

**THE EFFECT OF COMPETITION ON BID QUALITY AND  
FINAL RESULTS ON STATE DOT PROJECTS**

by

**Joseph W. Delaney, PE, PgMP, CCM, LEED AP**

November 16, 2017

A dissertation submitted to the  
Faculty of the Graduate School of  
the University at Buffalo, State University of New York  
in partial fulfillment of the requirements for the  
degree of

**Doctor of Philosophy**

Department of Civil, Structural, and Environmental Engineering.

ProQuest Number:10688753

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



ProQuest 10688753

Published by ProQuest LLC (2018). Copyright of the Dissertation is held by the Author.

All rights reserved.

This work is protected against unauthorized copying under Title 17, United States Code  
Microform Edition © ProQuest LLC.

ProQuest LLC.  
789 East Eisenhower Parkway  
P.O. Box 1346  
Ann Arbor, MI 48106 – 1346

## ACKNOWLEDGMENTS

I would like to express the deepest appreciation to my committee chair Professor Mohan, for believing in me and encouraging me to apply to the PHD program. Without his guidance and persistent help this dissertation would not have been possible.

I would like to thank my committee member, Professor Anastasopoulos, whose advice and support during the statistical analysis phase made this research deeper, and better. In addition, I would like to thank Professor Adel, for encouraging me to stay in the program when things looked bleak.

**DEDICATED TO MY FATHER DAVID DENISE DELANEY**

## **Abstract**

The study's objective was to determine if competition during bidding directly affects the end results for State DOT projects. Competition was measured as the number of bidders per bid, and end results were measured as cost overrun and time delay percentages at project completion. State DOTs use a recursive bidding process, a standard project management practice, and they record and archive results in a similar fashion, all according to FHWA regulations. There is therefore a well-built data set for both bid results and final project outcomes which is made available to the public, on-line, by several State DOTs. By accessing public websites, data from five of those State DOTs was utilized in the study, which contained 2,457 certified bid results and 1,040 project outcomes.

Two statistical models were developed using Multinomial Logit Regression (MLR) and Three Stage Least Squares Regression (3SLS) techniques. The MLR model was developed to provide estimates of the relative importance of bid-phase competition in predicting bid quality. The results showed that the likelihood of achieving an acceptable, versus an unfavorable bid result, was increased by 4.9x with each additional bidder per bid. The 3SLS model was developed to assess the influence of bid phase competition on project cost overruns and time delays. The results showed that each additional bidder per bid resulted in a 2.2 percent reduction in project cost overruns.

Both results are significant, as the models showed that as competition increases, the probability of high quality bids and better project outcomes is enhanced. Based on these results, it is recommended that State DOTs consider the existing competitive environment

before implementing alternative project delivery methods like Design-Build, or procurement strategies such as Project Labor Agreements, which artificially limit competition.

## Table of Contents

Abstract.....	iv
List of Tables .....	viii
List of Figures.....	ix
Chapter 1- Introduction.....	1
Chapter 2 - Liturature Review .....	17
Level of Competition vs. Bid Quality.....	17
Level of Competition vs. Project Performance.....	21
Lesson Learned .....	25
Chapter 3 - Methodology .....	32
Research Questions.....	32
Hypothesises.....	33
Theoretical Foundation .....	34
Nature of the Study .....	36
Significance of the Study .....	39
Chapter 4 - Data Gathering Process .....	44
Data Gathering Process – Bid Tabulations .....	44
Data Gathering Process – Project Performance .....	45
Chapter 5 – Competition vs. Bid Quality.....	58
Introduction.....	58
Multinomial Logit Regression .....	66

## Table of Contents (Continued)

Chapter 6 – Competition vs. Final Project Results .....	85
Introduction .....	85
Three Stage Least Squares Regression .....	92
Chapter 7 – Conclusions and Recommendations.....	101
Summary of Findings.....	101
Significant Contribution to the Profession .....	102
Practical Applications .....	103
Alternative Project Delivery Methods and PLAs .....	103
Expert System for Determining Bid Quality .....	108
National Database of Bid Results and Project Performance .....	111
Recommendations for Further Study .....	112
Limitations.....	113
References.....	117
APPENDIX – Bid Quality Database.....	128



## List of Tables

Table 1.1 Alternative Project Delivery Methods .....	16
Table 2.1 Performance Factors .....	30
Table 2.2 Competition Effect on Bid Prices .....	31
Table 3.1 Potential Model Variables .....	43
Table 4.1 Sample Precipitation Schedule .....	54
Table 4.2 Data Set 1 Descriptive Statistics .....	55
Table 4.3 Data Set 2 Descriptive Statistics .....	56
Table 4.4 Data Set Summary .....	57
Table 5.1 Two Sample Equivalence Test Data .....	82
Table 5.2 Data Set 2 Cross Tabulation .....	83
Table 5.3 MLR Model Output .....	84
Table 6.1 Ranking of Project Success Factors .....	98
Table 6.2 3SLS Model Output .....	99
Table 7.1 Recommended National Database Items .....	116

## List of Figures

Figure 1.1 Design-Bid-Build Approach.....	11
Figure 1.2 Design-Build Approach.....	12
Figure 1.3 FHWA National Highway Construction Cost Index.....	13
Figure 1.4 Project Delivery Trends.....	14
Figure 1.5. Design Build Market Share .....	15
Figure 2.1 Research Subject Matter.....	27
Figure 2.2 Bid/No Bid Decision Making Process.....	28
Figure 2.3 Bid Price Competition Feedback Structure .....	29
Figure 3.1 Research Outline .....	41
Figure 3.2 Cause/Effect Diagram .....	42
Figure 4.1 MDOT Bid Tabulation Sample .....	50
Figure 4.2 WSDOT Project Results.....	51
Figure 4.3 WSDOT Precipitation Statistics.....	52
Figure 4.4 WSDOT Construction Employment Statistics .....	53
Figure 5.1 Delphi Technique .....	70
Figure 5.2 Bid Quality Matrix .....	71
Figure 5.3 Competition's Effect on Bid Quality (U).....	72
Figure 5.4 Competition's Effect on Bid Quality (A).....	73
Figure 5.5 Competition's Effect on Bid Quality (I).....	74

## List of Figures (Continued)

Figure 5.6 Bid Spread Two Sample Equivalence Test .....	75
Figure 5.7. Competitions Effect on Bid Spread.....	76
Figure 5.8. Competition's Effect on the Deviation from estimate.....	77
Figure 5.9. WSDOT Time Series Analysis (Bid Spread).....	78
Figure 5.10 WSDOT Time Series Analysis (Deviation from estimate). ....	79
Figure 5.11. WSDOT Project Size Analysis (Bid Spread).....	80
Figure 5.12 WSDOT Project Size Analysis (Deviation from estimate). ....	81
Figure 6.1. WSDOT Time Delay Percentage Histogram .....	96
Figure 6.2. WSDOT Cost Overrun Percentage Histogram.....	97
Figure 7.1. WSDOT Bidders/Bid Histogram.....	114
Figure 7.2 Expert System Output.....	115

## **CHAPTER 1**

### **Introduction**

Per the Congressional Budget Office, public dollars spent on roadway construction totaled \$165 Billion in 2014 which represented approximately 2.5 percent of the GDP. Spending on roadways as a percentage of GDP has remained at, or near, this percentage for the last 30 years. Most of the work put in place over that period was procured through the traditional project delivery method of Design-Bid-Build (D-B-B). Under D-B-B the work is awarded to the contractor with the lowest, responsible, responsive, bid. Under the lowest-bid model, both the Federal Government, and most States, require a fair and open competition for the work. Recently, the Federal Highway Administration (FHWA), and several State DOTs, have experimented with alternative project delivery methods and procurement strategies. These methods, such as Design-Build (D-B) under the best value selection criteria, limit the number of contractors willing, or able, to compete for the work. The objective of the study was to quantify the impact of bid-phase competition levels on final project performance, as measured by the cost overrun and time delay percentages. The purpose is to provide a gauge of contract award risk based on the quality of the procurement process.

For well over a century, the U.S. Federal Government mandated the use of the Design-Bid-Build (D-B-B) project delivery method for all public construction projects. The selection of a specific project delivery method sets the “rules of engagement” for the project team and determines

the level of risk assumed by each party. Because of its long history, the D-B-B method is often called the traditional approach to contracting. The D-B-B approach mandates a linear, and prerequisite relationship between the three discrete project phases. Separate entities perform design services and construction work, and design is required to be completed prior to bidding (Figure 1.1). By clearly separating roles and responsibilities, the D-B-B approach is thought to set the adequate level of checks and balances, which in turn is thought to enhance accountability of the project team toward the owner.

The requirement to use the D-B-B delivery method on public projects can be traced back in time to the construction of the Transcontinental Railroad and the Credit Mobilier scandal of 1872. The Credit Mobilier scandal was the result of a rigged bidding system which allowed the railroad contractor to charge the government far higher percentages than the market, and in return, 9 million dollars in stock was secretly given as bribes to 15 powerful Washington politicians, including the Vice-President, the Secretary of the Treasury, four senators, and the Speaker and some members of the House (US House of Representatives Archives, 2015). The Credit Mobilier scandal is an example of what would be referred to today as a “pay-to-play” scheme. One consequence of the scandal was the formal separation of design services from construction work on federal projects through an act of Congress in 1893, and ultimately, today’s legislation at both the federal and state levels requiring the use of the D-B-B approach on State DOT projects. Under the D-B-B approach today, State DOTs award design services on a qualification based selection process (QBS), while construction work is awarded based on the lowest responsive bid by a responsible contractor. QBS procurement was mandated for design services through an act of Congress in 1972 (Brooks Act),

which required public agencies to “negotiate contracts for architectural and engineering services based on demonstrated competence and qualification for the type of professional services required, and at fair and reasonable prices”. The QBS method for selecting design professionals is a generally accepted way to ensure that the public’s health, welfare and safety is of primary importance on public projects. However, many consider the awarding of the construction contracts to the lowest bidder fraught with peril. The main concern is the subjective nature of the word “responsible”. One often cited definition, in the context of the award of public construction contracts, comes from the California Court of Appeals, which ruled in a civil case that it included an “attribute of trustworthiness but also had reference to quality, fitness and capacity of the low bidder to satisfactorily perform the proposed work” (Therriault, 2004). In addition, the court ruled, “public construction contracts must be awarded to lowest bidder unless it is found that he is not responsible”. Based on the potential legal consequences of this “innocent until proven guilty” interpretation of the law, many owners find it exceedingly difficult to justify rejecting a bid even if they feel the contractor is not fully qualified to perform the work.

Design-Build is a method of project delivery in which one entity—the D-B team, works under a single contract with the project owner to provide design and construction services. The structure of the contracts for the Transcontinental Railroad, which resulted in the Credit Mobilier scandal, can best be described as a form of D-B. The primary advantage of the D-B method is the contractor’s enhanced ability to fast-track a project. Because the pace of work is determined by the contractor, construction can begin prior to the completion of design (Figure 1.2). This is a more efficient progression of project tasks and can significantly reduce the project duration, and through

the “time-is-money” principle, also significantly reduce project costs. Benjamin Franklin first coined the phrase “time is money” over 200 years ago in his Advice to a Young Tradesman (Delaney, 2006), where he introduced the concept that time lost is money spent. For modern construction projects, the metaphor draws the correlation between cost and schedule, which are positively related due to the following:

1. Cost Escalation. Construction costs generally increase with time for labor, materials, and equipment. The FHWA keeps track of cost trends for construction of transportation projects in the National Highway Construction Cost Index system. As shown in Figure 1.3, the average cost increase per year, from the period of 2003 through 2016, averaged approximately four percent.
2. Project Overhead. Projects have administrators, office workers, supervisors and other overhead costs such as insurance and equipment rental that keep accumulating until a project is complete. Longer project durations will result in higher overhead costs.
3. Cost of Capital. Project costs include financing and these costs generally rise with time. The longer the project duration the higher the cost of capital.
4. Adverse Weather. In large parts of the U.S., construction activity is less expensive during some seasons than during others. In the north, winter construction adds significant costs. Contractors normally schedule projects, so the exterior

construction activities avoid the winter. The longer the duration of a project the higher the potential that construction activities will slip into winter, or an additional winter period, and add additional costs.

The money value of time also explains an additional advantage of D-B over the traditional approach. When construction professionals are included in the design phase of a project, decisions impacting constructability are moved earlier in the project development process. The earlier those decisions the better (Egdom, 2012). A value engineering idea, for example, to use precast concrete instead of cast-in-place concrete, would save more money and time if implemented during design, then it would as a change order during construction. It would cost more later due to the disruption, and possible delay, to the construction schedule.

