 20 years, the operating costs start at project completion, which HTA estimates as December 2004. Therefore, these figures represent 19 years of omitted operating costs.

- There are \$82.7 million in outstanding claims on five of the seven alignment section contracts.³¹ In addition, any future claims that may be submitted would also place demands on the contingency.
- A \$50 million lawsuit submitted by Siemens against the project as compensation for denied change orders would also challenge the contingency should the Court find in Siemens favor.
- Any additional costs that PRHTA may incur to resolve the outstanding safety and performance issues mentioned earlier, and any costs associated with the project completion date slipping beyond the formerly approved June 2004 opening may also place demands on the contingency reserve.

FTA Needs to Designate PRHTA a “High-Risk” Grantee

FTA should designate PRHTA a “high-risk” grantee under C.F.R. 49 §18.12. This designation is given to grantees that have a history of unsatisfactory performance, are not financially stable, or have not met the terms and conditions of previous grant awards. Our audit disclosed that PRHTA currently demonstrates all three of these conditions. For example, PRHTA has not resolved a substantial number of construction quality issues on the Tren Urbano project and it has identified recent cash shortages. Further, PRHTA has not complied with the FFGA requirement to use fair cost estimates in settling construction change orders.

For these reasons, FTA should designate PRHTA as a “high-risk” grantee so that increased oversight is provided to Tren Urbano and other grant awards. Doing so will also require that FTA sets specific conditions for future grant awards to ensure that PRHTA exercises greater accountability over Federal funds received and other grant awards.

RECOMMENDATIONS

We recommend that the Federal Transit Administrator:

1. Ensure all 77 safety-critical requirements are met and the level of performance that justified Federal participation in the project is achieved before approving an FFGA amendment.
2. Require PRHTA to provide a full accounting of the payment transactions on the 377 irregular change orders, including the amount of billings submitted to FTA for reimbursement and the amount of Federal reimbursements made.

³¹ The alignment sections contracts are Systems and Test Track Turnkey (Siemens), Bayamon, Centro Medico, Villa Navarez, and Hato Rey.

- FTA should ensure that only eligible and reasonable billings supported by fair cost estimates have been reimbursed. Where reimbursements were made to PRHTA for ineligible change orders, FTA should ensure the appropriate credits or withholdings are applied.
3. Not award any additional Federal Highway flex and FTA formula funds for this project unless and until an amendment to the Full Funding Grant Agreement is approved and signed by FTA, and it determines that PRHTA has provided adequate documentation to demonstrate that the project expenses to which the funds would apply are eligible for Federal reimbursement.
 4. Not approve PRHTA's FY 2004 Finance Plan until it ensures that the plan appropriately reflects all Tren Urbano capital and operating costs, PRHTA expenditures, and revenue sources. Our review of the FY 2003 Finance Plan identified large overstatements of revenue and understatements of expenses.
 5. Designate PRHTA a "high-risk" grantee based on PRHTA's unsatisfactory management of Tren Urbano, Finance Plan and cash flow deficiencies, and failure to comply with the FFGA requirements to use fair cost estimates. This will ensure that increased oversight is provided the Tren Urbano project. FTA should also set specific conditions on any release of future grants to ensure that PRHTA exercises greater accountability over the Federal funds it receives.

AGENCY RESPONSE AND OFFICE OF INSPECTOR GENERAL COMMENTS

In its September 28, 2004 response to the draft report (see Appendix), FTA generally agreed with the findings and recommendations in the report stating it would continue to closely oversee the project and would not amend the project's FFGA until it was satisfied that PRHTA had taken action to fully implement these recommendations. More specifically, FTA states that by no later than January 15, 2004 it will:

- require that the safety critical non-conformance reports are addressed satisfactorily before an amendment to the Full Funding Grant Agreement is signed. Further, FTA will not permit the Tren Urbano system to carry passengers until all safety-related issues are satisfactorily addressed.
- require PRHTA to: (1) provide additional documentation that demonstrates that all Federal funds awarded have been used to appropriately reimburse

only eligible project expenses; and (2) produce the necessary documentation for each change order, permitting FTA to evaluate the eligibility of each change order for Federal participation.

