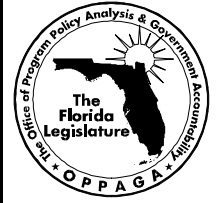




Office of Program Policy Analysis And Government Accountability



John W. Turcotte, Director

May 1997

Review of the Florida Department of Transportation Construction Bid and Contract Administration Process

Abstract

- Successful bids in the projects we examined averaged 6% below the Florida Department of Transportation's (FDOT) official preliminary estimates. Final construction costs averaged 9% above the award amounts, resulting in \$32 million in cost overruns.
- FDOT paid about \$2 million above average bid prices for increased quantities of planned work. FDOT could avoid paying these premium prices by adopting a policy to pay only reasonable unit prices when quantity overruns occur.
- FDOT advance payment practices for certain items resulted in \$90,000 in potential lost interest earnings to the state. FDOT could avoid the loss of potential interest earnings by retaining a portion of the payment for certain contract items.

Purpose

The Joint Legislative Auditing Committee, at the request of the House and Senate Transportation Committees, asked our Office to examine FDOT's central office construction bid and contract administration process. Our review addressed two objectives:

- Assess the relationships that exist between FDOT's estimates of construction costs, the bids received from contractors, and final construction costs; and

- Identify changes that can be made in FDOT's bid and contract administration process to help minimize construction costs.¹

Background

Chapter 334, F.S., requires FDOT to construct and maintain the state transportation system in the most efficient and cost-effective manner. Since FDOT does not have the in-house personnel and equipment necessary to build roads and bridges, it contracts with private contractors to carry out these projects. Chapter 337, F.S., authorizes FDOT to award construction contracts through a competitive bid process to the lowest responsible bidder.²

Before letting projects for bid, FDOT staff develop a confidential construction cost estimate for each project. This estimate is made using the project design plans, which specify work items. Work items include the quantity of materials, labor, and equipment necessary to complete the project. FDOT estimates the cost of each project by using historical bid prices and equipment, labor, and material costs. Design plans are provided to construction contractors to use in developing their bids. The Department uses an average of the bids received to analyze bids submitted by contractors. FDOT automatically awards contracts to the lowest bidder if the bid is within an acceptable range of the average bid price and does not have problems such as being materially unbalanced (i.e.,

¹ Additional steps that could be taken by FDOT to reduce cost overruns are discussed in our recent reports on the construction process (Report No. 95-30, issued January 11, 1996, and Report No. 96-21, issued November 27, 1996).

² In some cases, FDOT may award construction contracts using methods other than low bid, such as in emergencies or for projects that combine design and construction into a single bid. Also, Ch. 96-323, Laws of Florida, authorizes FDOT to consider construction time as well as cost in determining the lowest competitive bidder and to establish a demonstration program using innovative contracting techniques.

contains unrealistically high or low unit prices that may not result in the lowest cost to the Department).³

When submitting bids, contractors specify the unit price that they will charge for each work item required by the design plans, the sum of which equals the total bid price for the project. Although the contractor who is awarded a contract typically has submitted the lowest overall bid, this contractor may have bid significantly higher prices for some work items than did other contractors. This makes little difference when the quantity of work items is correctly specified in the design plan, as FDOT will pay the lowest price for the total project. However, when more work is required to complete the project, FDOT may pay a significant premium if the contractor has bid a high price for the affected work item. For example, if a contractor bid off-duty law enforcement at \$50 per hour and the average bid for that project is \$20 per hour, each additional hour over the planned quantity would carry a \$30 per hour premium.⁴

Although construction contracts specify the prices to be paid, actual project needs often vary from the design plans in terms of the quantity of work needed to be done. Changes in the quantity of work are usually due to factors such as unforeseen field conditions, design plan errors, changes in project specifications, alternative methods of construction, and unfavorable weather conditions. Changes to work quantity are generally made through change orders and supplemental agreements to the contract and paid according to the unit prices as originally bid.

To conduct our study, we analyzed each of the 108 transportation (road and bridge) construction contracts that were completed during the first six months of fiscal year 1995-96. In our analysis, we examined the bids received by FDOT for these projects, the successful bids, and the final construction costs.