The proper planning of a construction project involves many key, early decisions, but none more important than choosing the correct project delivery method. Because the project delivery method sets the rules of engagement for defining, monitoring, and controlling accountability within the project team, a poor choice early on can doom a project. Selection of the D-B project delivery method for the Transcontinental Railroad is a good example of what can go wrong when a poor choice is made when public funds are at stake. One of the major criticisms of the D-B project delivery method is that it does not allow for the competitive bidding of completed plans and specifications. There are several negative consequences to this limitation of D-B. Unlike the D-B-B method, contracts are awarded and executed when design is still in the conceptual stage. Critics contend that this reduces the number of firms able, or willing, to participate due to the



increased risk assumed by the bidder (Serbu, 2013). A stated advantage of D-B contracts is that they can be awarded by the State DOTs as either "low-bid" or "best-value". An opportunity to use the best-value selection criterion in D-B is often highlighted as an important owner advantage over the low-bid only criteria of D-B-B, because best-value selection allows for the consideration of additional factors, such as experience, qualifications, technical innovation, management approach, schedule, level of quality, and others in addition to price. Advocates contend that this results in the selection of the best contractor for the work. However, use of best-value to choose a contractor when design is still in the conceptual stage, can result in a wide range of bid prices and limited competition for the work. This is the case because the scope, and even the scale, of a project, are not well defined at that point. Critics contend that this also adds subjectivity to the procurement process which is inappropriate for public works.

The cost effect that limited competition has on construction procurement has not been thoroughly investigated (Carr R. and Carr P., 1982, 1983, and 2015), and is the focus of this research. The overall effect of limited competition in other markets (Stucke, 2013) show, that in addition to increased cost, the following negative consequences may exist:

1. lower quality,
2. less choices and variety,
3. less innovation,
4. less efficiency and productivity,
5. less development and growth,

6. less wealth equality,
7. a weaker democracy by concentrating economic power, and
8. less wellbeing by suppressing individual initiative, liberty, and free association.

It can be theorized that limited competition would lead to similar effects in the construction industry, but this is beyond the scope of this study, and is recommended for further research.

The road to again consider utilization of the D-B approach on public transportation projects has been cautious, but deliberate. Starting in 1988, the FHWA established the Special Experimental Project Number 14 (SEP-14) to test and evaluate innovative contracting practices such as alternative project delivery methods like D-B. This led to the Clinger-Cohen Act, which first empowered the FHWA to utilize D-B, and required State DOTs to consider the following factors:

1. If three or more contractors would submit proposals,
2. The extent to which the project requirements were defined, and
3. The capability of the State DOT to manage the D-B procurement process.

Using these criteria, State DOTs have experimented with many different variations of the D-B approach (Table 1.1) commonly referred to as alternative project delivery methods. This has been motivated by funding shortfalls, the lack of financing, and/or the need to expedite the work. As a result, additional fiscal, design, and in some cases, maintenance risks, has been transferred to the

contractor, and away from the State DOTs (Delaney, 2013). The shift in responsibility has had the negative consequence of limiting competition as only a small pool of contractors is willing, or able, to take on the added risk.

In May 2014, RSMMeans published the results of a 9-year study which considered the type of project delivery method used on nearly 1,000,000 construction projects across the United States. The nine-year historical analysis was based on commercial non-residential projects that were bid between 2005 and 2013. Figure 1.4 shows the resultant trends. The data clearly shows the growing use of D-B. In 2013 the D-B delivery method represented 40 percent of the construction market, growing over 10 percent since 2005. In the same time use of the traditional D-B-B delivery method fell 14 percentage points. The study also found that D-B was used most frequently in the military sector (80 percent), followed by commercial (47 percent), and medical buildings (43 percent). When D-B first started to proliferate around 15 years ago it was mainly a method to deliver buildings and other vertical projects. This is still reflected in the study's data. However, today D-B is also used extensively in the public transportation sector. In fact, transportation is the fastest-growing D-B sector in the United States, with publicly funded transportation D-B projects doubling in the past five years, both in quantity and value of projects (DBIA, 2015). The FHWA encouraged this trend with the SEP-14 program which allowed State DOTs to experiment with innovative contracting methods like D-B to determine if "the purported benefits found in vertical construction would hold true in the transportation sector". Similar D-B "friendly" provisions were included in the TEA-21 Transportation Reauthorization Act in 1998. TEA-21 authorized D-B for projects that were more than \$50 million. Within five years, more than 20 states had some D-B

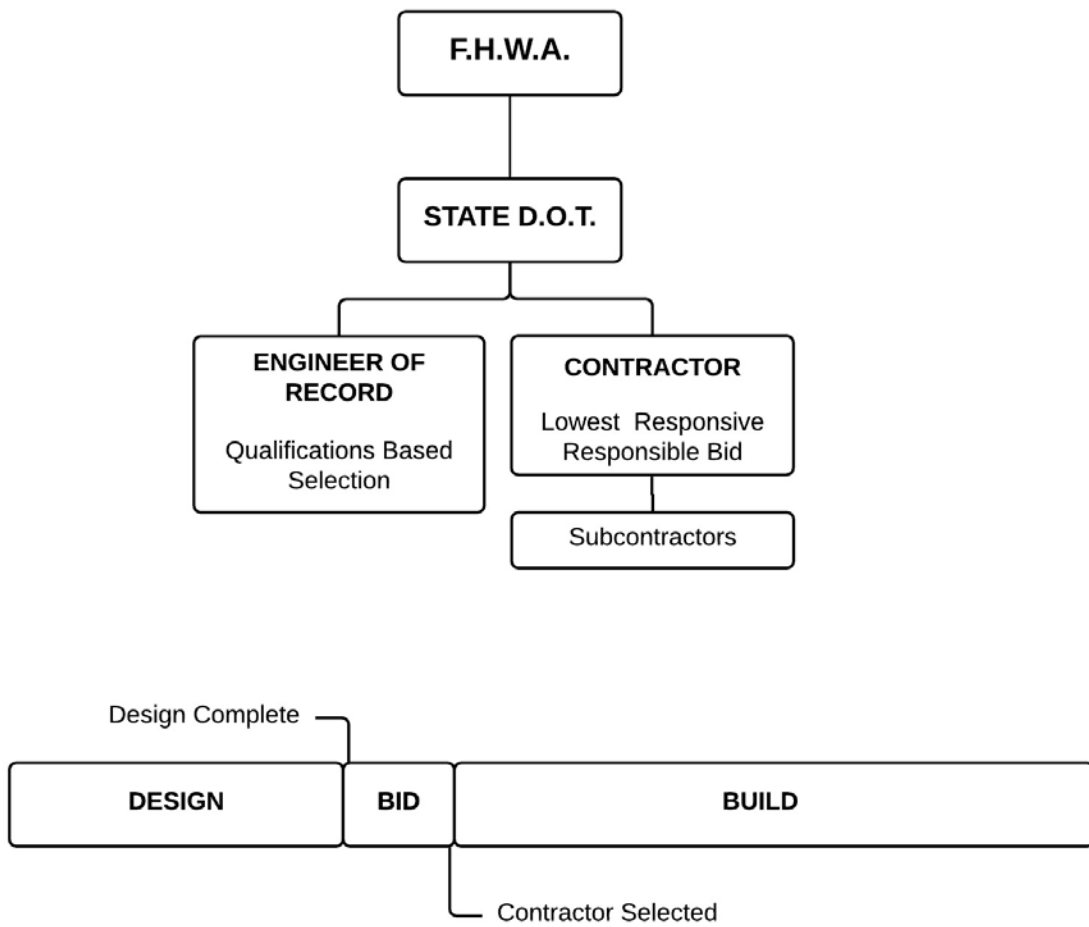
authority. Subsequent reauthorization bills streamlined the D-B process and today 45 states, plus the District of Columbia, authorize D-B in some fashion. Shown in Figure 1.5 is the D-B market share, by state, in the continental US, in 2013. As the chart shows the implementation of D-B varies from a high of 71 percent in Oregon to a low of 17 percent in South Dakota and Mississippi. D-B is fast becoming the new wave in project delivery.

The trend towards D-B is not without risk for the State DOTs. Perhaps the most critical danger of increased use of D-B would be to disregard the lessons learned from the Credit Mobilier scandal. Artificially limiting competition to three firms, for example, might lead to unexpected consequences, like bid-rigging and/or higher project costs. Combining design and construction into one contract could also shift the control of scope, or even the scale, of a project away from the State DOTs and to the contractor. The long-term effect on the construction industry could be the monopoly of large-scale transportation projects by just a few D-B contractors. Such a concentration of power could limit the State DOTs ability to safeguard the public health and welfare. Recent business scandals like Enron and WorldCom suggest that this “concentration of power” is a major concern.

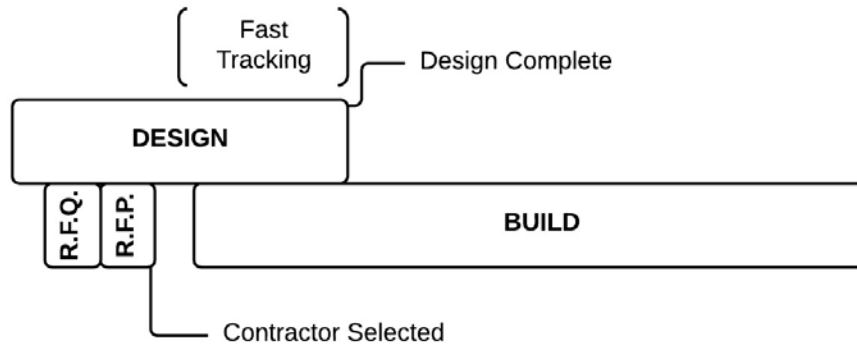
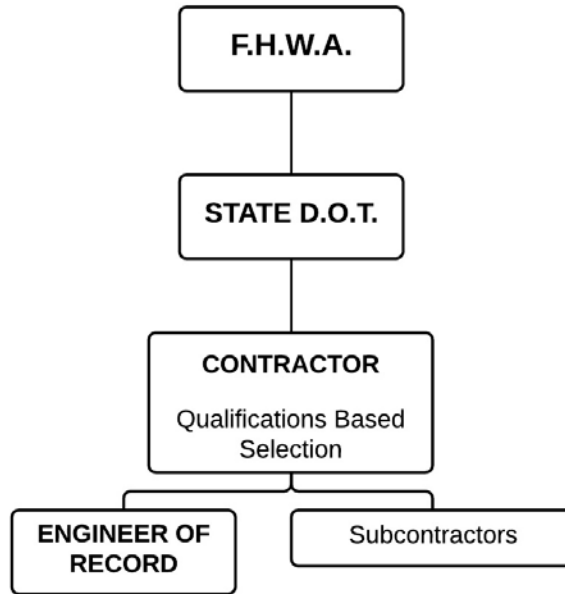
As State DOTs seek greater simplicity in directing and executing projects there is a trade-off - the loss of the checks and balances of the traditional model. This check and balance system was put in place by Congress to ensure that private entities were held accountable for the public funds they use. Separating the function of design from construction safeguards the public by placing their health and welfare above the financial only goal of the contractor. Cutting corners during

design to increase profits for the D-B contractor, for example, could lead to unsafe bridges, roadways, mass transit, and other critical public infrastructure. Or, like the crazily bent rail line constructed in Omaha by Credit Mobilier illustrates, putting the control of design in the hands of the contractor can lead to unjustified outcomes. The only purpose of the zig-zagged configuration was to increase profit by adding track. And according to the Historical Society of Pottawattamie County, to add “insult to injury”, the founder of Credit Mobilier (Thomas Durant) forced the city of Omaha to donate additional money and land to the Union Pacific to make it happen.

