AUDIT REPORT

CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
BUREAU OF FINANCIAL AUDIT
WILLIAM C. THOMPSON, JR., COMPTROLLER

Audit on the Department of Environmental Protection's Oversight of Costs to Construct The Croton Water Treatment Plant

FR09-110A

September 1, 2009

THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
1 CENTRE STREET
NEW YORK, N.Y. 10007-2341

WILLIAM C. THOMPSON, JR.
COMPTROLLER

To the Citizens of the City of New York

Ladies and Gentlemen:

In accordance with the responsibilities of the Comptroller contained in Chapter 5, §93, of the New York City Charter, my office has audited the Department of Environmental Protection's oversight of costs to construct the Croton Water Treatment Plant.

Under a 1998 federal, State, and City Consent Decree, the City is to construct and place into operation a water treatment plant for the Croton system. Accordingly, the Department of Environmental Protection is constructing the Croton Water Treatment Plant, which the Decree requires be completed by October 2011. We audit City programs such as this as a means of ensuring that agencies are accountable for public funds and use them effectively, efficiently, and as intended.

The results of our audit, which are presented in this report, have been discussed with officials of the Department of Environmental Protection, and their comments have been considered in preparing this report. Their complete written response is attached to this report.

I trust that this report contains information that is of interest to you. If you have any questions concerning this report, please e-mail my audit bureau at audit@Comptroller.nyc.gov or telephone my office at 212-669-3747.

Very truly yours,

William C. Thompson

William C. Thompson, Jr.

WCT/fh

Report: **FR09-110A**
Filed: **September 1, 2009**

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Bureau of Financial Audit

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FR09-110A

AUDIT REPORT IN BRIEF

We performed an audit of the Department of Environmental Protection's (Department's) oversight of costs to construct the Croton Water Treatment Plant (Plant). The purpose of the Plant is to filter drinking water from the City's Croton water system in order to comply with a 1998 Consent Decree with the federal government and New York State. The Consent Decree was executed because the federal government had alleged that the City had failed to safeguard the quality of Croton water, thus violating the Safe Drinking Water Act, the Surface Water Treatment Rule, and the National Primary Drinking Water Regulation.

After legal disputes prompted the Department to investigate alternative sites for the Plant, the original 2007 completion date was extended to October 31, 2011, through supplements to the Consent Decree issued in 2002 and 2005. The Department's engineering consultant (a joint venture between Metcalf & Eddy and Hazen and Sawyer) was responsible for preparing designs and cost estimates for the Plant's construction. In an August 2003 "Enhanced Conceptual Design Report," the joint venture estimated the cost of construction as $992 million, a figure that was reported in the Department's 2004 Final Supplemental Environmental Impact Statement for the Plant's construction. As of February 2009, the Department had awarded construction contracts totaling $2.13 billion.

Audit Findings and Conclusions

The Department has generally administered the construction of the Croton water treatment plant effectively to ensure that actual costs are substantiated, reasonable, and necessary. While we identified some problems in maintaining records for substantiating voucher payments, our review indicated that the Department has appropriate processes and internal controls for reviewing and approving payments to contractors.

However, we note that the actual cost to construct the Plant is much higher than was estimated by the Department when it reported in 2003 that the cost would be $992 million. The actual cost of the contracts awarded by the Department by February 2009 totaled $2.13 billion—$1.14 billion higher than estimated. Had the conceptual cost estimate complied with engineering standards for accuracy, the actual cost of construction would not have been expected to exceed $1.29 billion. Accordingly, we concluded that the conceptual cost estimate was unreliable and could not be used as a gauge of the actual costs that would be incurred by the Department to construct the Plant.

Audit Recommendations

This report makes a total of six recommendations. The major recommendations are that the Department should:

- Prepare written procedures for auditing payment vouchers in accordance with Comptroller's Directive No. 7.
- Ensure that engineering audit office files contain appropriate evidence to show that substantiating documentation was reviewed.
- Ensure that conceptual cost estimates adhere to estimating guidelines in the Department's "Cost Estimating Manual."
- Develop conceptual cost estimates that contain sufficient substantiating information.
- Adjust cost estimates to include the anticipated effects of inflation in labor, equipment, and material costs.
- Adequately oversee the work of consultants preparing cost estimates, and review documentation used in their development.

INTRODUCTION

Background

The Department of Environmental Protection (Department) is responsible for the daily delivery of approximately 1.1 billion gallons of drinking water to both New York City and State consumers. While most of the water comes from the City's Catskill and Delaware supply systems, 10 percent is supplied by the Croton system. Croton, the City's oldest system, was placed in service in 1842 and comprises 12 collecting reservoirs from which water is conveyed by gravity flow to the City through a network of aqueducts and tunnels.

The federal Safe Drinking Water Act was promulgated in 1974 to protect public health by regulating the nation's public drinking water supply. The law (amended in 1986 and 1996) requires municipalities to undertake various measures to protect drinking water and its sources. In accordance with the Safe Drinking Water Act, the federal Environmental Protection Agency issued the Surface Water Treatment Rule in 1989. That rule required the City's water supply systems to be either filtered or protected by other means to comply with drinking water standards.[1]

The City avoided filtration of water from the Catskill and Delaware systems by implementing a watershed protection program that was approved by the Environmental Protection Agency and New York State. But extensive population growth and commercial and industrial development precluded undertaking the same type of watershed protection program for the Croton system. Therefore, while the Croton system has provided high quality water for many years, it has not consistently fulfilled all Safe Drinking Water Act requirements and was taken out of service during the summer and fall months of 1992, 1993, 1994, and 1998 because of water quality problems. In addition, the Croton system was shut down for most of 2000-2001 because contaminants leaked into the New Croton Aqueduct.

In 1997, the federal government alleged that the City had failed to safeguard the quality of Croton water, thus violating the Safe Drinking Water Act, the Surface Water Treatment Rule, and the National Primary Drinking Water Regulation.[2] As a result, the federal government and New York State executed a Consent Decree with the City in 1998 in which the City agreed to construct and place into operation a water treatment plant for the Croton system by 2007. After legal disputes prompted the Department to investigate alternative sites for the Plant, the completion date was extended to October 31, 2011 through supplements to the Consent Decree issued in 2002 and 2005.

[1] Since passage of the Safe Drinking Water Act, federal water quality standards have become even more stringent. The Environmental Protection Agency's 1998 Enhanced Surface Water Treatment Rule increased required protection from microorganisms and lowered turbidity standards, and required that reservoirs of treated water be covered. Another regulation, the National Primary Drinking Water Regulation, provides standards for allowable contaminant levels in drinking water.

[2] Additionally, New York State alleged that the City's failure to treat Croton water was a violation of the State Sanitary Code.