Findings

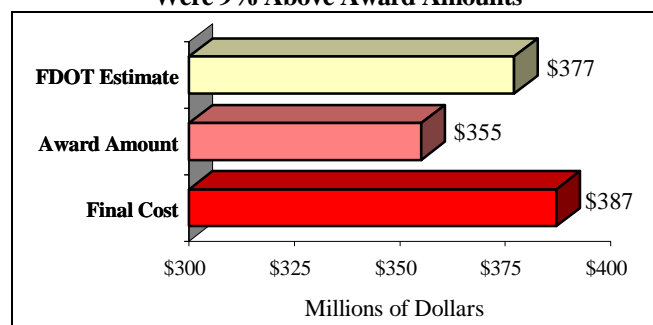
³ FDOT may reject low bids if the bid is 25% or more below or 10% or more above its estimate, the contractor has failed to meet Disadvantaged Business Enterprise goals, the bid is not prepared in accordance with FDOT specifications, or only a single bidder responds. Bid proposals that have these problems must be reviewed and approved by a committee of FDOT staff.

⁴ FDOT computes an average (including the Department's official preliminary estimate) for the bids received per work item and deletes extreme bids, if any, and then averages the remaining bids. It is this "second average" that is used in FDOT's analysis of bids submitted by contractors and is the "average" referred to in this report. We consider this second average as the most FDOT should generally consider paying for additional work and anything paid above it is calculated as a premium for this report.

Successful bids in the projects we examined averaged 6% below FDOT's official preliminary estimates. Final construction costs averaged 9% above the award amounts, resulting in \$32 million in cost overruns.

While successful bids submitted by contractors in the projects we examined were lower than FDOT's cost estimates, final project costs were substantially higher. As shown in Exhibit 1, FDOT estimated that the 108 projects in our sample would have a total cost of \$377 million. The successful bids for these projects totaled \$355 million, or 6% below FDOT's estimates. However, the final cost of these projects was \$387 million, which was \$32 million (9%) higher than the original award amounts.

Exhibit 1
Low Bids Averaged 6% Below FDOT's Estimate in Sample Projects, But Final Project Costs Were 9% Above Award Amounts



Source: Office of Program Policy Analysis and Government Accountability analysis of agency data.

There are several reasons for the difference between FDOT's official preliminary estimate and the successful bid. First, in establishing its official estimate, FDOT attempts to estimate a reasonable cost, which is primarily based on average bid prices, for projects instead of the lowest possible cost. Indeed, the average bids on the projects we examined were within 1% of FDOT's estimate. Second, competition in the bid process provides contractors with the incentive to bid lower than average prices. Third, individual contractors may submit lower bids because they can perform projects more efficiently than FDOT assumes. Finally, contractors may be willing to accept lower profit margins in order to obtain the work. In the 108 contracts examined, FDOT accepted seven bids that were more than 25% below its estimate, judging that these lower prices resulted from better than expected competition. FDOT also accepted six bids that were more than 10% above its estimate because the contractors were able to justify the higher costs, generally due to the need to do additional work that was not considered by FDOT in developing its estimate.

The \$32 million in cost overruns for these projects was primarily due to planned work described in the bid that increased in quantity. Also, in some cases, project design plans had omitted materials or construction steps that were later determined to be necessary. Overall, quantity increases resulted in \$22.7 million in cost overruns, while new contract items resulted in \$9 million in cost overruns.

Although most cost overruns are unavoidable, improvements in FDOT's contract administration process could have saved up to \$2 million by adjusting prices for additional work in the projects we examined.

Most cost overruns in transportation construction contracts are probably unavoidable. However, we identified two weaknesses in FDOT's bid and contract administration process:

- FDOT is subject to paying high prices for additional work due to unbalanced bidding and lack of price adjustments; and
- FDOT is subject to losing potential interest earnings by making advance payments on front-end-loaded work.

FDOT pays high prices for some additional work.

Given that construction cost overruns generally occur, concern has been raised that contractors may be "bidding claims." Contractors may bid claims by submitting unbalanced bids in order to increase their profits through changes made during construction. For example, a contractor may intend to construct a project in such a way that will require furnishing more barrier wall and less relocation of it during construction than was planned. In this case the contractor can bid a high price for furnishing barrier wall and a low price for relocating it, resulting in inflated profits for the additional work. We analyzed the contracts in our sample to determine if there was evidence that bidding claims took place. We concluded that FDOT's contract administration process does allow this practice to occur for two reasons: (1) unbalanced bidding, and (2) lack of adjusting prices for additional work.