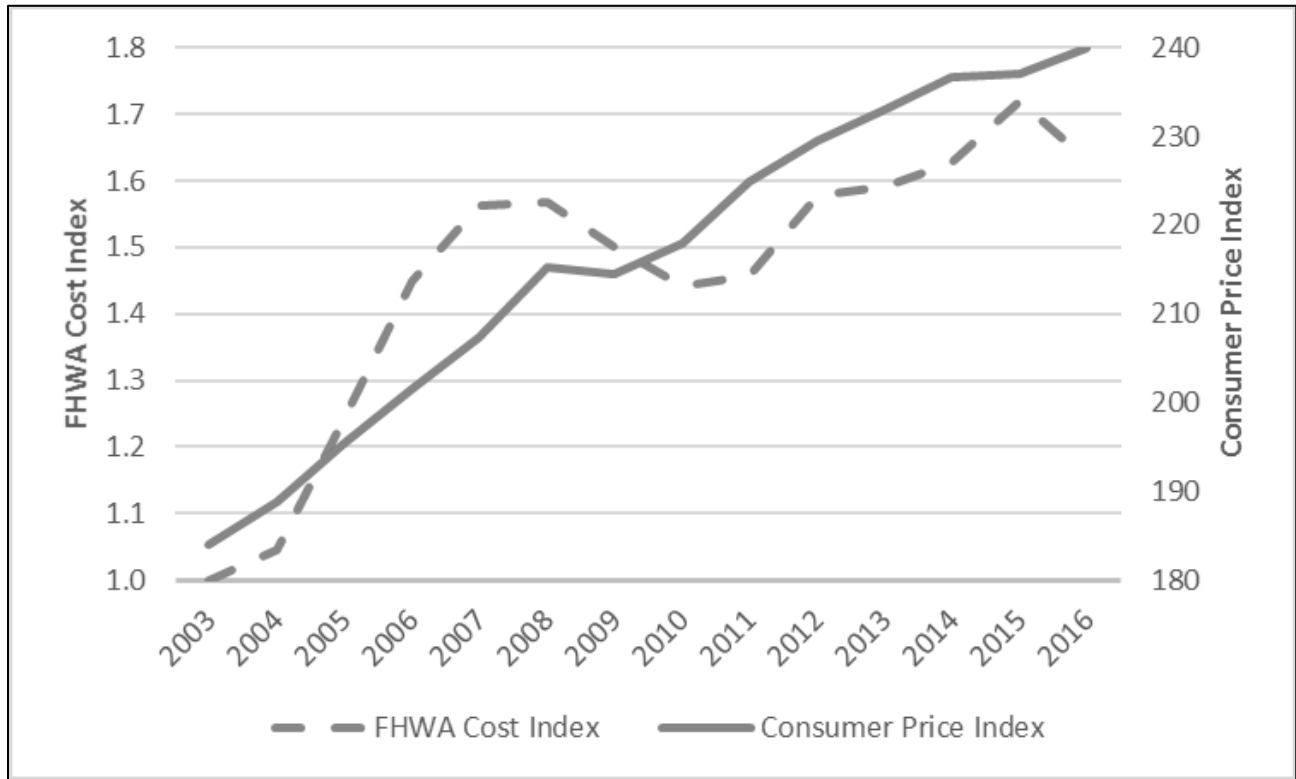
For private work, accountability is critical as well. Most privately funded facilities and infrastructure projects are intended for public use, and private work is often supported by government grants, payment in lieu of taxes, or other corporate welfare programs. Because of this, many government agencies still require the separation of design and construction on private work as well. For example, in New York State, Section 6512 of the Education Law, prohibits design professionals from contracting directly with contractors on both public and private work. In New York State D-B is illegal by statute. But as evident in the study data (40 percent of work in New York in 2013 was D-B) these provisions of the law are not being enforced.



**Figure 1.1 – Design-Bid-Build Approach**

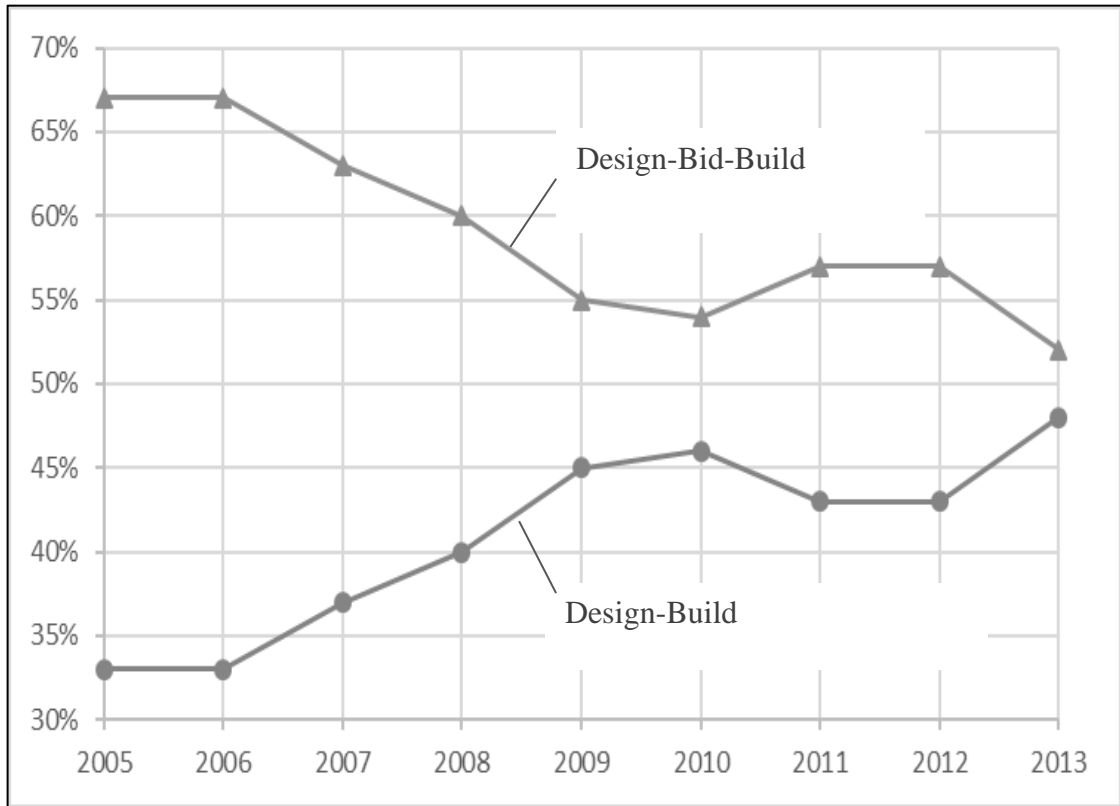


**Figure 1.2 – Design-Build Approach**



**Figure 1.3 – FHWA Cost Index**





**Figure 1.4 - Project Delivery Trends  
(Design Build Institute of America, 2014)**



**Figure 1.5 – Design-Build Market Share  
(RSMMeans Construction Data, 2013)**

**Table 1.1 Alternative Project Delivery Methods  
(Delaney, 2013)**

<b>Project Delivery Method</b>	<b>Description</b>
Design-Build Maintain	This takes the turnkey approach of the D-B model one step further by including the operations and maintenance of the completed project in the same original contract.
Design-Operate Maintain	Under this approach, the same contract governs the design, construction, operations, maintenance and financing of the project. After some concessionary period, the facility is transferred back to the owner.
Integrated Delivery	Integrated project delivery is an emerging business model that allows for the entire construction team (Owner, Contractor, and Design Professional) to collaborate during initiation to make the most effective decisions. Under this project delivery method, behavior and contractual relationships are enhanced by leveraging Building Information Modeling (BIM).

## CHAPTER 2

### Literature Review

There are two fundamental subject matters that are addressed in this study. As such, this review of the literature is delivered in two parts; research that has addressed the factors which influence the level of competition for the work, and those studies which have investigated the predictors of cost and time delays. This research combines the two through the new concept of bid quality defined by the Bid Quality Matrix. As depicted in Figure 2.1, bid quality is the concept that links the level of competition during bidding to final project results. The literature review found no past research which directly addresses the subject matter of this research.

#### 2.1 Level of Competition vs. Bid Quality

The level of competition for a project is directly linked to each contractor's bid/no bid decision. The decision-making process is complicated and is unique to each contractor, but can be generally be depicted as shown in Figure 2.2. In practice, the bid/no bid decision is determined individually by each contractor by accessing if the work can be performed at an acceptable profit level and the likelihood of winning the bid. For most projects, performance risk is the main unknown in determining the contractor's mark-up. Performance risk is made up of many components, including the size and/or complexity of the project, the aggressiveness of the schedule, and project specific conditions such as location and timing. Likewise, the level of competition is the main unknown in determining the probability of winning the bid. An assessment of the level of competition must

consider both the number, and the quality, of the bidders and a self-assessment of competitive advantage.

Interestingly, the earliest research suggests that the main factors that impact a contractor's bid/no bid decision are related to how favorably a potential project is perceived to be suited to the capabilities of the contractor (Ahmad and Minkarah, 1988). The research found that variables such as project type, location, amount, and degree of difficulty, are subjectively matched by the contractor with their capability to perform the work, and this becomes the primary motivation for submitting a bid. A following study (Moselhi et al., 1991) estimated a contractor's optimum mark-up and predicts the probability of winning a specific bid at that level of profit, in response to the known risk factors. Later research (Drew and Skitmore, 1992) indicated that such an approach increases a contractor's likelihood of success, as the study showed that large bidders are more competitive on large contracts, and that there was evidence to suggest that medium and small bidders are more competitive on smaller contracts. A following study (Eastham and Skitmore, 1993) broadened this "project fit" criteria to include long term portfolio considerations, such as business strategies for market share, entering new markets, and return on investment.

It has also been shown that an Owner's choice of procurement method, and reputation for both fair, and open, selection practices, has a direct bearing on the degree of competition since it affects the number of bidders competing for a contract (Drew and Skitmore, 1992). A different study (Eastham and Skitmore, 1993) used quantitative analysis to show that familiarity, and reassurance, with a client's bidding, and project management practices, enhanced a contractor's competitive

advantage. In practice, this process, best described as a feedback loop, is used by contractors to verify tactics that increase the likelihood of winning a bid. A later study (Fu and Drew, 2003) suggested that bid prices are set using a more complex form of a feedback structure, namely the “Price Competition Feedback Structure”. As depicted by the research team in Figure 2.3, to win a bid, contractors decide their bid price after they predict the possible prices of their competitors and what the market is for the work. In this case, the award prices of previous projects become an important reference, which was termed RMP “reference market price”. The research found, that to win a bid, contractors had to set their prices lower than the RMP and due to continuous competitions, each contractor improved its experience, approach to the work, and management skill, and bid prices dropped. Other approaches to model the bid/no bid decision process focused on the optimum mark-up value and/or a project’s fit with business goals and strategy. For example, one study (Lin and Chen, 2004) estimated an optimum mark-up value and predicts the probability of winning a bid at that profit level, in response to the project risk pattern. Additional research (Moselhi et al., 1991) examined construction companies' project selection decisions from a portfolio viewpoint. In addition to the mark-up value, consideration of the alignment of the project with the contractor’s business objectives, was included. A method was proposed by which objective decisions may be made considering the risks involved.

Other approaches to model the bid/no bid decision process focused on project specific attributes such as the client, the size or scope, and work type. One of those studies (Eastham and Skitmore, 1993) concluded that bidding decisions are greatly influenced by subjectively evaluated criteria, such as type of job, location, size of job, need for work, Owner, subcontractors, degree of hazard,

and degree of difficulty. Competition and profitability, although significant, were not the top ranked factors. A different study (Drew and Skitmore, 1992) examined the relationship between the competitiveness of contract bids entered by individual bidders through the variables of bidder size, contract value, and project type. The research found that large bidders seem to be more competitive on large contracts and there was evidence to suggest that medium and small bidders are more competitive on smaller contracts. They also found that the level of competition is largely determined by each contractor's familiarity with the client and/or advisors. They found that the client's choice of the bidding system coupled with bidder selection practices had a direct bearing on the degree of competition since it affects both the number and identities of bidders competing for a contract. Approaching the topic from a unique perspective, a different research project (Mills and Skitmore, 1999) studied why contractors decide to prequalify for work for both private and public-sector clients. Interestingly, the private contractors considered such factors as profit and the number of claims on previous projects to be important. The public contractors did not.

Other research looked at ways to enhance the success of a contractor's bid/no bid decision making, by proposing mathematical models of the process. One study (Skitmore et al., 2007) proposed a bidding strategy model that combined the concepts of the "best fit" with "optimum markup". The model was described as a "more informed" approach in selecting which contracts to bid on, and as a basis for determining the most appropriate mark-up level for distinct types and sizes of projects and client types. It concluded that the "difference between the lowest and second lowest bids is of value in strategic bidding; providing an indication of mistakes in bids; determining a justifiable amount of bid security; and a means of providing some insight into the consequences

of non-traditional auction arrangements”. Interestingly, a widely used textbook on estimating and bidding (Pratt, 2004) suggests that unlike estimating, bidding strategy has largely been carried out without any real supporting data. The book puts doubt that sufficient data can be obtained for each bidder for any effective predictions to be made. To the contrary, a recent study that considered the problem (Mohammad, 2012), proposed a mathematical model for making the bid/no-bid decision that consisted of two components; the current attributes of the bid and past bid results on similar projects.

## **2.2 Level of Competition Vs. Project Performance**

There have been several studies of the cause of cost overruns and time delays on construction projects. These past studies can be divided into the following categories based on the potential influencing factors they addressed. Some of the studies focused on a specific predictor variable, but many looked at the relative effect of a combination of these factors:

1. Project Size
2. Project Type
3. Level of Competition
4. Contract Document Quality
5. Project Management Effectiveness
6. Project Specific Items
  - a. Unforeseen Conditions



- b. Weather Conditions
- c. Economic Conditions

These factors can be broadly grouped into procurement and non-procurement (execution) related items as outlined in Table 2.1. Competition for the work is unique as its influence occurs only during the procurement phase.