The Department's Bureau of Engineering Design and Construction—which is responsible for managing the planning, design and construction of all major capital projects for the Department—is responsible for the overall administration of the Plant's design and construction. The Bureau's Office of Upstate Water Supply Treatment and Facilities Design is responsible for overseeing the Plant's design, which was carried out by a joint venture between the engineering firms Metcalf & Eddy and Hazen and Sawyer. The joint venture was responsible for preparing designs and cost estimates for the Plant's construction. In an August 2003 "Enhanced Conceptual Design Report" the joint venture estimated the cost of construction as $992 million, a figure that was reported in the Department's 2004 Final Supplemental Environmental Impact Statement for the Plant's construction. As of February 2009, the Department had awarded construction contracts totaling $2.13 billion. (See Appendix.)

The Bureau's Office of Facilities Construction North is responsible for overseeing construction management, which is being carried out by a joint venture between URS and Malcolm Pirnie. The Department's Contract Management Division is responsible for soliciting and awarding all design, construction, and construction management contracts.

The Croton water treatment plant is being constructed 80 feet under a portion of Van Cortlandt Park at the Mosholu Golf Course in the Bronx and is designed to treat up to 290 million gallons of raw (i.e., untreated) water from the City's New Croton Aqueduct daily by a process known as stacked DAFF (dissolved air flotation/filtration), a process that clarifies water by removing suspended matter such as oil or solids. Treated water will flow from the Plant through a water conveyance tunnel to the City's existing distribution facilities.

Objectives

The objective of this audit was to determine whether the Department of Environmental Protection has effectively administered the construction of the Croton w to ensure that costs were substantiated, reasonable, and necessary.

An associated audit (#FR08-121A) evaluated whether the Department of Environmental Protection effectively carried out the mandate in the Consent Decree to construct the Croton water treatment plant, and complete the plant on schedule.

Scope and Methodology

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. This audit was performed in accordance with the audit responsibilities of the City Comptroller as set forth in Chapter 5, §93, of the New York City Charter. This audit was conducted by staff that included auditors who are engineers.

The scope of this audit covered calendar years 2003 to 2009. (Field work for this audit was completed on February 10, 2009.)

We interviewed officials from the Department's Bureau of Engineering Design and Construction, Engineering Audit Office, and Contract Management Division about departmental internal controls. In addition, we interviewed design consulting engineers from Hazen and Sawyer/Metcalf & Eddy and construction managers from URS/Malcolm Pirnie. We conducted walkthroughs of the methods by which contracts were procured, schedules developed, materials and equipment purchased, invoices approved, payments processed, and design and construction problems handled. We documented our understanding of these controls in written descriptions.

We reviewed the following reports and cost estimates prepared by the joint venture between Metcalf & Eddy and Hazen and Sawyer and sub-consultants John Cullina, and V.J. Associates:

- Final Supplemental Environmental Impact Statement for the Croton Water Treatment Plant (June 2004)
- Mosholu Site:
  - Preliminary Design Report (May 2000)
  - Conceptual Cost Estimate (May 2000)
  - Enhanced Conceptual Design Report (August 2003)
  - Cost estimates for Plant construction contracts prepared at 90 percent design stage, pre-bid stage, and final design stage (July 2005 to June 2008)
  - Estimate for Residual Force Main to Hunts Point (October 2008)
- Eastview Site, Conceptual Cost Estimate (February 2002)
- Harlem River Site, Conceptual Cost Estimate (April 2002)

To determine whether incurred costs were adequately substantiated and reasonable, we reviewed the process by which the Department's engineering audit office oversees the review and approval of contractor payment requisitions. We selected for our review, two samples of payment requisitions that had been approved by the engineering audit office. The first sample consisted of all 37 payment vouchers totaling $108,950,088 that were submitted to the engineering audit office by the close of our field work on February 10, 2009, for work under site preparation contract no. CRO-311. We chose to review the vouchers for this contract because work was substantially completed by the time we commenced our audit.

The second sample consisted of four voucher payments totaling $29,924,038 for contract nos. CRO-312-G, E, H, and P, under which current work is proceeding. We selected these vouchers as a judgmental sample because they represented the most recent payments approved in calendar year 2008.[3] We obtained the sampled voucher files and reviewed the contents for

[3] The sampled vouchers were payment #7 for contract no. CRO-312E-2 approved on December 26, 2008, payment #20 for contract no. CRO-312G approved on December 4, 2008, payment #14 for contract no. CRO-312H approved on December 10, 2008, and payment #6 for contract no. CRO-312P approved on November 6, 2008.

adequate documentation to substantiate the engineering audit office's approval of the payments, and evidence of the steps that the engineering auditors carried out to approve the payments.

In addition, we conducted site visits between September 15, 2008, and September 19, 2008, to observe the work and to test the validity of the Department's daily inspection reports by ascertaining whether the quantities of observed work (i.e., concrete and steel reinforcement) was consistent with that noted in the reports. (The inspection reports are maintained at the project site and represent the source documents that affirm the type and quantity of construction work completed on a given day.) Furthermore, we reviewed payment requisitions for the observed work to determine whether the quantity of completed work noted in the requisitions was consistent with the amount of actual work completed and reported in the daily inspection reports.

We also reviewed contractor payment logs, change orders, certified payroll registers, time sheets, bidding documents and specifications, and other file documentation submitted by contractors and consultants.

To determine whether estimates of the Plant's construction cost were adequately substantiated, we obtained and reviewed all project estimates and associated documentation, and ascertained whether the estimates were based on established work scopes and contained key elements such as contingency markup, overhead and profit markups, and escalation factors.

We analyzed the $992 million conceptual cost estimate of the Plant's construction that was reported in the Final Supplemental Environmental Impact Statement, and compared the estimate to the actual amounts of the contracts that were awarded for the Plant's construction. (See Appendix.) We compared the conceptual cost estimate with the actual contract amounts to identify and ascertain the reasons for the differential in costs. We also examined the conceptual estimate to ascertain its reasonableness in relation to engineering cost standards. Furthermore, we assessed the current status of the Plant's construction and its projected completion date to ascertain their impact on the cost of the project.

For our analysis of the conceptual cost estimate, we used a construction industry standard (R.S. Means Building Construction Cost Data), and checked labor rates for compliance with the New York City Comptroller's Prevailing Wage Schedule. In addition, we checked key computations in the estimates to ascertain their accuracy. We used construction industry standards (Engineering News-Record Construction Cost Index and the Handy-Whitman Index of Public Utility Construction Costs) to independently verify whether the cost estimates were based on established escalation rates.

Due to the size and complexity of the project, the Department and the New York City Department of Investigation agreed to retain an investigative consultant (Thacher Associates) to ensure the continued integrity of the project. We met with officials of these organizations to ascertain their roles and procedures for investigating and monitoring allegations of potential fraud, waste and corruption relating to Plant construction.