Unbalanced Bidding. Most (82 of 108) awarded contracts we reviewed were mathematically unbalanced as they contained items of work priced substantially above and below the average bid. By structuring their bids in this manner, contractors can realize greater profits when high-priced items of work increase in quantity, increasing state costs. In contrast, work that is priced substantially below the average bid can benefit the state when that work is

increased because it lowers overall construction costs. However, rarely does low-priced work increase in proportion to high-priced work.

We found FDOT pays disproportionately higher prices for work that overruns during construction. This results from contractors tending to bid high prices for items that require additional work rather than bidding low prices for these items. For the 108 contracts examined, we estimate FDOT paid \$820,000 more for additional work on items bid with high unit prices compared to paying \$118,000 less for work that was bid with low unit prices.⁵ These results indicate that contractors are bidding claims by unbalancing their bids. If contractors were not deliberately unbalancing their bids to increase their profits, most items with quantity overruns would be priced below average bid prices.

Although FDOT's bid analysis system is among the most statistically sophisticated in the country in detecting unbalanced bids, it cannot effectively assess the impact of these unbalanced bids before construction. This is because the Department does not know precisely the quantity of work that will be needed under actual field conditions or the successful contractor's construction methods. Consequently, FDOT regularly awards unbalanced bids that may not result in the lowest cost to the Department.

For example, in one of the contracts we examined, FDOT design plans estimated that 500 feet of sheeting was needed to support a trench while drainage pipes were installed. However, the successful contractor used 1,729 feet of sheeting to complete the job, more than three times the amount estimated by the design plans. The successful contractor bid a unit price of \$420 per foot for the sheeting compared to the \$171 per foot average bid submitted by other contractors who bid on the project. As a result, the contractor was paid more than \$500,000 for the additional sheeting. FDOT would have paid only \$200,000 for the additional sheeting if it had paid the average unit price bid by other contractors. The Department thus paid a premium of \$300,000 for the additional sheeting.

In another project, the design plans specified that 10 impact attenuator modules (plastic barrels of sand as shown below) would be needed to separate the construction area from the roadway on a resurfacing project. However, the successful contractor used 125 modules to implement the project. The contractor had bid a unit price of \$1,297 per module, compared to the \$247 average price bid for these

⁵ In making our estimate, we used prices paid above and below 45% from the average bid. For instance, if the average price was \$1, any amount paid above \$1.45 or below \$0.55 was summed for each additional unit over the planned quantity. Using the average, rather than a range around the average, would otherwise mask the described tendency.

units by other contractors.⁶ As a result, the Department paid a premium of \$121,000 for the additional units.



Lack of Price Adjustments. The second reason that contractors may bid claims is that FDOT does not consider making price adjustments to minor work items (those that are less than 5% of the original contract amount). FDOT's policies provide that the Department will pay the unit prices specified in a construction contract unless there is a significant change to a major work item (those that are at least 5% of the original contract amount). Significant changes in major work items include changes in the character of work to be done or increases in quantities of items that exceed 125% of the amount specified in a contract (or that reduce a quantity by more than 75%). The examples given above were minor work items and were not subject to price adjustments.

Most quantity changes in our sample were either to minor work items or were not large enough to trigger price adjustments. Although two-thirds of the 11,386 work items in the contracts we examined experienced quantity changes during construction, less than 1% were major work items and had changes large enough to meet FDOT's criteria for adjusting unit prices.⁷

The problem with the state paying premium prices can be addressed in two ways. First, FDOT can continue its efforts to detect errors in design plans before contracts are

⁶ Retail unit costs for impact attenuator modules generally consist of \$200 for material, \$50 for transportation and installation, and a \$50 markup for a total of \$300 per unit. Contractors may also have a market advantage, such as a stock pile of used impact attenuator modules from previous work which enables them to bid prices below retail.

⁷ We focused our analysis of quantity changes subject to price adjustments on the quantity change rather than character change because we could not readily determine whether the change significantly altered the character of the work.

awarded. FDOT has increased its efforts to review design plans in recent years to ensure that estimated quantities of work are accurate. Second, FDOT can change its policies and adjust prices for minor items when quantity changes occur. For example, FDOT contracts could stipulate that if the total amount due for a minor item changes by more than a set amount (e.g., \$10,000), the Department could request a price adjustment for the new quantity. The Department's Standard Specifications already provide contractors the right to request additional compensation for work or materials not clearly covered in the contract.