The first study to focus solely on the level of competition was performed in 1986 (Rothrock and Repole, 1986). That study found that at the contract level, competition is an extremely critical issue. The study found that low bids on contracts which received only one or two bid responses, representing 16 percent of all contracts, were much higher than the engineers estimate (by an average of 9-10 percent). When the number of bidders ranged from three to five, low bids came in just over the estimate by an average of 1-2 percent. However, on the 28 percent of all contracts that received at least six bids, the low bids averaged 2-4 percent under the estimate. According to the researchers, “the figures stress the importance of bidding competition in receiving reasonable prices for highway construction work”. Later research (Vidalis and Najafi, 2002) investigated causes for cost and time delays in 708 highway projects for the FDOT (Florida Department of Transportation), constructed between 1999 and 2001 with a combined original contract amount of over \$1.9 billion. A cost overrun was defined as a percentage difference between the completion cost and the contract bid cost. A time overrun was defined as the difference between construction bid duration and completion duration, expressed in percentage of bid duration. The main objective of the study was to identify the reasons for cost and time overruns in these projects.

The data analysis showed that 34 percent of cost overruns were caused by changed conditions and 29 percent of the time overruns were due to the results of errors in the plans and specifications. The study did not consider the level of competition during bidding as a predictor of cost or time delays. A different study (Carr, 2005) found that “there is little published evidence and analysis on bid competition impacting cost-effectiveness, although there are numerous reports replete with arguments, assumptions, anecdotal evidence, and bias”. That research was unique in that it was a quantitative analysis of the impact of reduced competition on project bid prices. The study found that reducing the number of bidders resulted in increased bid prices. There was a 3.79 percent increase in the contract award amount, on average, for each bidder lost. An earlier study (Hong and Shum, 2002) used bid data from the NJDOT (New Jersey Department of Transportation), for the years 1989-1997. The research showed that the number of bidders was negatively correlated with the lowest bid. A paper (Hanak and Muchova, 2015) published in 2015 examined the issue of the competitive environment within public works contracts and explored the influence of the number of bidders on bid results. A research sample of 256 public projects supported the assumption that the number of bidders influences the relative difference between the engineers estimate and the bid price. It was concluded that contracting authorities must take steps “to motivate enough bidders to participate in the bid to achieve competitive prices”. A more comprehensive study (Bordat, et al., 2004) included “bid comparison” variables in the statistical analyses of INDOT projects for identifying the factors that significantly influence cost overruns and time delays. Predictor variables included the difference between the amounts for the winning bid and the second bid, the proportion of the difference between the winning bid and the engineers estimate, and the level of competition. In that study the three bid comparison variables were found

to be significant. The level of competition had a decreasing effect, suggesting that higher competition is associated with lower cost overruns. The results also suggested that when the difference between the winning bid and second bid was high (large bid spread), greater cost overrun amounts were encountered. When the difference between the winning bid and the engineers estimate was high, there were lower cost overruns. A more recent study (Bhargava et al., 2010) used Three-Stage Least Squares analysis to study the reasons for cost overruns on 1,862 INDOT highway projects. In that study the “results of the contract bidding process” were found to be statistically significant. The most recent study was conducted in 2015 (Forsberg, 2015) on 496 public construction projects in Finland. The study found that for each additional bidder there was a 2.5 percent decrease in bid prices, and for each 1 percent decrease in bid prices, there was a .16 percent decrease in project cost overruns.

There has been considerable work that has employed advanced data mining techniques to produce predictions on project performance. One (Son et al., 2012) developed a model using Principal Component Analysis and Support Vector Regression using 64 project definition variables to predict cost performance on building projects. The model could predict, during the initiation phase, the final cost performance of commercial building projects, with a modest level of accuracy. More specific to this research, econometric models (Gkritska and Labi, 2008) have been applied to the analysis of highway project cost overruns. They found that for a given project type and project duration, contracts of larger size or longer duration are generally more likely to incur cost overruns. Other advance statistical methods, such as multivariant regression and neural networks have been applied to predicting construction project performance. In some cases, bid

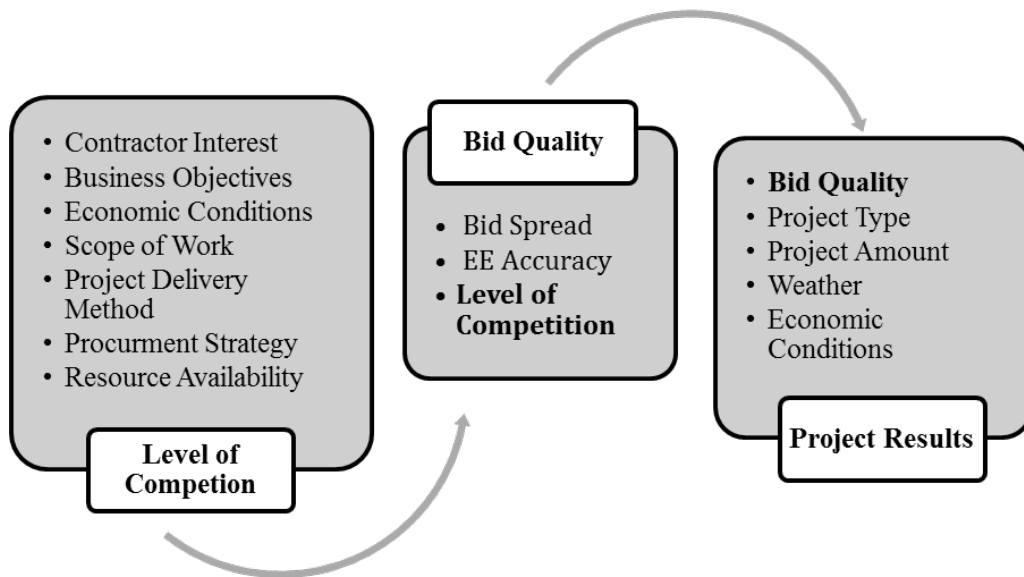
information was studied for inclusion as inputs to the models. For those studies, the data set included the low bid, median bid, standard deviation of the bids, expected project duration, and the number of bids. Interestingly, in a study of NJDOT projects (Trost and Oberlender, 2003), the regression model used only the natural log of the low bid as the independent variable to predict the natural log of the completed cost. In that study, neural networks (radial basis) were also developed to predict the final cost. The simple regression model using the natural log of the low bid as input produced the best results. From the analysis, the researchers concluded that “additional information about the variability of the bids submitted does not provide useful information for predicting the final project outcome”.

### **2.3 Lessons Learned**

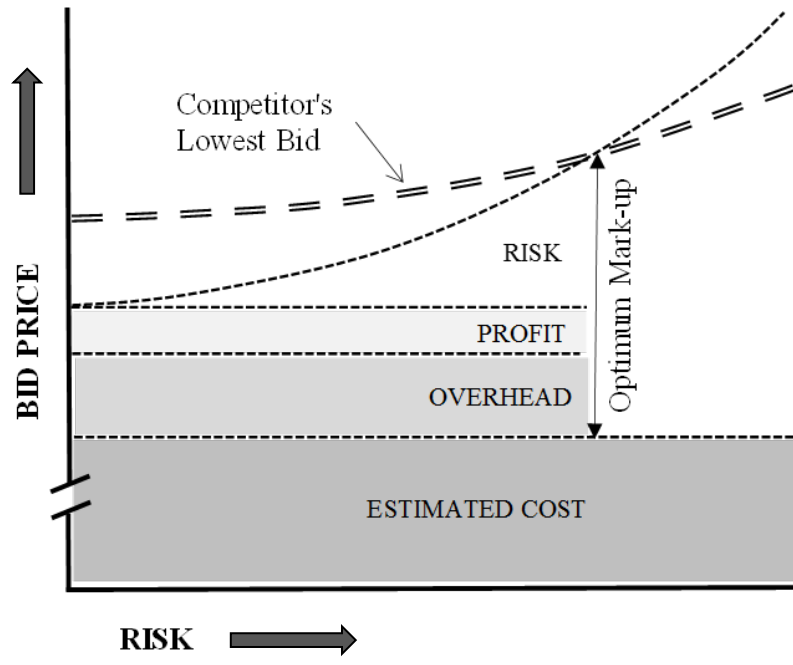
The knowledge gleaned from the literature review was as follows:

1. Several studies regarding the bid/no-bid decision, have confirmed that contractors evaluate two important criteria; if the work can be performed at an acceptable profit level, and their likelihood of winning the bid.
2. Research has confirmed that the bid spread, and the deviation from estimate, are good indicators of overall competitiveness between contractors.

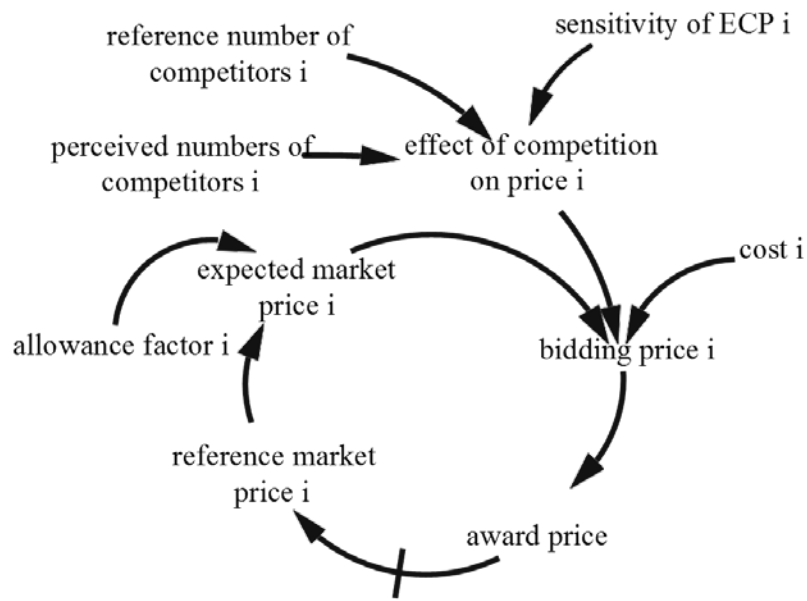
3. Research has shown the level of competition for the work has an inverse relationship on bid prices. More competition leads to better prices. A summary of the quantitative findings is included in Table 2.2.
4. Research has shown that there is a positive relationship between the bid price and the cost overrun percentage. The higher the bid price the higher the cost overrun percentage.



**Figure 2.1 – Research Subject Matter**



**Figure 2.2 – Bid/No-Bid Decision Process**



**Figure 2.3 – Bid Price Competition Feedback Structure (Fu and Drew, 2003)**



**Table 2.1 – Performance Factors**

Factor	Influence	
	Procurement	Execution
Project Size	✓	✓
Project Type	✓	✓
Competition	✓	NA
Document Quality	✓	✓
Project Management	✓	✓
Weather Conditions	NA	✓
Economic Conditions	✓	✓
Unforeseen Conditions	NA	✓

✓ Primary

✓ Secondary

**Table 2.2 – Competition’s Effect on Bid Prices**

<b>Study</b>	<b>Lowest Bid - Engineers Estimate</b>
Rothrock and Repole 1986	$\leq 2$ bidders, 10% over $\geq 2, \leq 6$ bidders, 2% over $\geq 6$ bidders, 4% under
Carr 2005	Each additional bidder = 3.8 % decrease in bid price
Forsberg 2015	Each additional bidder = 2.5% decrease in bid price

## CHAPTER 3

### Methodology

#### 3.1 Research Questions

The study's aim was to determine if the level of competition plays a significant role in determining bid quality and final project outcomes for State DOT projects. As part of that effort, the research also sought answers to the following related questions:

1. What are the factors that influence the number of bidders/bid?
2. What are the factors that indicate the level of risk inherent in each bid result?
3. What are the factors that influence whether a project experiences significant cost overruns or time delays?
4. Do the factors that determine the number of bidders/bid also directly, or indirectly, influence the likelihood of a cost overrun or time delay?
5. What is the singular effect of the number of bidders/bid on bid quality?
6. What is the singular effect of the number of bidders/bid on cost overruns and time delays?

### 3.2 Hypotheses

The following six hypotheses, and the related null hypothesis, comprise the basic premise for the study:

1. A combination of two commonly used bid quality metrics, the bid spread and the deviation from estimate, represent the relative level of risk inherent in awarding a bid based on the lowest price,
2. There is a statistically significant correlation between the level of competition for the work and the bid spread,
3. There is a statistically significant correlation between the level of competition for the work and the deviation from estimate,
4. The risk of awarding a contract increases as the number of bidders decreases,
5. The likelihood of cost overruns, and/or time delays, increases as the risk of awarding a contract increases, and
6. In recursive bidding situations, and where projects are managed with a standard practice and level of care, bidding and final project results can be appropriately and accurately compared between projects.