Discussion of Audit Results

The matters covered in this report were discussed with Department officials during and at the conclusion of this audit. A preliminary draft report was sent to Department officials on July 14, 2009, and was discussed at an exit conference on July 23, 2009. On August 5, 2009, we submitted a draft report to Department officials with a request for comments. We received a written response from the Department on August 19, 2009.

In its response, the Department stated that "We are pleased to see that your office found this Department to have "administered the construction of the Croton water treatment plant effectively to ensure that actual costs are substantiated, reasonable, and necessary." However, the Department disputed our findings that the conceptual cost estimate was unreliable and should not have been purported to be a reasonable projection of the Plant's final costs. In addition, the Department challenged our findings about the amount of the increase in construction costs attributable to inflation, and maintained that, once escalated, the conceptual cost was within 20 percent of the actual bid prices. Furthermore, the Department disagreed that certain cost items should have been anticipated.

Nevertheless, despite its disagreement with our findings, the Department agreed with all six recommendations of the audit report.

The full text of the Department's response is included as an addendum to this report.

FINDINGS AND RECOMMENDATIONS

The Department has generally administered the construction of the Croton water treatment plant effectively to ensure that actual costs are substantiated, reasonable, and necessary. While we identified some problems in maintaining records for substantiating voucher payments, our review indicated that the Department has appropriate processes and internal controls for reviewing and approving payments to contractors.

However, we note that the actual cost to construct the Plant is much higher than was estimated by the Department when it reported in 2003 that the cost would be $992 million. The actual cost of the contracts awarded by the Department by February 2009 totaled $2.13 billion—$1.14 billion higher than estimated. Had the conceptual cost estimate complied with engineering standards for accuracy, the actual cost of construction would not have been expected to exceed $1.29 billion. Accordingly, we concluded that the conceptual cost estimate was unreliable and could not be used as a gauge of the actual costs that would be incurred by the Department to construct the Plant.

> ***Department Response:*** "The conceptual design reports for the project, where the conceptual cost estimates were discussed, specifically state that the costs are not escalated and are in constant 2003 dollars, which is also a common practice in environmental impact statements that compare alternatives without having their associated cost differences distorted by applying many years of estimated inflation. . . . When the conceptual costs are escalated at an appropriate rate, which we believe is a minimum of 8.5%, the conceptual costs are within 20% of the bids. Indeed, data which we presented to the Comptroller in January 2008 showed that many heavy construction programs across the country were experiencing annual inflation rates of 10% to 15% during the three-year period between the publication of the conceptual estimates and the receipt of bids for the filtration plant."
>
> ***Auditor Comment:*** The Department has obfuscated its failure to escalate the conceptual estimate by contending that it is not "common practice" to do so in environmental impact statements. In fact, escalating cost estimates is a required practice under a directive that was promulgated by the Department in 1994.
>
> In contrast to the generic "data" provided by the Department, we established an appropriate escalation rate based on leading industry standards. The Engineering News-Record Construction Cost Index for New York City is one standard that is sometimes used by the New York City Comptroller's office in adjudicating heavy construction cost claims submitted by construction contractors. Another index that is applicable to water treatment plant construction—the Handy-Whitman Index of Public Utility Construction Costs for North Atlantic Region—was described by the Department as appropriate for ascertaining escalation rates. Both of these indices yielded escalation rates of 5.04 percent and 5.73 percent respectively, well below the escalation rate that the Department contends should have been 8.5 percent.

Accordingly, our analysis indicates that the awarded construction contract costs are 58 percent higher than the escalated conceptual costs—almost three times higher than the 20 percent that the Department contends.

The conceptual cost estimate was deficient partly because it omitted the cost of inflation, a key element in ensuring the estimate's accuracy. Furthermore, the estimate lacked sufficient documentation to substantiate its accuracy and completeness. These problems were exacerbated because the Department did not take adequate steps to ensure that the conceptual cost estimate complied with appropriate standards.

These matters are discussed in greater detail below.

Problems with Reviewing Voucher Payments

Our review of the files for 37 voucher payments totaling $108,950,088 for site preparation under contract no. CRO-311 indicated that 21 (57%) totaling $66,179,586 lacked certain documentation or adequate evidence of engineering audit office review as required by Comptroller Directive No. 7. In contrast, the files of four voucher payments totaling $29,924,038 for Plant construction contract nos. CRO-312-G, E, H, and P contained adequate evidence of review.

The lacking documentation included daily inspection reports, photographs, contractor invoices, and daily work logs. There was no indication of the whereabouts of the documentation or whether it had been reviewed by engineering audit office staff. We acquired the missing documentation at the Department's field office at the Plant location. While we verified that the documentation substantiated the sampled voucher payments, information in engineering audit office files should provide sufficient evidence that payment requests were properly reviewed and substantiated before funds are paid to the contractor.

Comptroller's Directive No. 7, §3.1.1, states that "The EAO [engineering audit office] must follow appropriate audit procedures to ensure that the payment requests are justified." Directive §5.2 requires that "After completion of the audit, the EAO must retain all notes, documents, reports and recommendations." Retention of substantiating documentation by the engineering audit office is important in order to certify to the public the authenticity of payments and to dispel attempts by contractors to submit future monetary claims. In part, we attribute the lack of adequate file documentation and adequate evidence of review to the engineering audit office's lack of written procedures that comply with Directive No. 7. Written procedures are vital to ensure that voucher payments are reviewed consistently and that appropriate documentation is maintained in the files.

Recommendations

The Department should:

1. Prepare written procedures for auditing payment vouchers in accordance with Comptroller's Directive No. 7.

Department Response: "Agree – A written procedure is being prepared to audit payment vouchers in accordance with Comptroller's Directive No. 7."

2. Ensure that engineering audit office files contain appropriate evidence to show that substantiating documentation was reviewed. In that regard, all key documentation used to substantiate voucher payments should be maintained in engineering audit office files.

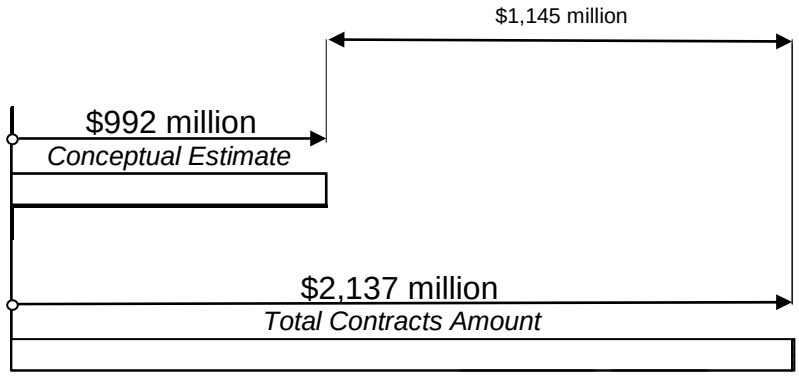
   Department Response: "Agree – The DEP EAO will ensure that engineering audit office files contain appropriate evidence to show that substantiating documentation was reviewed. EAO auditors are being instructed to complete their audits in a uniform manner to more clearly convey the completeness of the audit and their agreement with the requested payment."