In the contracts we examined, FDOT could have substantially reduced the premium paid if it had paid no more than average prices for work that increased over planned quantities. To save \$2 million, FDOT would have had to reduce unit prices for only 13% (1,485 of 11,386) of the total number of items. The estimated savings for these 1,485 items represents the amount paid over the average bid price for the work that exceeded the planned quantity. However, expanding the threshold for price adjustments may result in additional costs to the Department, such as increased contract monitoring costs and extra compensation granted to contractors. While these additional costs could not be readily determined, the net effect should result in the Department paying fair and reasonable prices for originally planned work that overruns.

Although we could not determine how much, if any, contractors would be due extra compensation for quantity increases on items bid below average prices, we estimate that if bid prices were increased to 6% below the average for additional planned work, contractors would be compensated an extra \$1.3 million. Thus, if the Department reduced premium costs by \$2 million and granted contractors an additional \$1.3 million, the Department would realize a net \$700,000 savings.

Several other states, including Connecticut, Hawaii, Maryland, Massachusetts, Nebraska, Nevada, New Mexico, North Carolina, Ohio, Rhode Island, and Utah provide for greater freedom to change unit prices in an effort to control construction costs when quantities change.⁸ Most of these states allow price adjustments for both major and minor items of work. Connecticut and Rhode Island use a technique called force account for

⁸ Connecticut and Rhode Island use force account for overruns; Hawaii, Maryland, Nebraska, and Nevada adjust prices for 20% to 25% quantity changes; North Carolina adjusts major item prices for 15% quantity changes and minor item prices for 100% quantity increases; Ohio adjusts prices for the lesser of changes in excess of \$100,000 or 5% of contract amount; and Utah allows price adjustments for minor items that increase more than 150%.

additional work, which limits payment for additional work to the actual equipment, labor, and material costs paid by the contractor.

FDOT makes advance payments on front-end-loaded work. The second weakness in FDOT's construction process is that the Department routinely makes advance payments to contractors who "front-end-load" their bids. Making payments above reasonable costs for completed work results in potential lost interest earnings on transportation funds that are withdrawn early from the State Transportation Trust Fund.

While not expressly provided for or prohibited by law, FDOT may award construction projects to contractors who have structured their bids in order to receive higher payments for work performed during the early phases of work. Some items of work, such as clearing land, removing existing structures, or building special detours, are usually completed earlier in project implementation than are others. When these items of work are bid unreasonably high, the contractor receives higher than reasonable progress payments in relation to the work completed.

FDOT regularly accepts the practice of front-end-loading bids unless the cost of making advance payments causes a switch in the order of the bids. Because front-end-loading is a common practice among contractors, FDOT must calculate the time value of money associated with front-end-loaded work items for each contractor. Unless the time value of money associated with the lowest bidder's front-end-loaded items surpasses that of the second bidder by at least several thousand dollars, FDOT generally does not reject the lowest bidder. Thus, making advance payments on front-end-loaded work generally results in potential lost interest earnings for the Department. In the contracts we examined, FDOT lost approximately \$90,000 in potential interest earnings as a result of this practice.

FDOT established "mobilization" as a work item to cover the up-front costs associated with contractors' setting up field operations to begin work. To minimize the front-end-loading of the mobilization work item, FDOT established a cap on this item and retains a portion of the funds until the project is completed.⁹ Establishing the mobilization work item was intended to avoid the practice of front-end-loading. However, as stated above, contractors continue to front-end-load their bids.

⁹ Payments made for mobilization are capped at 10% of the original contract amount with any remaining amount paid upon completion of the project.

The retainage concept could be expanded to other front-end-loaded work items to minimize potential lost interest earnings. The Department could identify those items that are priced above a reasonable cost and retain that portion of money above a reasonable cost until the end of the project. The contractor would receive full payment as bid but would not benefit from receiving early payment by front-end-loading the bid. Should contractors incur additional finance costs as a result of retaining these payments, they would likely include these costs in their bids.