The study was structured to test the null hypothesis that the level of competition during bidding had no considerable influence on the quality of bid results nor final project outcomes.

### 3.3 Theoretical Foundation

There has been significant research regarding bidding behavior in the construction industry where the contractor is selected based solely on the lowest-bid criteria. This research has focused in four principal areas:

1. Study of the risk factors that influence a contractor's decision to submit a bid, i.e., the "bid/no bid decision". The studies indicate that variables such as project type, location, amount, and degree of difficulty, are subjectively matched by the contractor with their perceived capability to perform the work, and this becomes the primary motivation for submitting a bid (Ahmad et al. 1988) (Moselhi et al. 1991). Later studies (Eastham et al. 1993) broadened this "project fit" bid/no bid criteria to include long term portfolio considerations, such as business strategies for market share, the desire to enter a new or emerging market, and return on investment.
2. Research on the external environmental factors which influence the level of competition for a bid. This research has included factors such as the general economic situation, fluctuation in material and labor costs, and the time of year (Milgrom, 1985) (Nyoman et al., 2014).
3. Evaluation of procurement processes and associated factors which influence the level of competition for a bid. The studies to-date have centered on issues such as the selection of the project delivery method, the quality of the construction

documents, the quality of the procurement process, the structure of the contract, the reputation of the Owner and the Owner's Project Team, and the type, size, and number of work packages (Nyoman et al., 2014) (Bagies, 2006).

4. Study of the competitive factors that determine whether a contractor's bid is the lowest (and responsible, and responsive) and thus selected for award. Factors such as the level of competition (Friedman, 1957), the contractor's resume and experience (Drew and Skitmore et al, 1992), and the level of anticipated profit (Gates, 1967) (Moselhi et al, 1991), have been shown to affect the competitiveness of a contractor's bid to a varying degree.

There also has been a great deal of research on the factors that influence project delivery success. These studies have been conducted in parallel, and generally not correlated with, the study of construction bidding behavior. Key Performance Indicators (KPIs) for project delivery success have been proposed in two categories; objective measures such as cost and schedule performance, and subjective measures, such as quality and functionality (Mahmoud and Stephen, 2002). Most of the quantitative research has been focused on the cause and effect of cost overruns and schedule delays (Chan, 2001). Additionally, in a few cases, the correlation between cost and schedule performance, i.e., the "time is money" principle, is explored (Delaney, 2006) (Carnell, 2008).

Studies of KPI's for subjective measures, such as a project's level of quality and functionality, have been presented, but they have not been consistent in concept nor approach. Developing a

standard set of metrics to determine if a project is a success, or failure, based on subjective measures, has been problematic to researchers, partly because the parties who are involved in a project perceive the concept differently (El-Sokhn and Othman, 2014). It has also been shown that project participants avoid discussing failure cases, making even objective data, such as cost and schedule performance, vulnerable to manipulation. Most significant is the reality, that due to the fear of harming the reputation of the parties involved, project failure cases are rarely reported (Ortega, 2000).

This research combines the two subject matters through the new concept of bid quality defined in the Bid Quality Matrix. Bid quality is the concept that links the level of competition during bidding to final project results. The literature review found no past research which directly addresses the subject matter of this research.

### **3.4 Nature of the Study**

The study's main objective was to determine if there was a correlation between bidding results, bid quality, and final project outcomes. As shown in Chapter 2 – Literature Review, generally, past research on competitive bidding behavior has been uniform and reliable, whereas, research on the reasons why a project is a success or failure have been inconsistent and less than reliable. Moreover, there have been no significant studies that have tried to correlate the two. Because the theoretical foundation is weak in that regard, the approach for this study was to use deductive reasoning to supplement the theory and then use observed results, and statistical analysis, to determine if a correlation between bidding results and bid quality, and bid quality on final project outcomes existed, and if so, to what degree. To facilitate the research, the study was divided into

two parts, the first part addressing procurement risk, and the second part addressing those critical factors that influence final project outcomes (Figure 3.1). The strategy was then to determine if the level of competition played a key role in both instances. To begin the process, a cause/effect diagram was created which identified potential factors that could influence both bid quality and final project outcomes. The cause/effect diagram developed for this study was unique as it included the level of competition (number of bidders) with other more frequently researched factors, such as project scope, project amount, micro and macro-economic conditions, and weather effects (Figure 3.2). The study proceeded as detailed below.

1. A pilot study was first performed to evaluate the information gleaned from the literature that formed the basis for the theoretical foundation. Basic statistical analysis (Descriptive Statistics, Ordinary Least Square Regression, and a Two Sample Equivalence Test) was performed on a set of 1,417 State DOT certified bids. The results confirmed the critical parameters and signaled that a more comprehensive study was warranted.
2. The first step in the comprehensive study was to develop a method to measure the relative risk of awarding State DOT contracts to the lowest bidder based on observed bid results. Risk was categorized as either process or performance based. Process risk was defined as the risk inherent in the procurement process and performance risk was defined as the risk associated with proceeding with the lowest bid contractor. The metrics used were the bid spread and the deviation from estimate. The bid spread was determined by taking the difference between the second lowest bid and the lowest bid. The deviation from estimate was calculated by subtracting the engineers estimate from the lowest bid. The method



established to classify bid quality was the Bid Quality Matrix which defined each bid result as either acceptable, ideal, or unfavorable, based on specific combinations of the bid spread and the deviation from estimate. The Delphi Technique was used to gain consensus from construction professionals on how to grade each observed bid result. To see if the level of competition influenced the classification of the observed bid results, the statistical technique of Multinomial Logit Regression (MLR) was used. MLR was considered as it is an extension of binomial logistic regression and allows for a dependent variable with more than two categories.

3. The final step in the comprehensive study was to determine if the level of competition, through its influence on bid quality, affected final project outcomes. Final project outcomes were defined as cost overruns and time delays. Three Stage Least Squares (3SLS) regression was used to determine if a correlation existed and to what extent. 3SLS regression was chosen because the method allows for situations of reverse causation. Project outcomes are affected by the “time is money” principle which is an example of reverse causation. The “time is money” principle has been shown in past research to be present when measuring final project outcomes because cost overruns can cause time delays (additional cost might indicate additional scope for example), and time delays can cause cost overruns (a time delay could increase escalation costs for example). To achieve the best results, 3SLS regression requires that all measurable potential influencing factors be included in the analysis. So, in addition to the level of competition, discrete data on project type, project amount, start date, economic conditions, and weather impacts, was

collected. The final parameters for the study can be found in Table 3.1. which were collected for all 1,040 projects.

### **3.5 Significance of the Study**

Currently there is no standard way to assess the risk of a competitive bid letting. This study proposes the concept of the Bid Quality Matrix, which uses the bid spread, and the deviation from estimate, to classify observed bid results as acceptable, ideal, or unfavorable. If properly developed, the Bid Quality Matrix could be used as a tool across projects to gauge procurement risk based on observed bidding behavior. In the past, practitioners have relied on “seat of the pants” techniques to assess the quality of a bid letting. The Bid Quality Matrix would improve the process by providing a level of context that is surely needed.

The study endeavors to establish a statistical correlation between increased competition during bidding and improved project performance. Such a result would have a profound impact on State DOT procurement practices. It could, for example, influence how State DOTs develop bid packages, how, and when, they solicit bidders, and when projects are put out to bid. Past research has shown that these factors directly influence the number of bidders/bid. Such a result could also play a role in the continued use of, and/or the pace of adoption, of alternative project delivery methods like D-B, or other unusual procurement strategies like PLA’s. These methods of procurement have been shown in past research (Tuerck, et al., 2009) to artificially reduce competition. If it can be proven that more bidders leads to better outcomes, then the negative

impact of limiting competition would have be taken into consideration by State DOTs when choosing contracting methods other than the traditional approach.