- not award any additional Federal highway flex or FTA formula funds for this project unless and until an amendment to the Full Funding Grant Agreement is approved and signed by FTA, and FTA determines that PRHTA has provided adequate documentation to demonstrate that the project expenses to which the funds would apply are eligible for Federal reimbursement.
- not approve PRHTA's FY 2004 Finance Plan until the plan appropriately reflects all Tren Urbano capital and operating costs, PRHTA expenditures, and revenue sources. FTA will undertake a review of an amendment application for this project only when the PRHTA has satisfactorily addressed any issues that result from FTA's review of PRHTA's August 2004 Project Finance Plan.
- FTA will designate PRHTA a "high-risk" grantee consistent with 49 C.F.R. §18.12.

In addition, FTA's comments describe actions it has taken as well as provide an update of recent activities on the project. FTA's comments and proposed actions are responsive to our recommendations and are subject to follow-up requirements in DOT Order 8000.1C.

We appreciate the courtesies and cooperation of the Federal Transit Administration representatives during this audit. If you have any questions concerning this report, please call me at (202) 366-1992 or Debra Ritt, Assistant Inspector General for Surface and Maritime Programs, at (202) 366-5630.

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cc: Deputy Secretary
Assistant Secretary for Budget
And Programs/Chief Financial Officer

EXHIBIT A. OBJECTIVES, SCOPE, AND METHODOLOGY

The objective of this audit was to determine whether our March 2002 recommendations had been fully addressed before FTA approved PRHTA's May 2003 request to amend Tren Urbano's FFGA. In 2002, we recommended that FTA neither amend the project's FFGA nor accept the updated Finance Plan until PRHTA submits a realistic project schedule, cost estimate, and timetable to resolve significant construction quality problems.

Specifically, our current audit objectives were to determine whether (1) Tren Urbano's schedule was achievable, (2) Tren Urbano's cost estimate was reliable, (3) PRHTA had the financial capacity to complete Tren Urbano, and (4) Tren Urbano's outstanding construction quality problems were corrected. We also looked for fraud, waste, and abuse on the project.

To determine Tren Urbano's schedule viability and resolution of construction quality problems, we met with PRHTA staff, FTA's PMOC and the General Management Architectural Engineering Consultant. The OIG engineer also reviewed the following:

- The PMOC's assessment of the current project schedule to identify potential schedule risks.
- Technical assessment reports prepared by the project and its contractor, Hansen and Wilson (the contractor hired by PRHTA to conduct independent analyses), which documented construction quality and safety issues impacting the project schedule.
- A draft of the Management Action Plan developed by PRHTA to assess actions planned for resolving construction quality and safety issues.

We made several site visits to the project to observe construction quality and safety issues reported by PRHTA. We discussed the impact of these issues with Siemens, the project contractor responsible for the majority of the construction quality and safety issues. We also reviewed FTA's policy and FFGA requirements involving the safety certification process to determine the reasonableness of the June 2004 scheduled revenue operations date.

In assessing the reliability of the project's cost estimate, we analyzed budget data, contractor change request logs, and FTA PMOC reports. We conducted limited

tests of computer-generated cost data from PRHTA and FTA, but did not assess the general and application controls for each automated system. For example, we reviewed the change order process, and selected a judgmental sample of 17 executed change orders. We compared the computerized logs to source documents from project files. We also met with project managers and engineers to determine how they developed the project cost estimate, what the supporting assumptions were, and how construction quality problems and schedule delays would affect the project's cost.

Finally, to determine whether PRHTA has the financial capacity to complete Tren Urbano, we reviewed PRHTA's May 2003 Finance Plan and earlier finance plans, 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, the preliminary official statement for the 2002 bond issue, and various legal documents.

We conducted limited tests of pledged revenue and capital and operating expenses. Specifically, we analyzed 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 2002 and the March 2003 "Analysis of the Revenues of the Highway Authority," prepared by Applied Research, Inc. Our analysis included a review of the following:

- Gasoline taxes, gasoline oil and diesel oil taxes, petroleum taxes, vehicle license fees provided by the Puerto Rico Treasury Department, and toll revenue data provided by Banco Popular.
- FY 2002 pledged revenue estimates that were reported in PRHTA's Construction Improvement Program for FYs 2002 through 2005.
- PRHTA long-term bond and line-of-credit issuance transactions and interest expense figures, including PRHTA's inflation assumptions underlying capitalized expenses.
- PRHTA's preliminary official statement for its 2002 and 2003 bond prospectus. We reviewed Solomon/Smith Barney, Moody, and Standard and Poor reports, and interviewed officials of the Government Development Bank for Puerto Rico to verify the amount of bonds PRHTA would qualify for to finance its transportation infrastructure programs.