Other Issue

Unreliable Conceptual Cost Estimate

According to the Department's August 2003 "Enhanced Conceptual Design Report" and 2004 "Final Environmental Impact Statement," the cost to construct the Plant was estimated to be $992,462,918.[4] In contrast, the total amount of the contracts that have been awarded by the Department to construct the Plant as of February 2009 was $2,137,045,745—$1,144,582,827 higher than estimated. (See Figure 1 below.)

Figure 1
Comparison of Estimated and Actual Construction Costs



Our review indicated that the 2003 conceptual cost estimate was based on a design that was only 30 percent complete. The Bureau of Engineering Design and Construction's "Cost Estimating Manual" contains the "Association for the Advancement of Cost Engineering" standard no. 18R-97, which provides "generally accepted cost engineering practices" for

[4] This figure was rounded to $992 million in the Enhanced Conceptual Design Report and Final Environmental Impact Statement.

estimating construction costs for process facilities at different stages of completion.[5] (Process facilities, such as the Plant, are those that "center on mechanical and chemical process equipment, and they have significant amount of piping, instrumentation, and process controls involved.") According to standard no. 18R-97, for conceptual estimates for which designs are 10 to 40 percent complete, actual costs would be expected to range between 20 percent lower and 30 percent higher than estimated. In other words, the actual cost of the Plant could have totaled as low as $793,970,334 or as high as $1,290,201,793. However, the actual cost—which increased 115 percent above the estimated cost—far exceeded the expected high range of estimating accuracy. In this regard, the Department's consultant that prepared the estimate (i.e., Metcalf & Eddy and Hazen and Sawyer) was particularly remiss by not disclosing that the $992 million estimate was subject to wide variations in its cost.

After the exit conference, the Department stated that "the conceptual designs were at most 10% complete." But if the designs upon which the cost estimate was based were, in fact, only 10 percent complete, the Department should not have led the public to believe that the $992 million estimate was a reasonable projection of what the Plant's final costs could be.

> ***Department Response:*** "The conceptual design reports presenting the $992 million along with the statement that the costs were in constant 2003 dollars and were not escalated were made available to the public. It is unreasonable to expect that the final bid prices, submitted three years after the conceptual cost estimates were published and covering a project with a four-year construction duration, would not be higher than the unescalated estimate. As discussed above, when the conceptual cost estimate is escalated at a proper rate, it compares favorably with the bid prices."
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> ***Auditor Comment:*** We disagree with the Department's contention that the escalated conceptual cost estimate compares favorably with the bid prices. As noted in Table 1 on page 16 of this report, the amount of the actual contracts exceeded the highest range of the conceptual estimate's accuracy by $214,512,612. This is particularly intolerable since our analysis of the $992 million conceptual cost estimate indicated that it included $229 million to account for design contingencies.

Our review identified various flaws with the conceptual cost estimate. Specifically, we noted that the estimate was not based on appropriate design drawings, lacked documentation to substantiate the cost of design revisions, tunnel work, and off-site facilities, and contained calculation errors.[6] Furthermore, the conceptual estimate was unreliable because it was not adjusted to include the anticipated effects of inflation in labor, equipment, and material costs that would have been expected to beset a project of such a lengthy duration.

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[5] Standard no. 18R-97 was promulgated in 1997 and incorporated in the Department's 2008 cost estimating manual.

[6] For example, we identified an error in the manner by which the estimate's overhead, profit, and contingency factors were calculated, whose effect was to reduce the amount of the $992 million estimate by $39 million. Consequently, the amount of the cost estimate should actually have been reported as $953 million instead of $992 million.

Contract No. HED-543 (change order no. X-5) between the Department and the joint venture of Metcalf & Eddy and Hazen and Sawyer states: "Prepare detailed estimates for the cost of construction of a treatment plant and related facilities based on the conceptual designs of the selected process at each of the alternative sites." Despite this requirement, the estimate for the Plant's construction cost was much too low to be a reliable gauge upon which to budget and appropriate funds for the work. Accurately estimating the cost of the Plant was particularly important, given that the cost of the work was a factor in the Final Environmental Impact Statement's evaluation of three alternative sites in which to situate the Plant (i.e., Mosholu, Harlem River, and Eastview).

Conceptual Estimate Not Escalated

The conceptual estimate was not escalated to cover the cost of anticipated inflation in labor, equipment, and material.[7] A June 3, 1994 cost estimating memorandum from the Department's Director of Environmental Engineering directed that construction cost estimates be escalated to the midpoint of construction, and that escalation rates be consistent with those recommended by the City's Office of Management and Budget (OMB). (Department officials informed us that OMB determined that the average annual rate to escalate the cost of the Plant to the midpoint of construction should have been 3 percent.) However, the conceptual cost estimate lacked any provision for escalation.

We performed independent calculations that indicated the increase in construction costs from 2003 to 2008 that were attributable to inflation ranged from $310,802,418 to $359,190,840.

Department Response: "At the audit exit conference the Department presented information, which had been previously provided to the Comptroller's Office and the Independent Budget Office, indicating escalation rates of 8.5% to 10% and higher (rather that the 5.04% to 5.73% escalation rate used by the auditors) would be more consistent with costs project owners were subject to at the time the main and most costly WTP contracts (CRO 312G, H, E1, E2, P and CRO 313) were bid. Factors not captured by indices, as detailed in the next paragraph, led to higher construction escalation rates during the time the main WTP contracts were bid.

"The Department's presentation is based on indices specific to this industry and other heavy construction sectors. The information driving these indices was nationwide or from outside of the New York metropolitan area. Costs in New York are generally higher than elsewhere. If the rate of escalation in the water industry was 9% nationwide as the Handy-Whitman Index showed, it was almost certainly higher in New York City. Prior to bidding on the CRO 312G, H, P, E1 & E2 contracts, the Department initiated a review of costs of the Croton WTP. That review, in which the design joint venture participated, determined 8.5% to be a proper escalation rate."

[7] According to federal Department of Energy Directive DOE G 430.1-1, "Most cost estimating is done in 'current' dollars and then escalated to the time when the project will be accomplished. . . . Since the duration of larger projects extends over several years, it is necessary to have a method of forecasting or predicting the funds that must be made available in the future to pay for the work."