### Competition Vs. Bid Quality

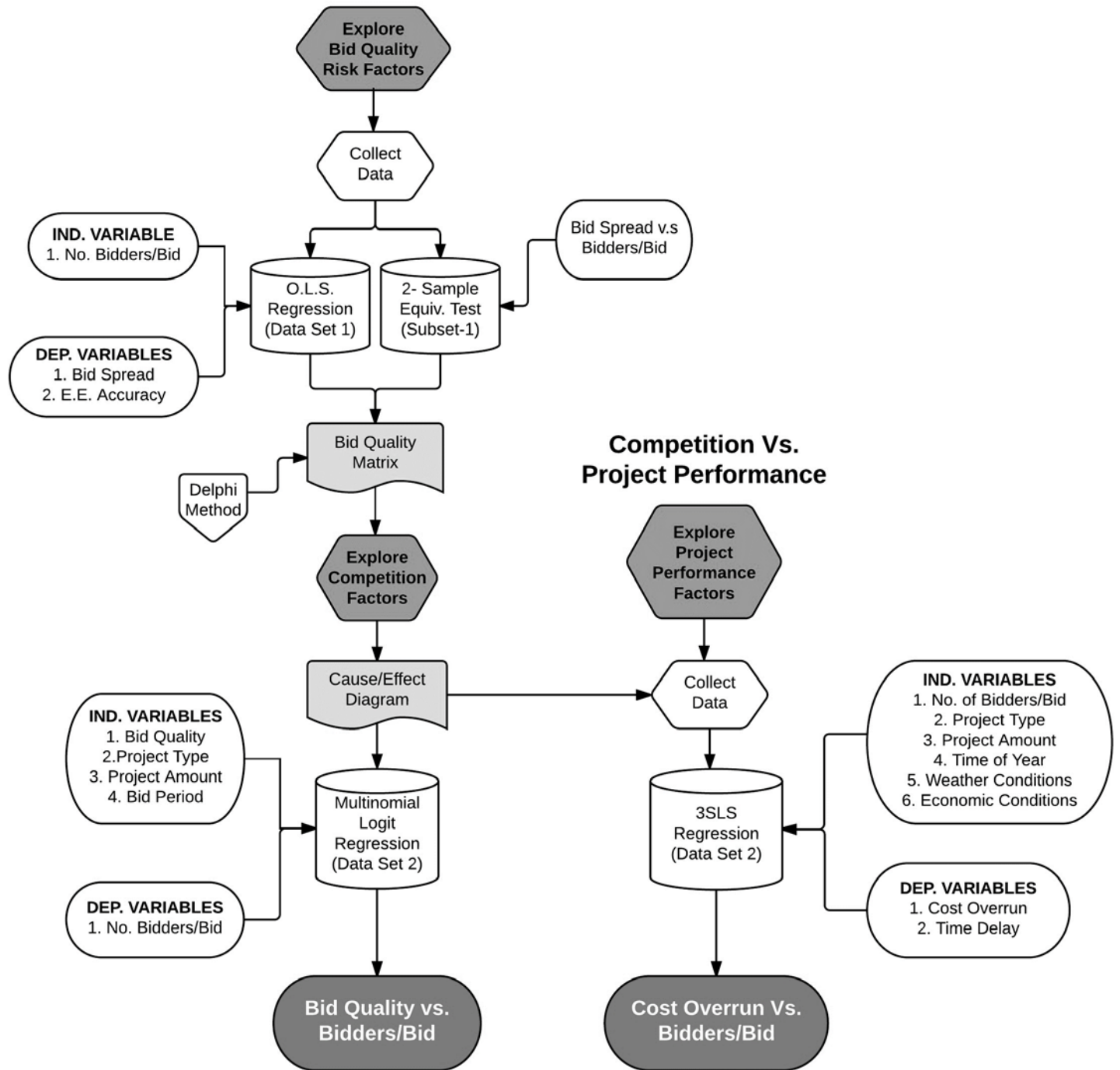


Figure 3.1 – Research Outline

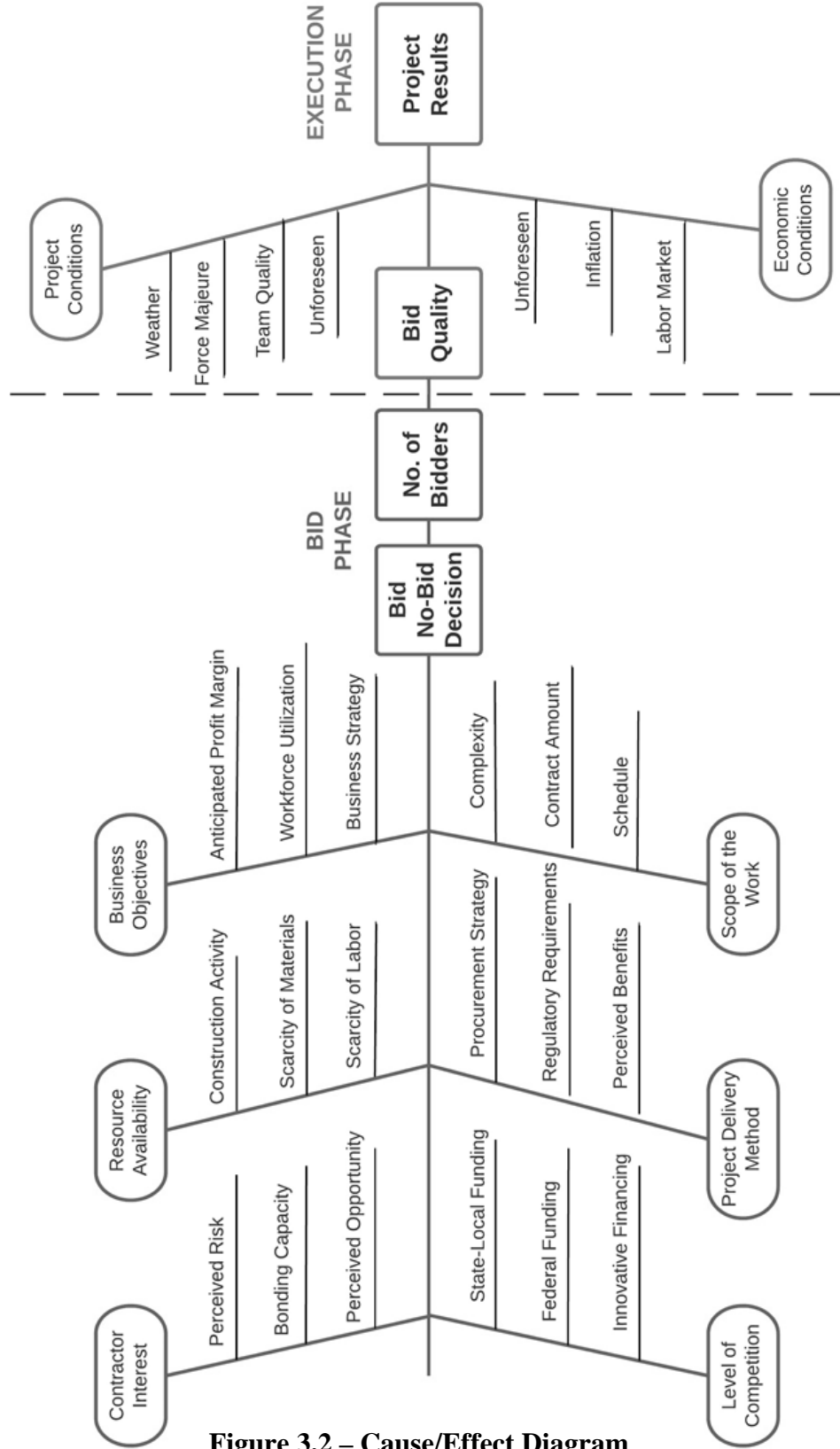


Figure 3.2 – Cause/Effect Diagram

**Table 3.1 – Potential Model Variables**

Variable		Description	Type	Model
<i>c</i>	Cost Overrun	Actual Cost - Engineer's Estimate	D	Cost/Schedule Performance
<i>bp</i>	Bid Period	Northern Meteorological Seasons 1. Spring (March 1 – May 31) 2. Summer (June 1 – August 31) 3. Fall (Sept. 1 – Nov. 30) 4. Winter (Dec.1 – Feb. 28/29)	P	Bid Quality
<i>bq</i>	Bid Quality	Bid Quality Matrix 1. Ideal (I) 2. Acceptable (A) 3. Unfavorable (U)	D	Bid Quality
<i>e</i>	Deviation from Estimate	Lowest Bid - Engineer's Estimate	P	Bid Quality
<i>la</i>	Labor Availability	Construction employment level during the execution phase of the project. Data from the ENR Construction Employment Index – Washington State, 2007-2015	P	Cost/Schedule Performance
<i>n</i>	Level of Competition	Number of Bidders/Bid	P	Bid Quality and Project Performance
<i>pa</i>	Project Amount	Award Amounts 1. Less than \$1,000,000 2. Between \$1,000,001 and \$5,000,000 3. Greater than \$5,000,000	P	Bid Quality and Project Performance
<i>pl</i>	Precipitation Levels	Precipitation level, above/below the mean level of the study period, during the execution phase of the project. Data from the National Weather Service – Washington State, 2007-2015	P	Cost/Schedule Performance
<i>ps</i>	Project Start Date	Start date of the project.	P	Cost/Schedule Performance
<i>pt</i>	Project Type	WSDOT Project Type 1. Bridge 2. Highway 3. Other – Safety, Paving, Maintenance, Ferry	P	Bid Quality Cost/Schedule Performance
<i>s</i>	Bid Spread	Second Lowest Bid - Lowest Bid	P	Bid Quality
<i>t</i>	Time Delay	Actual Duration-Contract Duration	D	Cost/Schedule Performance

## **CHAPTER 4**

### **Data Gathering Process**

#### **4.1 Introduction**

Because this research integrated two distinct subject matters, it was critical that the following rules were followed regarding data collection:

1. Bid quality had to be defined identically for both parts of the study,
2. All independent variables that had been shown in past research to influence bid quality and/or final project results, had to be considered, and
3. All potential predictor variables in this study that might influence both bid and final project results, had to be identically measured and calculated.

#### **4.2 Data Gathering Process – Bid Tabulations (Data Set 1)**

The objective for this part of the study was to obtain certified bid results that were representative of all State DOT projects (sample population). The State DOTs recurrent bidding situation for D-B-B projects generally ensures aggressive competition for the work and “levels the field” regarding openness and fairness (Fu & Drew, 1999). As part of that openness, all State DOTs are required to follow the same federal procurement guidelines (23U.S.C.112) and to openly publish bid results. Several states provide this information on-line, however, each has its own system for recording bid results, and each archive historical data differently. New York (NYSDOT), Michigan (MDOT), Indiana (INDOT), and Washington State (WSDOT) record and archive bid data in a similar fashion.

The bid tabulations, for these State DOTs for the year 2015, were selected from a pool of similar postings. This data was used to represent the sample population for the research.

Several State DOTs, including NYSDOT, do not include the engineers estimate in the public posting of their bid results. Confidentiality of the engineers estimate is encouraged by the FHWA to limit the potential of what it refers to as “rigged bids” or, in other words, collusion between bidders. Because the NYSDOT bid results did not include the engineers estimate, only the information related to the bid spread was used in the study. A sample of the bid tabulation report for the MDOT is provided in Figure 4.1; NYSDOT, WSDOT, and INDOT post similar bid information in a similar fashion.

A total of 1,417 bid results for the year 2015 were analyzed which totaled \$2.929 billion in contract value. Descriptive statistics for Data Set 1 are provided in Table 4.1. It is estimated that this data set represents well over 10 percent of all U.S. State DOT D-B-B bid results for 2015.

#### **4.3 Data Gathering Process – Project Performance (Data Set 2)**

The foundation for this part of the study was simple cost and schedule measures – “was the project built for the expected cost,” and “was the project built on the expected schedule”? However, unlike the requirement to publicly post bid tabulations, the FHWA does not require final project results to be shared with the public, and research found that they are seldom provided by the State DOTs. WSDOT is an exception, and as part of the Results WSDOT (WSDOT – 2014) initiative, a comprehensive, on-line, system has been developed to record, archive, and post final project results.



WSDOT has developed a unique methodology (the Gray Notebook) to define and track performance for all projects. Their Gray Notebook is a quarterly performance and accountability tool. Each edition of the report features quarterly and annual updates on key agency functions and provides in-depth analysis of final project results. The “stewardship” portion of the report provides statistical data on the following key indicators:

1. The cumulative number of projects completed, and the percentage, on time,
2. The cumulative number of projects completed and percentage on budget, and
3. The variance of total project costs compared to budget expectations.

Figure 4.2 includes key indicator data from the most recently posted report. The results from WSDOT appear to be above average as compared to other State DOTs. WSDOT reported that 87 percent of their projects were completed on time, and 91 percent were completed under budget. The American Association of State Highway and Transportation Officials (AASHTO) prepared a detailed analysis of the performance by 20 State DOTs (Crossett and Hines, 2007) completing more than 26,500 projects over a five-year period between 2001 and 2005. Results for the five-year period reviewed:

1. State DOTs in the study averaged 46 percent of all projects built at or below original award amounts with 81 percent built within a cushion of 110 percent.
2. For projects over \$5 million these figures drop to 18 percent built at or below original award amounts and 70 percent built within a cushion of 110 percent.

3. State DOTs averaged 53 percent of all projects built within their original schedules.
4. For projects over \$5 million this figure slid to 35 percent.

It is interesting to note that, according to the AASHTO, “Many states agreed to participate in the study on condition that their relative rank in terms of performance was not shared with other states unless they were found to be a top performer”. It seems that not only do the State DOTs want to keep this information from the public, they do not even want to share it with other State DOTs. Nonetheless, the project data used for WSDOT’s stewardship program is very comprehensive, and includes:

1. Project description data, including the project type, project funding and financing sources, the project delivery method, and the region where the work was performed.
2. Bid tabulation data, including the bid date, the number of bidders, the engineers estimate, the lowest and second lowest bidders, and the final award amount.
3. Final project status data, including the variance between the engineers estimate and the final project cost, the variance between the award amount and the final project cost, and the difference between the contractual completion date and the actual completion date.

Mining of the WSDOT data for this study involved a thorough review of each record to remove obvious errors and duplicates, filtering the data to include only those variables needed in the research, and exporting (WSDOT keeps in .txt format) to Microsoft Excel for “ease of use”.

In addition to the factors included in WSDOT’s Gray Notebook, information on weather conditions and employment levels during construction was needed as it was hypothesized that these two factors also play a significant role in final project results. For these factors, additional research was required to obtain metrics that could identify their potential impact. For weather conditions, the amount of precipitation in inches, obtained from the National Oceanic and Atmospheric Administration (NOAA), was superimposed on the individual construction schedules for all 1,040 WSDOT projects (Table 4.2). An average precipitation level over the construction period was then used to provide a relative measure between projects. Over the seven-year study period there was significant variation in the amount of precipitation as shown in Figure 4.3. Therefore, if precipitation levels indeed affected cost overrun, or time delay percentages, it most likely would be confirmed by the model.

In addition to weather conditions, local economic factors were also considered to potentially effect final project results. Because the availability of skilled labor impacts productivity, which can directly influence a project’s cost and schedule, employment levels were used as the best way to gauge local economic conditions. Employment levels were obtained from the Engineering News Record Construction Employment Index for Washington State. The mean employment level for each project’s time frame was compared to the mean employment level for the study period (2007-

2015) to obtain a relative score (+/-) of labor availability amongst projects. Over the seven-year study period there was significant variation in the available pool of construction labor as shown in Figure 4.4.

The final data set consisted of 1,040 bid and final project outcomes for the WSDOT, for the years 2007 - 2014, representing almost \$3.5 billion in completed projects. The eight-year date range was selected to encompass potential variation in exogenous factors such as economic conditions, skilled labor availability, and adverse weather affects. Descriptive statistics for Data Set 2 are provided in Table 4.3.

The objective of the data gathering process was to find sample data that would represent all 50 State DOTs which utilize the D-B-B method. Because of the size and breath of the sample data used, the FHWA's standard of care that is universally implemented by State DOTs, and the recursive nature of the procurement process, it is believed that the data used was a sufficient sample of that population for statistical analysis. A numerical summary of the fields and records for the combined Data Set 1 and Data Set 2 is included in Table 4.4.

Letting of November 4, 2016

Letting Call: 1611 009

Project: STU 25049-121488

Local Agreement: 16-5466

Start Date: 10 days after award

Low Bid: \$2,384,940.70

Engineer Estimate: \$2,292,058.75

Pct Over/Under Estimate: 4.05 %

Completion Date: September 30, 2017

Description:


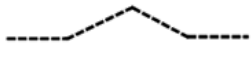

1.56 mi of hot mix asphalt cold milling and resurfacing, pavement removal, drainage, pavement repairs, impact attenuators, concrete, curb, gutter, sidewalk and ramps and guardrail on Fenton Road from Hemphill Road to I-69 in the city of Flint, Genesee County.