Some states such as Arizona, Arkansas, and Connecticut retain mobilization costs in excess of a reasonable amount until the end of the project. North Carolina retains the amount in excess of a reasonable cost for other front-end-loaded unit and lump-sum-priced items until the last partial payment estimate, at which time these funds are paid to the contractor. The retained funds are not eligible for deposit in any trust account and interest is not paid for delaying payment for the retained portion of the bid price.

Conclusions and Recommendations

Although FDOT's bid analysis system is among the most statistically sophisticated in the country in detecting unbalanced bids, it cannot effectively ensure the lowest cost to the state. Construction cost overruns cannot be eliminated because FDOT cannot accurately determine project needs in advance of construction. Consequently, FDOT will often encounter problems necessitating changes to construction contracts. Therefore, to avert the materially unbalanced bid, FDOT should pay no more than reasonable prices for additional project work. Unbalanced bidding, when used to inflate contractor's profits, undermines the integrity of the construction bid process and should be discouraged.

FDOT could save money and reduce the potential for contractors to "bid claims" by adopting a policy to pay fair and reasonable prices when quantity changes occur, rather paying whatever unit price had been bid by the contractor. Additionally, FDOT could retain a portion of the payment for contract items that are front-end-loaded by contractors. This would avoid making advance payments to contractors for front-end-loaded items and losing potential interest earnings on early withdraw of State Transportation Trust Funds.

We recommend that FDOT:

- Provide terms and conditions for making price adjustments in construction contracts, including

thresholds for both major and minor work items upon which price adjustments are subject.

- Revise its Standard Specifications to provide for making price adjustments in construction contracts, including thresholds for both major and minor work items upon which price adjustments are subject.
- Revise its Standard Specifications to retain payment for certain front-end-loaded items to avoid making advance payments.
- Use complete bid and final cost data to track overrun and underrun trends in construction items through the Department's computer systems and quality assurance review process to improve its bid analysis and design plans.
- Closely monitor changes during construction to ensure only fair and reasonable prices are paid for originally planned work that overruns. The Department should provide project engineers with adequate information, including bid data upon which to initiate price adjustments during construction.

Agency Response

In accordance with the provisions of s. 11.45(7)(d), F.S., a list of preliminary and tentative findings and recommendations was submitted to the Secretary of the Florida Department of Transportation for his review and response.

We received a written response from the Secretary of the Florida Department of Transportation. This response has been retyped so that comments by the Director of OPPAGA could be inserted where necessary and appropriate in the body of the response.

Response From the Florida Department of Transportation

March 24, 1997

Mr. John W. Turcotte, Director
Office of Program Policy Analysis
and Government Accountability
111 West Madison Street, Room 312
Tallahassee, Florida 32302

Dear Director Turcotte:

This letter is in response to the preliminary and tentative findings and recommendations concerning the **Review of the Florida Department of Transportation Construction Bid and Contract Administration Process**. This response addresses the revised report submitted by your office subsequent to my March 18, 1997 letter. It is gratifying to know the review finds our bid analysis process to be among the most statistically sophisticated in the nation. However, I am concerned with other findings and recommendations in the report.

In a number of places in the report, the phrase "lowest cost" is used. While the Department agrees that it is in the public's interest to obtain a low cost, it should also be recognized that a contractor is due a fair price, including profit, for their work.

While I agree any premium in contract cost is undesirable, I submit that an overall increase in cost has not been demonstrated. The report implies there has been a significant increase in cost to FDOT construction projects due to unbalanced bidding by contractors, citing a potential savings of \$2 million. However, in another section of the report a net savings of approximately \$700,000 is calculated, using a different set of criteria. Further, OPPAGA's staff have stated that if a zero percent threshold above or below the average unit price was used, the net cost impact would be zero.

OPPAGA's Comment

We do not believe that the problems cited in our report have a zero net cost impact; in contrast, we believe that the Department's current practices can significantly increase costs. The public generally expects the state to pay the lowest price for products and services it purchases on their behalf. To pay anything more than the lowest price for work on construction projects would be a waste of taxpayers' money. For instance, the report cites an example where the Department paid a contractor \$121,000 above a reasonable cost for impact attenuator modules that were

added to the contract. There was no evidence that the contractor was paid \$121,000 less than his costs for other work added to the contract. As a result, it does demonstrate an overall increase in cost to the Department and a waste of taxpayers' money.