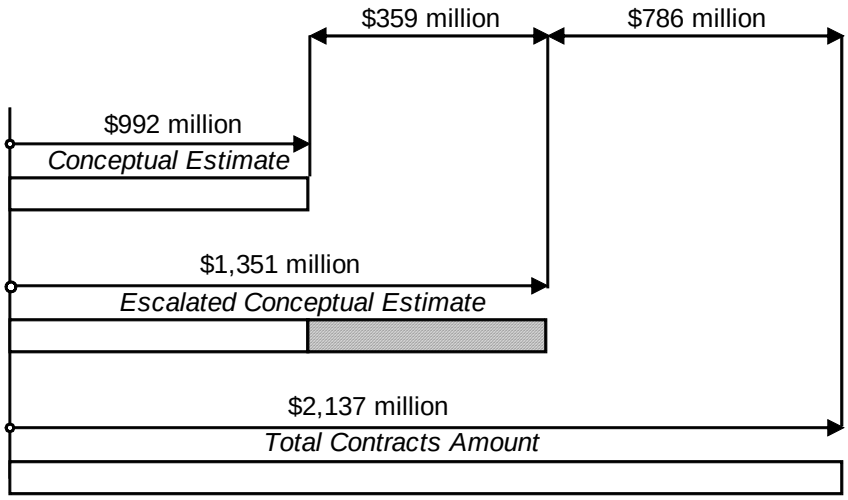
Auditor Comment: Notwithstanding our disagreement with the Department about the amount of escalation, the conceptual cost estimate did not include any provision for escalating the projected cost of the Plant's construction. Accordingly, the conceptual cost estimate was unreliable and should not have been used as a gauge of the actual costs that would be incurred by the Department to construct the Plant.

Department Response: "The draft audit report states that labor costs represent 68% of overall costs. If this is correct, it further justifies the use of a higher escalation rate than was used in the draft audit report. The shortage of construction labor in the metropolitan area due to the other public works projects as well as privately funded construction required contractors to pay premiums over negotiated labor contracts to obtain the proper level of workers for the project. This would not appear in an ENR index that is based on labor contracts, but it would be evident from contact with construction contractors, industry associations, and labor union representatives. Information the Department obtained from discussions with these groups was used in arriving at the 8.5% escalation rate. When these factors are taken into consideration we believe they support the Department's position that actual construction costs were higher than anticipated because of factors not apparent in general indices."

Auditor Comment: The Department asserted at the exit conference that the predominant cost of construction was for materials rather than for labor, as our review of the approved detailed estimates and bid breakdowns submitted by the Department's contractors ascertained. In any case, our analysis of the New York City Comptroller's prevailing wage schedules for New York City shows that construction labor wages increased approximately 4.7 percent annually from 2003 to 2007, an analysis that further supports our determination that the escalation rate was between 5.04 percent and 5.73 percent. The Department did not provide any substantive evidence to support its claim that the higher escalation rate was a result of information obtained from "contact" with construction contractors, industry associations, and labor union representatives.

Our calculations were based on the Engineering News-Record Construction Cost Index for New York City, which indicated that the average escalation rate was 5.04 percent, and the Handy-Whitman Index of Public Utility Construction Costs, which indicated that the average escalation rate was 5.73 percent. Accordingly, if escalation costs had been included, the conceptual estimate would have been as high as $1,351,653,758 instead of $992,462,918. Nevertheless, even after adjusting the conceptual estimate to account for inflation, the estimate is still $785,391,987 less than the amount of the awarded contracts. (See Figure 2 on page 14.)

Figure 2
Comparison of Escalated Conceptual Cost Estimate and
Actual Amount of Awarded Contracts



After we commenced the audit, the Department acknowledged that the conceptual estimate lacked any provision for escalation. The Department contended that the increase in construction costs from 2003 to 2008 that were attributable to escalation was $569,147,514—$209,956,674 more than we calculated. The Department asserted that the reason for this difference was that the annual escalation rate between 2003 and 2008 was 8.5 percent—rather than an average rate of up to 5.73 percent as we ascertained. Specifically, Department officials attributed the high rate of escalation to significant increases in the cost of materials—rather than in the cost of labor—used in the Plant's construction.[8] While our review indicated that material cost increases were indeed significant, we determined that labor costs dominated the overall cost of construction. Thus, our analysis of file documentation indicated that the cost of labor for the Plant's construction represented 68 percent of the overall cost, while material costs represented only 32 percent. Accordingly, we contend that the actual escalation rate was between 5.04 and 5.73 percent rather than 8.5 percent as the Department believed.

> ***Department Response:*** "As indicated above, DEP made a presentation to the Comptroller in January 2008, long before the Comptroller commenced the audit. The presentation contained at least seven slides that stated that the conceptual estimates in the environmental impact statement were in constant 2003 dollars."

[8] We note that the figures that the Department ascribed to material price increases in a January 4, 2008 presentation to the Comptroller's Office entitled "Croton Filtration Plant Program Costs" were inconsistent. Thus, the percentage by which the price of concrete increased was reported to be both 33 percent and 26 percent. For carbon steel and reinforcing, the amount of the percentage increase was reported to be 48 percent and 72 percent (for steel mill products).

Auditor Comment: Clearly, the Department did not escalate the 2003 conceptual cost estimate to provide to the public a more accurate assessment of likely construction costs. Thus, we note again that the conceptual cost estimate was unreliable and could not be used as a gauge of the actual costs that would be incurred by the Department to construct the Plant.

Unanticipated Cost Items

The Department contended, and our review acknowledged, that the awarded construction contracts included cost items that were not anticipated in the 2003 conceptual estimate. These items included $72,440,500 for incentive payments, commodity price adjustments, and contingency allowances. Incentive payments may be granted to a contractor in the event that work is successfully completed before a contract's stipulated time completion. Commodity price increases are intended to compensate a contractor according to an established cost index if the price of a particular commodity rises. Contingency allowances are intended to provide for work items that cannot be anticipated until construction is underway (e.g., encountering hidden utilities, underground water, etc.). Although these items were not included in the 2003 conceptual cost estimate, we contend that the Department and its consultant should have anticipated that these items would have been required in a construction project as significant as the Plant.

Department Response: "As stated in the draft audit report, incentive payments, commodity indexing and contingency allowances were not included in 2003 cost estimates. With the exception of incentive payments, these factors had not been included on any previous projects. In the past, the NYC Comptroller's Office has not allowed contingency allowances in most Department construction contracts."