In analyzing PRHTA's capital and operating expenses, we reviewed Tren Urbano financing costs reported in the May 2003 Finance Plan and operating expenses for

Exhibit A. Objective, Scope, and Methodology

a bus feeder system. We also analyzed inflation assumptions for all of PRHTA's capitalized expenditures. We computed inflation costs based on net present values and compared them to amounts reported in the Finance Plan. In order to derive the net present values, we first used an inflation rate to generate the stream of expenditures to be discounted. We derived our estimates using three different inflation assumptions: (1) an average of inflation rates for the last 5 years, 3.52 percent; (2) an average of inflation rates for the last 10 years, 3.19 percent; and (3) that inflation rates would continue to repeat the pattern they have followed over the last 10 years.

During the course of the audit, we were made aware of possible fraud, waste, and abuse concerning the project's change orders. We referred these issues to the OIG investigators.

Our audit was conducted at the Tren Urbano Project Office and PRHTA headquarters in Puerto Rico; FTA and Federal Highway Administration headquarters in Washington, D.C.; FTA Region IV in Atlanta, Georgia; and FHWA Division Office in Puerto Rico. We conducted our work from October 2002 to July 2004 in accordance with the Government Auditing Standards as prescribed by the Comptroller General of the United States and included tests of internal controls as were considered necessary.

EXHIBIT B. PRIOR AUDIT COVERAGE

We have issued two prior reports on Tren Urbano. In these reports, we identified problems with the project's schedule, cost, and construction quality.

- **OIG Report Number RT-2000-091, "Report on the Finance Plan for the Tren Urbano Rail Transit Project," May 25, 2000.** The OIG reported that (1) the project was experiencing construction quality and schedule problems, (2) Tren Urbano lacked an integrated master schedule, and (3) the project may experience construction delays that could be as much as 2 years beyond the original revenue operation date. We recommended that FTA ensure that PRHTA develops an integrated master schedule for Tren Urbano.
- **OIG Report Number IN-2002-085, "Report on the Tren Urbano Rail Transit Project," March 5, 2002.** The OIG reported that (1) the scheduled completion date of September 2003 was unlikely to be achieved due to the slow progress and interruptions in installing Tren Urbano's track work, (2) the cost to complete Tren Urbano was likely to increase beyond PRHTA's current estimate of \$2.036 billion if the September 2003 completion date was not met, (3) the project's cost increases and schedule delays had adversely affected PRHTA's ability to fund planned transportation improvements, and (4) the long-term safety and operability of the project would remain at risk until PRHTA corrected all construction quality problems.

We recommended that FTA neither amend Tren Urbano's FFGA, nor accept or approve the updated Finance Plan until it is satisfied that PRHTA has: (1) revised the project's master schedule to reflect attainable project milestones, (2) submitted a cost estimate consistent with a supportable project completion date, and (3) established and adhered to a timetable to resolve significant construction quality problems.

EXHIBIT C. PROJECT DESCRIPTION

Tren Urbano is the first electrified rail transit system for Puerto Rico and consists of a 10.7-mile, L-shaped alignment with 16 stations located between the Bayamón and Santurce communities in the municipality of San Juan (see Figure below).

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



This heavy rail system will operate along a fixed guideway that is predominately elevated, with a 1.1-mile (2 km.) tunnel in the Río Piedras district. The system will have a fleet of 74 rail cars and one maintenance and storage facility.

PRHTA officials are using a modified innovative procurement technique, known as the design/build method, to construct the transit stations and six separate sections of the Tren Urbano alignment. The project also includes a Systems and Test Track Turnkey contract, with Siemens, to design and build a seventh alignment section and to provide and operate rail transit cars and all track, traction power, and train control systems. The Systems and Test Track Turnkey contract includes the design and construction of an alignment section with two stations, a maintenance facility, operations control center, and storage yards for the rail cars.

The other six contracts cover the design and construction of the remaining stations and alignment sections. The table below provides a description of each alignment section contract, its estimated cost, and percent of contract dollars expended.