Also, OPPAGA's review did not consider contract bid items that decreased in quantity which would have resulted in an even lower premium amount. For instance, the report describes a project in which the quantity for sheeting overran resulting in an increase of approximately \$500,000 due to an unbalanced bid for the item. However, that overrun caused an underrun for a related item which was also unbalanced at time of bid. The underrun resulted in a reduction in cost for the item of approximately \$400,000. The net increase in the cost of the project was therefore approximately \$100,000 rather than the \$300,000 indicated in the report.

OPPAGA's Comment

We do not consider reductions in estimated quantities due to plan errors as savings to the Department. Reductions in estimated quantities of work are not savings to the Department because it was work not needed in the first place. To credit the contractor for an over-estimated quantity of work and use that amount to offset or justify paying exorbitant prices is wrong and misleading. The bottom line is that the Department paid at least \$300,000 more on the project than necessary.

The analysis is apparently based on an assumption that bid prices which are higher than the average are inappropriate. This ignores the fact that there are valid reasons for differences in bid amounts for specific items. Individual contractors approach a project differently depending on manpower resources, equipment and material availability. Other intangibles affect the bid amount including complexity of the work, contract time allowed and level of competition in the area. Contractors must account for these factors in their assessment of risk and, ultimately, their bid. A difference in bid amount for a particular item does not

in itself indicate an anticipation of quantity overruns by the contractor. Using the average price for an item is questionable since the spread can vary significantly on a particular project. Again, using one of the projects cited, the bid prices for the sheeting ranged from \$80 to \$420. In short, the report fails to recognize the variability of costs for materials and labor among contractors.

OPPAGA's Comment

Our point is that since FDOT is to award contracts based on the low bid, it is reasonable to expect that the actual prices paid for most work would be lower than that bid by other contractors. The average bid received is generally a reliable indicator of the work's value. The report recognizes that contractors' prices do deviate substantially from average costs for some items and defines these as being unbalanced. Contractors generally unbalance their bids to maximize their profits. When bid prices deviate substantially from average costs the Department needs to take appropriate steps to protect the state's interest, including paying no more than reasonable costs for work added to the contract.

Likewise, the finding that advance payment practices may have resulted in lost interest earnings is misleading. The potential loss of \$90,000 in interest covers 108 contracts totaling \$355 million. There are valid reasons for allowing up-front costs to be recovered early in the contract. Material acquisition, equipment purchases and contract bonds, to name a few, are necessary expenditures that are often incurred prior to commencement of work. The cost and timing of these items will vary among contractors and from project to project. To imply front-end bidding results in a windfall to contractors reflects a lack of understanding of the complexity of cost allocation in contract bidding.

OPPAGA's Comment

The Department provides for contractor's up-front costs through the "mobilization" work item. Contractors may front-end-load other items simply to maximize their profits. Paying

contractors more than is commensurate with the work involved through the front-end-loading of other items does not ensure the lowest cost to the Department and is a waste of taxpayers' money.

With respect to the recommendations contained in the report, the Department plans to further evaluate their appropriateness and potential for improving our existing procedures. The first two recommendations are essentially the same and would require a different threshold for negotiating unit prices on items that overrun. As the report notes, contractors would expect the same consideration to negotiate new prices where their bid price was **under**

the average. Before we consider changes to contract language and specifications, it would be prudent to evaluate the success of similar actions in the states referenced in the report. The report does not indicate whether or not these actions have materially reduced unbalanced bids in those states.

The third recommendation calls for retaining a portion of payment due the contractor on front-end loaded items. The Department will evaluate options for determining "reasonable" prices for appropriate pay items. Where feasible, a schedule of retainage for such items will be developed.

The Department concurs in the fourth recommendation and will use bid and final cost data to identify trends in quantity overruns. This is already underway and will be used to improve design plans. The final recommendation relates to the first two and will be considered as part of our evaluation of programs in other states.

Sincerely,

/s/ Ben G. Watts

Ben G. Watts, P.E.
Secretary

BGW:se

This project was conducted in accordance with applicable evaluation standards. Copies of this report may be obtained by telephone (904/488-1023 or 800/531-2477), by FAX (904/487-3804), in person (Claude Pepper Building, Room 312, 111 W. Madison St.), or by mail (OPPAGA Report Production, P.O. Box 1735, Tallahassee, FL 32302).

Web site: <http://www.state.fl.us/oppaga/>

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