Auditor Comment: Our review acknowledged that the awarded construction contracts included cost items that were not anticipated in the 2003 conceptual estimate. Accordingly, we excluded these items from our audit analysis. However, costs for unanticipated items such as contingencies, which are common factors in most large construction projects, should have been anticipated in the Department's cost estimate that was developed years before the actual contracts were awarded.

We also acknowledge that a problem in awarding a contract (no. CRO-312G) for the Plant's phase-one construction resulted in an additional cost that could not have been anticipated in the conceptual cost estimate. The Department attained only two bids for contract no. CRO-312-G. The apparent low vendor, a joint venture between Perini Corporation, Tutor-Saliba Corporation, and O&G Industries, submitted a $1.127 billion bid, but ultimately withdrew its bid.[9] Consequently, the Department awarded the contract to the second vendor, a joint venture between Slattery Skanska and Gottlieb, which submitted a $1.327 billion bid. The additional $200,700,000 cost could not have been anticipated in the original cost estimate.

[9] Department officials stated in an October 6, 2008 e-mail that "the City and the Perini Joint Venture could not agree on the set of business conditions governing the proposed contract, and the Perini Joint Venture withdrew its bid."

The amount of the unanticipated cost items discussed above totaled $273,140,500. However, even after reducing the cost of the current contracts to account for the unanticipated items and the previously discussed amount for escalation, the amount of the actual contracts still exceeded the highest range of the conceptual estimate's accuracy by $214,512,612. (See Table 1 below.) Therefore, as previously discussed, the conceptual cost estimate was unreliable.

Table 1
Variance Between Adjusted Contract Amount
and Estimating High Range

Actual Contract Amount	**$2,137,045,745**
Less Unanticipated Items	$273,140,500
Less Maximum Escalation Factor	$359,190,840
Adjusted Contract Amount =	**$1,504,714,405**
Estimating High Range	**$1,290,201,793**
Variance Between Adjusted Contract Amount and Estimating High Range	**$214,512,612**

The Department also contended that actual construction costs were higher than anticipated because of other factors that we could not substantiate. These included fewer competitive bids because of a large number of competing public works projects in the New York City area (i.e., 2nd Avenue Subway, World Trade Center Reconstruction, Mets' and Yankee stadiums), the consolidation of large construction companies, and "extraordinary" labor costs. The Department did not provide any estimates for the costs associated with these factors or evidence to substantiate the Department's contention that these factors affected the actual costs of construction. In fact, our review of file documentation found that the Department obtained at least three or more competitive bids for 9 of the 12 construction contracts, a figure that would belie the Department's contention about limited bidding.[10]

> ***Department Response:*** "The three contracts that received only two bids each represented almost 70% of the total project bid prices. The bid for the largest awarded contract by far, CRO 312G, was $1.327 billion, or 62% of all contracts; there were only two bids for this contract. In addition, the other two contracts with only two bids were CRO 312H at $105,700,000 and CRO 312P at $58,475,000. The fact that there were more bidders for the other project contracts does not belie the Department's contention about limited bidding."

[10] For the Plant's phase-one construction contract no. CRO-312G for which the Department obtained two bids, we acknowledged on page 12 that the Department could not have anticipated expending an additional $200,700,000 as a consequence of awarding the contract to the second lowest bidder.

Auditor Comment: The Department did not provide any substantive evidence about the actual effect on bid prices that might have resulted from the number of bidders that responded to the Plant's solicitations for construction contracts. As previously discussed, had the conceptual estimate been accurate, the actual cost of construction could have been as high as $1,290,201,793—30 percent higher than the $992,462,918 conceptual cost estimate. Since this figure represents the cost for unanticipated factors such as those suggested by the Department (e.g., fewer competitive bids because of a large number of competing public works projects, the consolidation of large construction companies, and "extraordinary" labor costs), we contend that the Department's fears about limited bidding were already accounted for in our analysis.

Recommendations

The Department should:

3. Ensure that conceptual cost estimates adhere to estimating guidelines in the Department's "Cost Estimating Manual." In that regard, estimates should disclose any variations in their range of estimating accuracy.

   Department Response: "Agree – We previously recognized the need to address cost estimating on our numerous capital projects. Our Bureau of Engineering Design and Construction (BEDC) formed a new Cost Estimating Division in April 2007. The group currently has three full-time staff and an additional staff member is currently in the process of being hired. A key task of the estimating group is to ensure the use of the new Cost Estimating Manual, released in August 2008, in the development of engineer's estimates. The estimating framework described in the Manual is largely based on the Association for the Advancement of Cost Engineering (AACE) practices adapted and expanded to the specific needs and characteristics of DEP's water and wastewater capital program. Training sessions with both in-house staff and consultants on implementation of the manual were conducted in the Fall of 2008 and implementation of all requirements within the manual was mandated as of February 1, 2009.

   "The primary functions of the BEDC Cost Estimating Division include:

   - Review Consultant estimates at all phases of the project life cycle
   - Participate in estimate meetings with project team
   - Ensure full compliance with estimating manual
   - Develop preliminary (Class V) estimates at project initiation
   - Develop independent estimates for in-house projects.

   "To further support the quality of our estimating functions, BEDC hosts an annual Cost Estimating Symposium where an array of regional stakeholders (engineers, contractors, city agencies, etc.) share information on current market conditions as they affect cost estimating in the New York City municipal market. The symposium includes an open discussion forum and presentations are distributed to all participants.

These symposiums have been an excellent communication tool for disseminating critical information to improve the accuracy of our estimates."

4. Develop conceptual cost estimates that contain sufficient substantiating information.

   Department Response: "Agree – Please see the response to Recommendation 3, above."

5. Adjust cost estimates to include the anticipated effects of inflation in labor, equipment, and material costs. In that regard, the Department should ensure that escalation is adjusted to the mid-point of construction. Escalation rates should be consistent with those recommended by the City's Office of Management and Budget and with other applicable sources.

   Department Response: "Agree – Please see the response to Recommendation 3, above."

The Department Did Not Effectively Monitor The Preparation of Cost Estimates

The Department did not have an adequate management system in place to effectively monitor whether the Plant's cost estimate was appropriate and complied with estimating standards. An effective management system would include:

- Ensuring that cost estimates were based on appropriate design drawings,
- Reviewing estimates for appropriate escalation factors,
- Ensuring that cost estimates are prepared in a consistent format and include all substantiating documentation,
- Acquiring updated cost estimates at key phases of design,
- Implementing written procedures for reviewing and approving cost estimates.

However, interviews with Department staff and consultants and a review of records indicate that the Department took none of these steps to ensure that cost estimates were completed in accordance with appropriate standards. As a result, as previously discussed, the Plant's cost estimate was woefully underestimated.