**Table. Cost of Alignment Section Contracts for the Tren Urbano Rail Transit Project as of June 30, 2004
(\$ in millions)**

Alignment Section Contract	Original Contract Award	Forecast at Completion	Alignment Section Length (miles)	Percent of Contract Dollars Expended
Bayamón	\$68.3	\$106.7	1.8	99.99
Río Bayamón	\$36.7	\$52.5	1.1	100.00
Torrimar/Las Lomas Systems and Test Track Turnkey	\$554.2	\$771.9	1.7	97.60
Villa Nevárez	\$71.5	\$106.6	1.2	99.70
Centro Médico	\$71.5	\$108.8	1.6	99.90
Río Piedras	\$225.6	\$317.0	1.1	99.90
Hato Rey	\$117.4	\$226.2	2.2	99.00
Source: Tren Urbano Project Design and Construction Contracts Summary June 30, 2004 and OIG Report Number IN-2002-085, "Report on the Tren Urbano Rail Transit Project," March 5, 2002.				

EXHIBIT D. MAJOR CONTRIBUTORS TO THIS REPORT

THE FOLLOWING INDIVIDUALS CONTRIBUTED TO THIS REPORT.

<u>Name</u>	<u>Title</u>
Debra Ritt	Assistant Inspector General for Surface and Maritime Programs
Kurt Hyde	Deputy Assistant Inspector General for Surface and Maritime Programs
Sarah Batipps	Program Director
Oleg Michalowskij	Senior Auditor
Laurence Burke	Senior Analyst
Rosa Scalice	Auditor
Kenneth Vought	Systems Engineer
Rodolfo Pérez	Engineer Advisor
Betty Krier	Economist

APPENDIX. MANAGEMENT COMMENTS



U.S. Department
of Transportation

Federal Transit
Administration

Administrator

400 Seventh St., S.W.
Washington, D.C. 20590

SEP 28 2001

MEMORANDUM TO THE PRINCIPAL ASSISTANT INSPECTOR GENERAL FOR AUDITING AND EVALUATION

From: *Robert D. Jamison*
Jennifer L. Dorn, Administrator Federal Transit Administration,
X64040

Prepared by: Susan E. Schruth, Associated Administrator for Program Management,
X64077

Re: Final Report on the Tren Urbano Rail Transit Project

Thank you for the opportunity to comment on the OIG Final Report on the Tren Urbano Rail Transit Project in the San Juan, Puerto Rico metropolitan area.

As you know, the Tren Urbano project is an important addition to Puerto Rico's transportation system. It is expected to carry over 110,000 people a day when it opens, and will significantly enhance the mobility of the residents of Puerto Rico. Unfortunately, the project has had a series of quality control and project management problems since the first Full Funding Grant Agreement was awarded in 1996. These problems have resulted in changes to the project scope, increased costs, and significant schedule delays. They also led FTA to withhold Federal funds from the project, and to require the PRHTA to develop a management action plan to address non-conformance reports, systems testing and acceptance criteria, vehicle acceptance, safety certification, hiring and training of staff, the schedule for operations, the resolution of contractual issues, change order documentation, costs, and financing.

FTA continues to invest substantial oversight resources to monitor and protect the Federal investment in this project. FTA's regular oversight has included monthly site visits by the Project Management Oversight Contractor (PMOC); quarterly review meetings with FTA, PMOC and PRHTA staff to discuss issues identified in the monthly PMOC reports; PMOC spot reports; annual Financial Management Oversight Reviews; Procurement System Reviews; and State Management Reviews to ensure that all FTA grant management requirements have been met by PRHTA.

Based on the results of both standard and extraordinary oversight activities, during the last 10 months FTA and its Project Management Oversight Contractor (PMOC) have also taken the following additional steps:

MEMORANDUM TO THE PRINCIPAL ASSISTANT INSPECTOR GENERAL FOR
AUDITING AND EVALUATION continued

1. Brought PRHTA and Siemens together to jointly develop a prioritized plan to address construction and safety issues;
2. Required and arranged for PRHTA to bring in experts from the nation's two largest rail transit systems to conduct peer reviews of two key aspects of the construction, the track-work installation and the automatic train control system;
3. Reexamined specific project elements with regard to eligibility for Federal reimbursement; and
4. Undertaken an examination of PRHTA's billing and expense records to validate that sufficient eligibility for Federal reimbursement remains (excluding any expenses involved in change orders) to permit release of additional FY03 and FY04 funds.

As a condition for the release of the fiscal year 2003 and 2004 New Starts funds, FTA is limiting the use of the funds to the payment of expenses related to the construction management (GMAEC) contract for which PRHTA has not been previously reimbursed. As follow-up to the release of the funds, FTA is requiring the PRHTA to:

1. Provide additional documentation that demonstrates that all Federal funds awarded have been used to appropriately reimburse only eligible project expenses; and
2. Produce the necessary documentation to permit FTA to evaluate the eligibility of each change order for Federal participation. Furthermore, FTA will not award any additional Federal formula or highway flexible funds for this project unless and until an amendment to the Full Funding Grant Agreement is approved and signed by FTA. Further, additional Federal formula or other Federal non-New Starts funds will be awarded only to the extent that FTA determines that PRHTA has provided adequate documentation to demonstrate that the project expenses to which the funds would apply are eligible for Federal reimbursement.