5.00 % DBE participation required

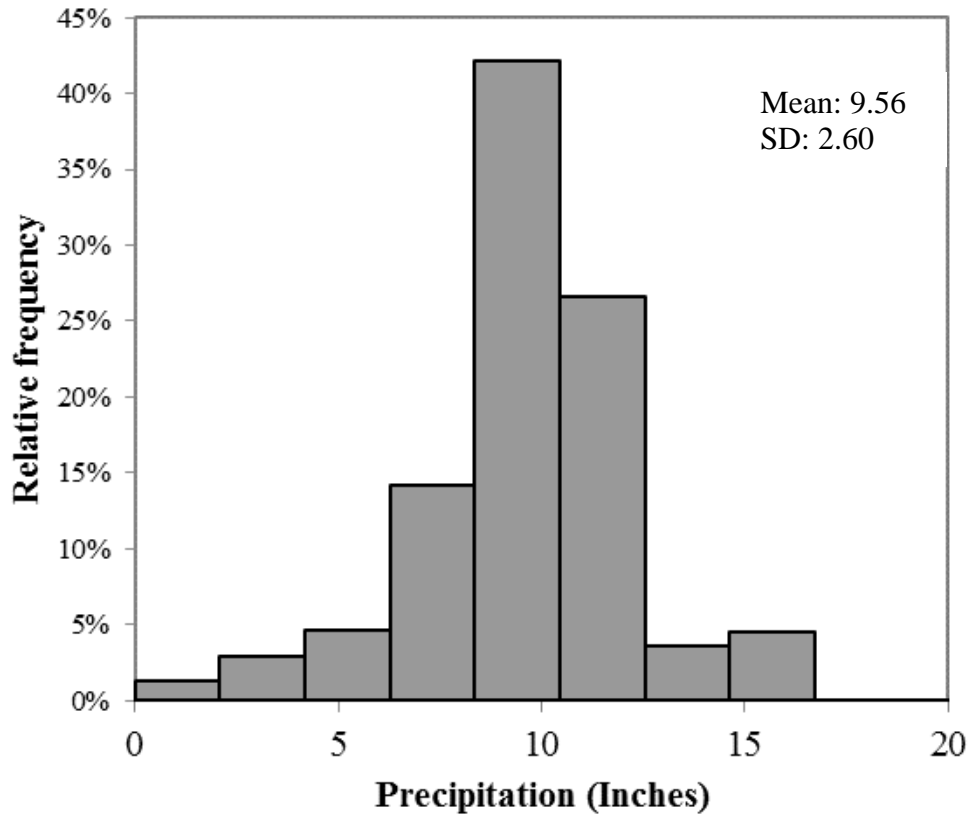
Bidder	As-Submitted	As-Checked	
C & D Hughes, Inc.	\$2,384,940.70	Same	1 **
Zito Construction	\$2,452,166.00	Same	2
Ace-Saginaw Paving Company	\$2,484,113.76	Same	3
Florence Cement Company	\$2,495,439.26	Same	4
L. A. Construction, Corp.	\$2,606,324.49	Same	5
Cadillac Asphalt, L.L.C.	\$2,631,405.56	Same	6
Angelo Iafate Construction Company	\$2,685,651.20	Same	7
Spartan Paving, Inc.	\$2,689,935.32	Same	8
Ajax Paving Industries, Inc.	\$2,696,624.26	Same	9

Total Number of Bidders: 9

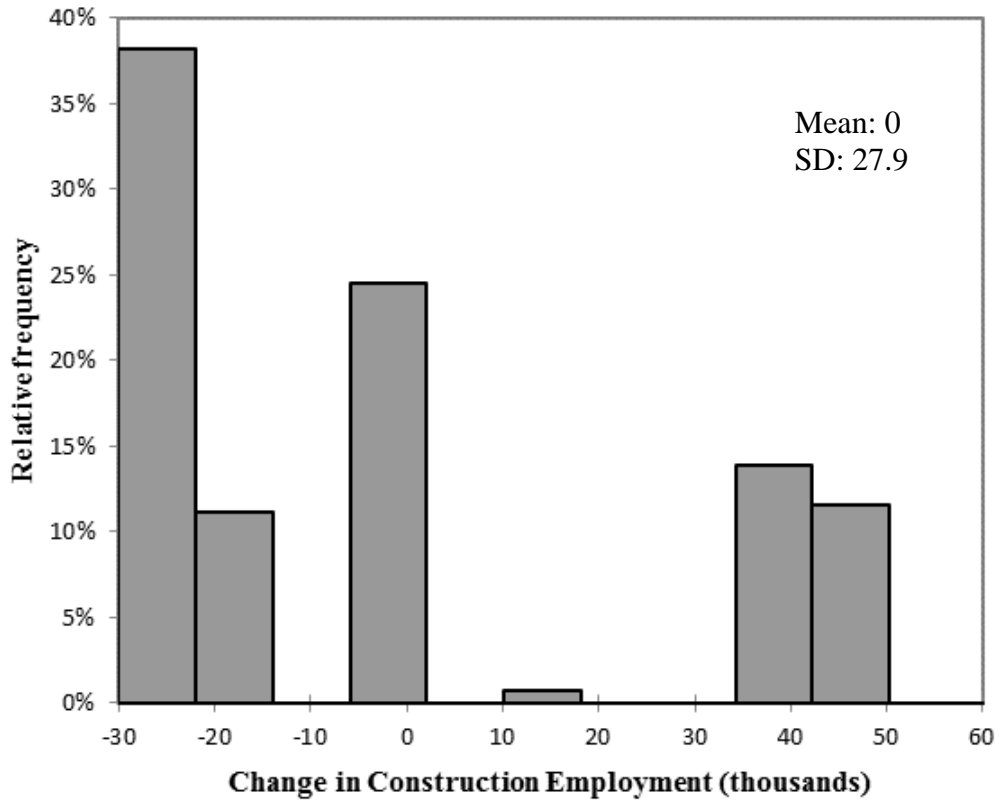
**Figure 4.1 – Michigan DOT Bid Tabulation**  
**Source: MDOT Website**

WSDOT Performance Measure	Period		Goal		Five Year Trend	
	Previous	Current	Set	Met	Actual	Desired
Cumulative number of projects completed and the percentage on time	377-87%	377-87%	≥ 90% on time	—		↑
Cumulative number of projects completed and percentage on budget	377-91%	377-91%	≥ 90% on budget	✓		↑
Variance of total project costs compared to budget expectations	Under by 2.2%	Under by 2.2%	On or under budget	✓		NA

**Figure 4.2 – WSDOT Project Results**  
Source: WSDOT Website



**Figure 4.3 – WSDOT Precipitation Data (2007-2014)**  
Source: National Weather Service



**Figure 4.4 – WSDOT Construction Employment Statistics (2007-2014)**  
**Source: ENR Construction Employment Index**



**Table 4.1 – Sample Precipitation Schedule**

PROJECT SCHEDULE			SEASONAL PRECIPITATION (INCHES)								
			2007				2008				
ID	START	FINISH	S1	S2	S3	S4	S1	S2	S3	S4	S1
7225	M-07	J-08	22	3	6						
7247	M-07	O-07	22	3							
7252	M-07	D-07	22	3	6						
7249	M-07	A-08	22	3	6	14					
7250	M-07	M-08	22	3	6						
7231	M-07	M-12	22	3	6	14	10	10	4	12	
7248	M-07	F-08	22	3	6						
7260	M-07	A-07	22								
7254	M-07	N-08	22	3	6	14	10	10			
7245	A-07	A-08		3	6	14	10	10			
7240	A-07	F-09		3	6	14	10	10	4	12	8
7263	A-07	A-09		3	6	14	10	10	4	12	8
7242	A-07	J-12		3	6	14	10	10	4	12	8
7259	A-07	A-11		3	6	14	10	10	4	12	8
7264	A-07	J-13		3	6	14	10	10	4	12	8
7283	A-07	J-12		3	6	14	10	10	4	12	8
7266	A-07	S-07		3							
7258	A-07	M-11		3	6	14	10	10	4	12	8
7271	A-07	O-07		3							

**Table 4.2 – Data Set 1 Descriptive Statistics**

<b>Bidders</b>	<b>Bids</b>	<b>Bid Spread</b>	<b>Deviation from Estimate</b>	<b>Total Awarded</b>
1	73	26.6%	5.2%	\$ 69,368,238
2	351	18.5%	-1.0%	\$ 537,432,999
3	356	12.4%	-3.2%	\$ 685,206,778
4	276	9.3%	-3.7%	\$ 754,193,841
5	165	9.4%	-4.1%	\$ 369,156,544
6	80	5.8%	-7.2%	\$ 275,327,847
7	49	8.6%	-6.9%	\$ 117,538,865
8	29	6.6%	-5.1%	\$ 39,464,222
9	15	4.1%	-0.4%	\$ 30,045,897
10	11	5.5%	-6.7%	\$ 12,897,438
11	7	4.0%	-13.2%	\$ 34,791,319
12	3	2.5%	-0.4%	\$ 2,994,735
14	2	4.8%	-21.1%	\$ 798,186
<b>Grand Total</b>	<b>1,417</b>	<b>12.1%</b>	<b>-2.8%</b>	<b>\$ 2,929,216,908</b>

**Table 4.3 – Data Set 2 Descriptive Statistics**

Bidders	Bids	Bid Spread	Estimate Deviation	Bid Quality			Total Awarded
				A	I	U	
1	49		8.3%	18		31	\$ 92,520,517
2	198	18.1%	-2.3%	165	12	21	\$ 308,850,440
3	218	10.7%	-7.8%	194	16	8	\$ 622,336,817
4	201	9.6%	-10.6%	179	18	4	\$ 549,399,264
5	118	7.1%	-14.2%	110	7	1	\$ 444,753,825
6	75	8.6%	-16.8%	71	4		\$ 531,317,698
7	42	7.2%	-18.0%	40	2		\$ 170,538,762
8	45	4.8%	-19.8%	43	2		\$ 306,936,788
9	26	5.2%	-18.8%	25	1		\$ 109,319,943
10	14	9.8%	-26.5%	14			\$ 56,378,182
11	11	5.3%	-22.8%	11			\$ 107,216,157
12	12	3.1%	-29.0%	12			\$ 74,414,558
13	8	4.3%	-24.2%	8			\$ 22,365,472
14	8	2.6%	-30.5%	8			\$ 24,129,969
15	6	3.9%	-30.5%	6			\$ 39,836,439
16	2	4.7%	-30.2%	2			\$ 2,909,017
17	4	5.7%	-23.9%	4			\$ 4,894,063
18	2	4.5%	-32.2%	2			\$ 4,188,044
19	1	6.7%	-25.4%	1			\$ 1,687,701
	<b>1040</b>	<b>10.4%</b>	<b>-10.3%</b>	<b>913</b>	<b>62</b>	<b>65</b>	<b>\$ 3,473,993,654</b>

A = Acceptable  
I = Ideal  
U = Unfavorable

**Table 4.4 – Data Set Summary**

Field	Records		
	Data Set 1	Data Set 2	Total
Cost Overrun	-	1,040	1,040
Bid Period	1,417	1,040	2,457
Engineer's Estimate	1,057	1,040	2,097
Lowest Bid	1,417	1,040	2,457
Second Lowest Bid	1,344	991	2,335
Labor Availability	-	1,040	1,040
Level of Competition	-	1,040	1,040
Project Amount	1,417	1,040	2,457
Precipitation Levels	-	1,040	1,040
Project Start Date	-	1,040	1,040
Project Type	1,417	1,040	2,457
Time Delay	-	1,040	1,040

## CHAPTER 5

### Competition Versus Bid Quality

#### 5.1 Introduction

Researchers, and practitioners alike, have focused on two metrics for evaluating bid results: the percentage deviation of the lowest bid from the engineers estimate (Eq. 1.1) and the bid spread percentage (Eq. 1.2).

$$\bar{e} = 1/m \sum_{i=1}^m \frac{b_{li} - EE_i}{EE_i} \quad (1.1)$$

$$\bar{s} = 1/m \sum_{i=1}^m \frac{b_{2i} - b_{li}}{b_{li}} \quad (1.2)$$

$\bar{s}$  = Mean Bid Spread

$\bar{e}$  = Mean Deviation from Estimate

$b_{li}$  = Lowest Bid

$b_{2i}$  = Second Lowest Bid

$EE$  = Engineers Estimate

$m$  = Number of Bids

The deviation from estimate is found by subtracting the engineers estimate from lowest bid and can be either positive or negative. The bid spread is determined by taking the difference between the second lowest bid and the lowest bid, is always positive, but unlike the deviation from estimate, cannot be calculated if there is only one bidder. The bid spread can be thought of as primarily a measure of performance risk as it is the low-bid contractor's foregone profit. The bid spread is often

described by construction contractors as “money left on the table” as it represents the additional profit that the contractor could have added to the bid and still have been awarded the work. Because of this, an unusually large bid spread (bonding sureties use  $\geq 10$  percent) is always indicative of an unfortunate result, at least from the low bid contractor’s perspective, regardless of the reason. A large bid spread for example, could indicate what is often referred to by construction contractors as the “winners curse”. Under the “winners curse” scenario, the construction contractor might have missed an element of the scope from the bid, that other bidders have correctly included, and that is the reason the bid is the lowest. To complicate matters, the lowest bid may also not necessarily represent the contractor’s opinion of the project’s true cost. Strategic manipulation of bids in response to competition has been shown to be the main source of bid variation (Gaver & Zimmerman, 1977), which is directly measured by the bid spread. Under that scenario, a large bid spread could be indicative of a poor assessment of the market, and/or, poor judgement regarding the competition for the work. Construction contractors call this “low balling”.