Recommendation

6. The Department should adequately oversee the work of consultants preparing cost estimates, and review documentation used in their development. In that regard, the Department should:

- ensure that cost estimates are based on appropriate design drawings,
- review estimates for appropriate escalation factors,
- ensure that cost estimates are prepared in a consistent format and include all substantiating documentation,
- acquire updated cost estimates at key phases of design,
- implement written procedures for reviewing and approving cost estimates.

Furthermore, consultants such as Metcalf & Eddy and Hazen and Sawyer that prepare cost estimates for the Department should ensure that cost estimates are based on appropriate design drawings, are consistently prepared, include appropriate escalation factors and substantiating documentation, are updated at key phases of design, and disclose any variations in the range of estimating accuracy.

Department Response: "Agree – Please see the response to Recommendation 3, above."

Plant Construction Contracts

Contract Number	Description	Actual Contract Amount (A)	Incentives/ Commodity Adjustments/ Contingency Allowances * (B)	Adjusted Amount (A-B)
CRO-311	Site peparation including excavation and traffic improvements	$127,660,000	$10,800,000	$116,860,000
CRO-312-G	General construction work including structures and equipment	$1,327,700,000	$44,350,000	$1,283,350,000
CRO-312-E1	Low voltage electrical work	$134,680,000	$4,825,000	$129,855,000
CRO-312-E2	High voltage electrical work	$37,678,000	$3,725,000	$33,953,000
CRO-312-H	Mechanical work	$105,700,000	$2,950,000	$102,750,000
CRO-312-P	Plumbing work	$58,475,000	$1,250,000	$57,225,000
CRO-313	Construction of water tunnels and associated work	$212,227,000	$0	$212,227,000
CRO-312-OS-G	General off-site construction work to deliver treated water to the City's water distribution	$96,842,500	$2,572,000	$94,270,500
CRO-312OS-E	Electrical work at off-site facilities	$15,762,500	$602,000	$15,160,500
CRO-312OS-H	Mechanical work at off-site facilities	$822,000	$131,500	$690,500
CRO-312OS-P	Plumbing work at off-site facilities	$872,000	$85,000	$787,000
CRO-312-FM	Construction of force main to deliver residuals from the Plant to Hunts Point	$18,626,745	$1,150,000	$17,476,745
CRO-312-HP **	Modification of Hunts Point Sewage Treatment Plant to receive Plant residuals	**	**	**
	Total =	**$2,137,045,745**	**$72,440,500**	**$2,064,605,245**

* Items not included in conceptual cost estimate

** Contract not yet awarded

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August 19, 2009

John Graham
Deputy Comptroller - Audits, Accountancy & Contracts
Office of the Comptroller
1 Centre Street
New York, NY 10007-2341

Re: Response to Draft Report on Audit FR09-110A
"Audit of the Department of Environmental Protection's Oversight of Costs to Construct the Croton Water Treatment Plant"

Dear Mr. Graham,

Thank you for providing the opportunity to comment on this draft report. Having reviewed the report, we have some general observations as well as responses to specific information contained in the draft report.

The Croton Water Treatment Plant (CWTP) is one of the largest and most innovative construction projects ever undertaken by the City of New York. The cost of the construction contracts totals $2.1 billion.

We are pleased to see that your office found this Department to have "...administered the construction of the Croton Water Filtration Plant effectively to ensure that actual costs are substantiated, reasonable, and necessary."

The following are specific responses to observations and findings contained within the report:

- "...we concluded that the conceptual cost estimate was unreliable, and could not be used as a gauge of the actual costs that would be incurred by the Department to construct the Plant." (P.8, ¶2)

The conceptual design reports for the project, where the conceptual cost estimates were discussed, specifically state that the costs are not escalated and are in constant 2003 dollars, which is also a common practice in environmental impact statements that compare alternatives without having their associated cost differences distorted by applying many years of estimated inflation. The draft audit report compares the unescalated costs of a design that was approximately 10% complete with the bid prices taken several years later and reaches the conclusion that the significant differences are indicative of a lack of reliability in the original cost estimates. For example, the bids for the plant itself, the most

complex part of the entire Croton project, were not opened until the fall of 2006. Construction cost estimates that are not stated in constant dollars are typically inflated to the midpoint of construction which, in the case of the Croton project, would be in 2009. The conceptual estimates in constant 2003 dollars therefore excluded approximately six years of inflation. When the conceptual costs are escalated at an appropriate rate, which we believe is a minimum of 8.5%, the conceptual costs are within 20% of the bids. Indeed, data which we presented to the Comptroller in January 2008 showed that many heavy construction programs across the country were experiencing annual inflation rates of 10% to 15% during the three-year period between the publication of the conceptual estimates and the receipt of bids for the filtration plant.

- "...the Department should not have led the public to believe that the $992 million estimate was a reasonable projection of what the Plant's final costs would be." (P.10, ¶2)

The conceptual design reports presenting the $992 million along with the statement that the costs were in constant 2003 dollars and were not escalated were made available to the public. It is unreasonable to expect that the final bid prices, submitted three years after the conceptual cost estimates were published and covering a project with a four-year construction duration, would not be higher than the unescalated estimate. As discussed above, when the conceptual cost estimate is escalated at a proper rate, it compares favorably with the bid prices.

- "We performed independent calculations that indicated that the increase in construction costs from 2003 to 2008 that were attributable to inflation ranged from $310,802,418 to $359,190,840." (P. 11, ¶2)

At the audit exit conference the Department presented information, which had been previously provided to the Comptroller's Office and the Independent Budget Office, indicating escalation rates of 8.5% to 10% and higher (rather than the 5.04% to 5.73% escalation rate used by the auditors) would be more consistent with costs project owners were subject to at the time the main and most costly WTP contracts (CRO 312G, H, E1, E2, P and CRO 313) were bid. Factors not captured by indices, as detailed in the next paragraph, led to higher construction escalation rates during the time the main WTP contracts were bid.

The Department's presentation is based on indices specific to this industry and other heavy construction sectors. The information driving these indices was nationwide or from outside of the New York metropolitan area. Costs in New York are generally higher than elsewhere. If the rate of escalation in the water industry was 9% nationwide as the Handy-Whitman Index showed, it was almost certainly higher in New York City. Prior to bidding on the CRO 312 G, H, P, E1 & E2 contracts, the Department initiated a review of costs for the Croton WTP. That review, in which the design joint venture participated, determined 8.5% to be a proper escalation rate. The draft audit report states that labor costs represent 68% of overall costs. If this is correct, it further justifies the use of a higher escalation rate than was used in the draft audit report. The shortage of

construction labor in the metropolitan area due to the other public works projects as well as privately funded construction required contractors to pay premiums over negotiated labor contracts to obtain the proper level of workers for the project. This would not appear in an ENR index that is based on labor contracts, but it would be evident from contact with construction contractors, industry associations, and labor union representatives. Information the Department obtained from discussions with these groups was used in arriving at the 8.5% escalation rate. When these factors are taken into consideration we believe they support the Department's position that actual construction costs were higher than anticipated because of factors not apparent in general indices.