As OIG and FTA have agreed, in our letter announcing the release of \$59 million in New Starts funds, FTA will indicate that it considers PRHTA a high-risk grantee under 49 CFR 18.12. Accordingly, FTA will undertake a review of an amendment application for this project only when the following steps have been successfully accomplished:

1. PRHTA must satisfactorily address any issues that result from FTA's review of PRHTA's August 2004 Project Finance Plan.
2. PRHTA and STT must agree on the disposition of the remaining non-conformance reports (NCRs) and timetable for completing the final closeout of all NCRs, both of which must be acceptable to FTA.
3. PRHTA must update the final project budget and propose an achievable revenue operations date, subject to FTA review and approval.

MEMORANDUM TO THE PRINCIPAL ASSISTANT INSPECTOR GENERAL FOR
AUDITING AND EVALUATION continued

4. PRHTA must provide FTA with updated project documents, including, but not limited to, an updated Bus Fleet Management Plan.

In addition to, and separate from, the requirements outlined above, FTA will not award any additional Federal formula or other Federal non-New Starts funds for this project in the next 90 days. This will permit an assessment by the Defense Contract Audit Agency (DCAA) or an equivalent firm, in consultation with the OIG, to verify the reliability of selected PRHTA's contractors' records to substantiate billing.

During the month of September, FTA discussed and provided comments to OIG on the draft report. FTA generally agreed with the findings and recommendations, and stated that FTA would continue to closely oversee the project. Listed below are the recommendations from the Report and FTA's responses.

Recommendation 1: Ensure all 77 safety-critical requirements are met and the level of performance that justified Federal participation in the project is achieved before approving an FFGA amendment.

FTA Response: Concur-in-part. FTA agrees that resolving the pending safety critical nonconformance reports are essential to the operation of the Tren Urbano system.

As we have consistently conveyed to PRHTA, FTA will not permit the Tren Urbano system to carry any passengers until all safety-related issues are satisfactorily addressed and the safety certification process is satisfactorily completed. Further, FTA is informing PRHTA that, consistent with the terms of the FFGA, the Tren Urbano system must deliver the operational capacity to provide the transportation benefits that justified federal participation in the project.

As OIG and FTA have agreed, FTA will not undertake a review of an amendment to the Full Funding Grant Agreement until PRHTA and STT agree on the disposition of the remaining nonconformance reports and a timetable for completing the final closeout of all NCR's, both of which must be acceptable to FTA.

Milestone: FTA believes that PRHTA and STT should be able identify a realistic completion schedule for the disposition of the remaining nonconformance reports by January 15, 2005.

Recommendation 2: Request PRHTA to provide a full accounting of the payment transactions on the 377 irregular change orders, including the amount of billings submitted to FTA for reimbursement and the amount of Federal reimbursements made. FTA should ensure that only eligible and reasonable billings supported by fair cost estimates have been reimbursed. Where reimbursements were made to PRHTA for ineligible change orders, FTA should ensure the appropriate credits or withholdings are applied.

MEMORANDUM TO THE PRINCIPAL ASSISTANT INSPECTOR GENERAL FOR
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FTA Response: Concur. FTA is requiring the PRHTA to: (1) provide additional documentation that demonstrates that all Federal funds awarded have been used to appropriately reimburse only eligible project expenses; and (2) produce the necessary documentation for each change order to permit FTA to evaluate the eligibility of each change order for Federal participation. FTA will ensure that only eligible, documented expenses are reimbursed.

Milestone: January 15, 2004

Recommendation 3: Not award any additional Federal Highway flex and FTA formula funds for this project unless and until an amendment to the Full Funding Grant Agreement is approved and signed by FTA, and it determines that PRHTA has provided adequate documentation to demonstrate that the project expenses to which the funds would apply are eligible for Federal reimbursement.

FTA Response: Concur. FTA will not award any additional FTA formula funds or other Federal non-New Starts funds for this project unless and until an amendment to the Full Funding Grant Agreement is approved and signed by FTA, and FTA determines that PRHTA has provided adequate documentation to demonstrate that the project expenses to which the funds would apply are eligible for Federal reimbursement. FTA will engage the Defense Contract Audit Agency (DCAA) or equivalent firm, in consultation with the OIG, to conduct an assessment of selected PRHTA contractors' records to substantiate billing.

Milestone: The assessment is expected to be completed within 90 days (December 30, 2004).

Recommendation 4: Not approve PRHTA's FY 2004 Finance Plan until it ensures that the plan appropriately reflects all Tren Urbano capital and operating costs, PRHTA expenditures, and revenue sources. Our review of the FY 2003 Finance Plan identified large overstatements of revenue and understatements of expenses.

FTA Response: Concur. FTA will not approve PRHTA's FY 2004 Finance Plan until the plan appropriately reflects all Tren Urbano capital and operating costs, PRHTA expenditures, and revenue sources. FTA will undertake a review of an application for an amendment of the FFGA only when the PRHTA has satisfactorily addressed any issues that result from FTA's review of PRHTA's August 2004 Project Finance Plan.

Milestone: FTA will review the August 2004 Project Finance Plan and identify any outstanding issues within 60 days (December 1, 2004).

Recommendation 5: Designate PRHTA a "high-risk" grantee based on PRHTA's unsatisfactory management of Tren Urbano, Finance Plan and cash flow deficiencies, and failure to comply with the FFGA requirements to use fair cost

MEMORANDUM TO THE PRINCIPAL ASSISTANT INSPECTOR GENERAL FOR
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estimates. This will ensure that increased oversight is provided the Tren Urbano project. FTA should also set specific conditions on any release of future grants to ensure that PRHTA exercises greater accountability over the Federal funds it receives.

Response: Concur. In the letter to PRHTA announcing the release of fiscal year 2003 and 2004 New Starts funds, will give notice to PRHTA that they are considered a “high-risk” grantee, consistent with 49 CFR 18.12.

Milestone: Notification will be completed by October 1, 2004.

ADDITIONAL COMMENTS

FTA would like to offer the following updated information on the project.

Page 3, under “Safety and Performance...” second paragraph: “From March 2004 to July 2004, the contractor has reworked the 750-volt DC traction power cables.

Page 4, first paragraph and third paragraph: While the results have not yet been accepted by PRHTA, the most recent System Demonstration Testing (SDT), conducted in August 2004, achieved sustained 5-minute headways and even accomplished a 4-minute sustained headway. Under the original FFGA, the “level of performance that justified Federal participation in the project” is appropriately defined as achieving sustained 4-minute headways, as reflected in the FEIS for the project.

Page 8, “RESULTS,” first paragraph: During August 2004, the PRHTA safety-certified 72 of the 74 vehicles, communications, operations control center, elevators, escalators, and fare collection system. The automatic train control, power distribution, traction power, track, SCADA, and signage/graphics systems are not yet safety certified.

Page 8/9: Under “Traction Power and Other Cables Were Unprotected”: Work has been substantially completed on the traction power cables.

Page 11, “Proper headways are not...”: While the results have not yet been accepted by PRHTA, the most recent System Demonstration Testing (SDT), conducted in August 2004, achieved sustained 5-minute headways and even accomplished a 4-minute sustained headway. Under the original FFGA, the “level of performance that justified Federal participation in the project” is appropriately defined as achieving sustained 4-minute headways, as reflected in the FEIS for the project. In addition, the “Before and After” study will document the project’s benefits.

Page 18, under the “PRHTA’s May 2003 Finance Plan...”: The 2004 update of the project Finance Plan was received on August 18, 2004, and is under review by the FMO contractor.

Page 21: First “Recommendations”: As of the end of August 2004, PRHTA has disposed of seven (7) Safety Critical Non-Conformance Reports (NCRs), and 70 safety critical NCRs remain open.

The following pages contain textual versions of the graphs and charts found in the preceding document. These pages were not in the original document but have been added here to accommodate screenreaders and other assistive technology.

Figure 1 Number and Additional Cost of Change Orders Issued Above 15 Percent of Fair Cost Estimates
(\$ in Millions)

Year	1997	1998	1999	2000	2001	2002	2003	2004
Number of Change Orders > 15% of the Fair Cost Estimate	3	3	14	28	42	61	16	0
Additional Cost of Change Orders > 15% of Fair Cost Estimate	\$1,364,502	\$3,826,447	\$1,679,868	\$1,328,186	\$2,303,308	\$4,420,787	\$385,442	\$0