- "After we commenced the audit, the Department acknowledged that the conceptual estimate lacked any provision for escalation." (P.12, ¶1)

As indicated above, DEP made a presentation to the Comptroller in January 2008, long before the Comptroller commenced the audit. The presentation contained at least seven slides that stated that the conceptual estimates in the environmental impact statement were in constant 2003 dollars.

- "The Department contended, and our review acknowledged, that the awarded construction contracts included cost items that were not anticipated in the 2003 conceptual estimate. These items included $742,440,500 for incentive payments, commodity price adjustments, and contingency allowances. ... Although these items were not included in the 2003 conceptual cost estimate, we contend that the Department and its consultant should have anticipated that these items would have been required in a construction project as significant as the Plant." (P.12, ¶2)

As stated in the draft audit report, incentive payments, commodity indexing and contingency allowances were not included in 2003 cost estimates. With the exception of incentive payments, these factors had not been included on any previous projects. In the past, the NYC Comptroller's Office has not allowed contingency allowances in most Department construction contracts.

The Croton WTP is the first project allowing for commodity price indexing bid by the Department. When it became apparent in 2006, prior to advertising the main construction contracts for the project, that materials costs were rising rapidly and unpredictably, it was decided to include commodity indexing in the contracts. It would not have been reasonable, when the conceptual estimate was being prepared in 2002, to anticipate this unstable market.

With regard to incentive payments, at the time the conceptual estimate was prepared, these were not included in initial cost estimates. Incentive payments must be justified to the Law Department prior to bid based on schedule, consent order considerations, etc., and included on the final Schedule of Prices in the bidding documents. This occurs just prior to advertisement. Nevertheless, the Department recognizes that in the future allowances should be made for anticipated incentive payments in earlier stage cost estimates. That being said, the total incentive payment allowance in all Croton WTP

contracts was $18,165,000, or about 1% of the conceptual estimate and 0.85%of the bid prices. Omitting these from conceptual costs thus had a minimal effect on the estimate.

- "...the Department obtained at least three or more competitive bids for 9 of 12 construction contracts, a figure that would belie the Department's contention about limited bidding." (P.13, ¶2)

The three contracts that received only two bids each represented almost 70% of the total project bid prices. The bid for the largest awarded contract by far, CRO 312G, was $1.327 billion, or 62% of all contracts; there were only two bids for this contract. In addition, the other two contracts with only two bids were CRO 312H at $105,700,000 and CRO 312P at $58,475,000. The fact that there were more bidders for the other project contracts does not belie the Department's contention about limited bidding.

Response to Recommendations:

Recommendation 1 – "Prepare written procedures for auditing payment vouchers in accordance with Comptroller's Directive No. 7."

- DEP Response – Agree – A written procedure is being prepared to audit payment vouchers in accordance with Comptroller's Directive No. 7.

Recommendation 2 – "Ensure that engineering audit office files contain appropriate evidence to show that substantiating documentation was reviewed. In that regard, all key documentations used to substantiate voucher payments should be maintained in engineering audit office files."

- DEP Response – Agree – The DEP EAO will ensure that engineering audit office files contain appropriate evidence to show that substantiating documentation was reviewed. EAO auditors are being instructed to complete their audits in a uniform manner to more clearly convey the completeness of the audit and their agreement with the requested payment.

Recommendation 3 – "Ensure that conceptual cost estimates adhere to estimating guidelines in the Department's "Cost Estimating Manual." In that regard, estimates should disclose any variations in their range of estimating accuracy."

- DEP Response – Agree – We previously recognized the need to address cost estimating on our numerous capital projects. Our Bureau of Engineering Design and Construction (BEDC) formed a new Cost Estimating Division in April 2007. The group currently has three full-time staff and an additional staff member is currently in the process of being hired. A key task of the estimating group is to ensure the use of the new Cost Estimating Manual, released in August 2008, in the development of engineer's estimates. The estimating framework described in the Manual is largely based on the Association for the Advancement of Cost Engineering (AACE) practices adapted and expanded to the specific needs and characteristics of DEP's water and wastewater capital program. Training sessions with both in-house staff and consultants on implementation of the manual were

conducted in the Fall of 2008 and implementation of all requirements within the manual was mandated as of February 1, 2009.

The primary functions of the BEDC Cost Estimating Division include:

- Review Consultant estimates at all phases of the project life cycle
- Participate in estimate meetings with project team
- Ensure full compliance with estimating manual
- Develop preliminary (Class V) estimates at project initiation
- Develop independent estimates for in-house projects

To further support the quality of our estimating functions, BEDC hosts an annual Cost Estimating Symposium where an array of regional stakeholders (engineers, contractors, city agencies, etc.) share information on current market conditions as they affect cost estimating in the New York City municipal market. The symposium includes an open discussion forum and presentations are distributed to all participants. These symposiums have been an excellent communication tool for disseminating critical information to improve the accuracy of our estimates.

Recommendation 4 – "Develop conceptual cost estimates that contain sufficient substantiating information."

- DEP Response – Agree – Please see the response to Recommendation 3, above.

Recommendation 5 – "Adjust cost estimates to include the anticipated effects of inflation in labor, equipment, and material costs. In that regard, the Department should ensure that escalation is adjusted to the mid-point of construction. Escalation rates should be consistent with those recommended by the City's Office of Management and Budget and with other applicable sources."

- DEP Response – Agree – Please see the response to Recommendation 3, above.

Recommendation 6 – "The Department should adequately oversee the work of consultants preparing cost estimates, and review documentation used in their development. In that regard, the Department should:

- ensure that cost estimates are based on appropriate design drawings;
- review estimates for appropriate escalation factors;
- ensure that cost estimates are prepared in a consistent format, and include all substantiating documentation;
- acquire updated cost estimates at key phases of design;
- implement written procedures for reviewing and approving cost estimates.

Furthermore, consultants such as Metcalf & Eddy and Hazen and Sawyer that prepare cost estimates for the Department, should ensure that cost estimates are based on appropriate design drawings, are consistently prepared, include appropriate escalation factors and substantiating documentation, are updated at key phases of design, and disclose any variations in the range of estimating accuracy."

- DEP Response – Agree – Please see the response to Recommendation 3, above.

In closing, I would like to again thank you and your staff for the time and effort taken to assess this Department's oversight of this critical project. When completed, the Croton Water Treatment Plant will help the Department continue to provide New York with the best tasting, highest quality and safest drinking water.

Sincerely,

Steven W. Lawitts
Acting Commissioner