The deviation of the lowest bid from the engineers estimate (also referred to herein as the deviation from estimate) can be thought of as primarily process risk, as it is a measurement of the effectiveness of the owner’s procurement program. The deviation of the lowest bid from the engineers estimate is a more complex metric to use in the evaluation of bids than the bid spread. This is because there are several reasons why an engineers estimate may be well off the mark. The precision of the engineers estimate, the quality of the low bid, the capability of the low bidder to perform the work, and the standard of care taken by the owner to produce the bid documents, are just a few. Recurring bid situations reduce these variations in process quality due to the

standardization of methods and procedures. For State DOT projects, the use of unit pricing, the use of the D-B-B project delivery method, and the consistency of bidders and project participants all further reduce variability. In addition, the FHWA sets a high standard for the accuracy of engineers estimate on State DOT projects. FHWA guidelines state, in part, that the engineers estimate must “reflect a fair and reasonable cost of the project in sufficient detail to provide an accurate estimate of the financial obligations to be incurred by the State and FHWA, and permit an effective review and comparison of the bids received”. According to FHWA guidelines, the engineers estimates should be within +/- 10 percent of the low bid for at least 50 percent of all awarded contracts (FHWA, 2017).

It was realized early in the research that both process and performance risks were critical in evaluating bid results, and that both could be gauged based on observed characteristics of a bid letting. To capture that significance, a cross reference chart was developed, which categorized the quality of a given bid result based on a combination of the bid spread (performance risk metric) and the deviation from estimate (process risk metric). The cross-reference chart, designated the “Bid Quality Matrix”, was used to provide an accurate, efficient, and consistent way to categorize observed bid results as either acceptable (A), ideal (I), or unfavorable (U). The assigned bid classifications were based on the risk in awarding the contract to the lowest bidder given the circumstances of the bid. Classifications were determined from specific combinations of the bid spread and the deviation from estimate. Because it was clear that the process would be subjective in nature, the consensus building method of the Delphi Technique was used to assign the bid quality classifications. The Delphi Technique allows experts to work towards an agreement by conducting

a circulating series of questionnaires and releasing related feed-back to further the discussion with each subsequent round. Since the responses of the participants are anonymous, individual panelists don't have to worry about “push back”, or repercussions, for their opinions (Chia-Chien Hsu & Brian A. Sandford, 2007).

The Delphi Technique was used to gain consensus that the two-metrics identified in this research (*e and s*) were indeed the critical measurements for bid quality, and to reach agreement on each classification (A, I, or U) in the Bid Quality Matrix. A total of 45 project professionals were asked to participate in an on-line survey. The group included managers from State DOTs, managers from the FHWA, Construction Managers, Architects, Engineers, Bonding Sureties, Professional Associations, and Owner Representatives. Figure 5.1 is a flow chart of the process used. There was a total of 16 responses over a period of 5 months. The outcome of that process was the consensus Bid Quality Matrix shown in Figure 5.2.

For the next part of the study the task was to determine if the level of competition, as defined by the number of bidders/bid, had a direct influence on how a bid was classified according to the Bid Quality Matrix. To test the assumption that it did, first a simple analysis was performed using descriptive statistics from Data Set 1 and Data Set 2 (Database in Appendix). For each level of competition ( $n = [2..19]$ ), a Bid Quality Matrix was filled out and the percentage of unfavorable bids was noted. The likelihood of an unfavorable bid was determined by summing the percentage of bids that fell into category “U” in the Bid Quality Matrix for each level of competition. This



information was then put on a scatter plot to see if any trends could be visually noted. For the special case where there was no competition ( $n = 1$ ), an unfavorable bid was classified as a bid that was either 10 percent higher, or 10 percent lower, than the engineers estimate. This resulted in 64.5 percent of noncompetitive bids ( $n = 1$ ) classified as unfavorable, certainly not a surprise. Conversely, the results for when competition levels were very high ( $n = [11..19]$ ) the results did not contain any unfavorable bids, again not a surprise. More interesting though, were the results for  $n = [2..10]$  as shown in Figure 5.3. The majority (92.4 percent) of the bids were posted within this range of competition levels. The plotted data (Figure 5.3) showed an inverse relationship between the number of bidders/bid and the probability of an unfavorable bid for  $n = [2..6]$ . This trend however reversed for  $n = [7..10]$ . This was the first indication that a simple inverse linear relationship did not fully explain the correlation between the number of bidders and bid quality. This was later confirmed, and explained, as the “winners curse” phenomenon, through a more rigorous analysis of the results. Similar analysis was performed for acceptable, and ideal, bid quality results. They are plotted in figures 5.4 and 5.5 respectively.

Next a more robust analysis was performed to investigate the relative effect that the number of bidders/bid had on the observed bid spread. The bid spread statistic was selected for the analysis as it was hypothesized that it would provide the most direct measure of competition’s effect on bid results. To focus on comparable types of projects, a similar time frame, and a comparable number of bids, the bid tabulations for the WSDOT for the years 2013 through 2015, and the NYSDOT for the year 2015, was utilized which contained 656 bids totaling \$2.6 billion (Table 5.1). A two-sample

equivalence test was run to determine if the bid spread with 3 bidders/bid was significantly different than when there were 4 bidders/bid. The reference category of 3 bidders/bid was chosen because it is the most common level of competition considered when State DOTs use the D-B approach. Four bidders per bid was chosen because it was the integer closest to the mean (4.48) for the observed data. The results show (Figure 5.4), that within a confidence interval of 95 percent, that it can be stated that the mean bid spread when there are  $\leq 3$  bidders/bid is significantly higher (17.6 percent vs. 8.4 percent) than when there are  $\geq 4$  bidders/bid. Simply stated, the results infer that design-build, and other restrictive bidding processes, which limit competition to  $\leq 3$  bidders/bid, probably result in larger bid spreads and potentially higher bid prices.

The next analysis focused on the direct correlation between the bid spread, and the deviation from estimate, with the level of competition. Ordinary Least Squares (OLS) regression was performed using Eq. 1.1 and Eq. 1.2 to define the dependent variable ( $\bar{s}$  and  $\bar{e}$ ), with the predictor defined as the number of bidders/bid ( $n$ ). Results from that analysis verified that there was a significant statistical relationship between the level of competition and both dependent variables. In general, each of the two variables showed an inverse relationship with the number of bidders as expected.

For the variable bid spread, the relationship was best described by the logarithmic function:

$$\bar{s} = -.047 \ln(n) + .1476 \quad (1.3)$$

$$R^2 = .86$$

$$CI = 95 \text{ percent}$$

$$P\text{-Value} = 90.7$$

The relationship is plotted in Figure 5.7, with the individual bid results displayed in strip chart format (horizontal lines) grouped by the number of bidders per bid (level of competition). The average bid spread for each number of bidders grouping is displayed by the "+" symbol. As predicted by the Friedman Model (Friedman, 1957), the general trend showed that as the number of bidders/bid increased the average bid spread decreased. However, there was an anomaly in the trend when the number of bidders increased from 6 to 7. For that portion of Data Set 1, the bid spread increased significantly (5.4 percent to 7.9 percent) as competition increased. It is hypothesized that this occurred because as competition increases the potential for "low balling" or the "winners curse" grows resulting in a lowest bid that is significantly lower than all others.

For variable  $\bar{e}$ , the mean deviation of the lowest bid from the engineers estimate, the relationship can best be described by the following third order polynomial function:

$$\bar{e} = -.0029n^3 + .0376n^2 - .1554n + .1793 \quad (1.4)$$

$$R^2 = .98$$

$$CI = 90 \text{ percent}$$

$$P\text{-Value} = 62.5$$

The trend for the deviation from estimate (Figure 5.6) is more complex than that for the bid spread, which is most likely because it is a more multifaceted measurement of project performance risk. For the level of competition  $n = [1..3]$  the trend is downward which would be expected based on odds alone. For example, it would be more likely to end up near the engineers estimate with 3 bidders/bids than if only 1 bidder placed a bid. For  $n = [3..5]$  the downward trend levels off, and there is no discernable difference in how close the low bids are to the engineers estimates. The majority (58 percent) of the bids were observed in this range and the lack of a trend might indicate that latent factors, such as the quality of the pool of bidders, are countering the effect of increased competition. From  $n = [5..7]$  bidders/bid the trend is downward again and the average bids are significantly lower than the engineers estimate. It is hypothesized that this occurred because competition at these levels reduces the overall quality of the bidder pool, which in turn might lead to a higher probability of “low balling” or the “winners curse”.

The next step in the study was to research other factors that might influence the bid quality metrics ( $\bar{s}$  and  $\bar{e}$ ) and thus the classification of bids as defined by the Bid Quality Matrix. Because this part of the analysis required additional data on potential predictors, a more comprehensive database of bid data was needed. The data used was the Washington State DOT bid results, posted on-line, for the years 2007-2014 (Data Set 2). In addition to the type of information included in Data Set 1, Data Set 2 contained information on the type of project, the project amount, the bid period, and final project outcomes. This additional information was first used to see if the correlation between bid quality and the level of competition was influenced by other factors

commonly considered in past research on the assessment of bid results. To do that, Data Set 2 was categorized as follows, and descriptive statistics were used to identify trends.

1. Project Type – Road, Bridge, Other
2. Project Amount –  $\leq \$1,000,000$ ;  $\geq \$1,000,001$  and  $\leq \$5,000,000$ ;  $\geq 5,000,001$
3. Bid Period – Spring (March Equinox to June Solstice); Summer (June Solstice to September Equinox); Fall (September Equinox to December Solstice); and, Winter (December Solstice to March Equinox).

Two axis and multiple series charts, examples of which are shown in Figures 5.9, 5.10, 5.11, and 5.12, were used to first visually identify trends. The results of this exercise showed that independent of how the data was categorized, the strong positive relationship between bid quality and the number of bidders/bid, remained evident. For example, the data shows that the level of competition has a time-series effect (Figures 5.9 and 5.10) on the bid quality metrics ( $\bar{s}$  and  $\bar{e}$ ), possibly due to changing economic conditions, but it also shows a consistent correlation with the level of competition. The data also exhibits a project size influence on the bid quality metrics (Figures 5.11 and 5.12), possibly due to the increased quality of the pool of bidders attracted to larger projects, but like the time series trend, there is a consistent correlation with the level of competition.

## 5.2 Multinomial Logit Regression

The ultimate goal was to develop a mathematical model that could be used to predict the probabilities of bid quality outcomes (A, I, or U) based on the number of bidders/bid. Because the dependent variable, bid quality, is nominal with three levels, the method chosen for the analysis was Multinomial Logit Regression (MLR). MLR is considered an extension of binomial logistic regression and allows for a dependent variable with more than two categories. In addition to the number of bidders, additional potential predictor variables were considered for project type, project amount, and the bid period, as defined in Table 3.1. This is considered best practice for MLR as omitting relevant variables can skew results and reduce the precision of the model. The cross tabulation of Data Set 2 with the additional indicator variables is shown in Table 5.2. In all, five parameters were used in the analysis: the main independent variable - the number of bidders/bid ( $n$ ), three independent categorical variables - project type ( $pt$ ), project amount ( $pa$ ), and the bid period ( $bp$ ), and the dependent variable, bid quality ( $bq$ ), defined by the Bid Quality Matrix (A-Acceptable, I-Ideal, U-Unfavorable), with “U” being the reference category. Using the observed bid results (Data Set 2), various linear groupings of the independent variables were modeled. The NLOGIT® statistical software package’s (Version 5, Econometric Software, Inc., May 1, 2012) Discrete Choice Module and the Newton-Raphson Optimization Algorithm, were used for the computations. The provided Akaike Information Criterion (AIC) statistic was used to estimate the relative quality of each model, with the model defined by Equations 1.5 and 1.6 selected as “best fit” (lowest AIC). Next the parameters were estimated by maximum likelihood with the probabilities  $\pi_i^{A,I}$  viewed as functions of the  $\alpha^{A,I}$  and  $\beta_i^{A,I}$ .

$$\log\left(\frac{\pi_i^A}{\pi_i^U}\right) = \alpha^A + \beta_1^A n_i + \beta_2^A \log(pa) + \beta_3^A pt_1 + \beta_4^A pt_2 + \beta_5^A pa_1 + \beta_6^A pa_2 + \beta_7^A bp_1 + \beta_8^A bp_2 + \beta_9^A bp_3 + \beta_{10}^A \log(pa_i) \times (pt_j) \quad (1.5)$$

$$\log\left(\frac{\pi_i^I}{\pi_i^U}\right) = \alpha^I + \beta_1^I n_i + \beta_2^I \log(pa) + \beta_3^I pt_1 + \beta_4^I pt_2 + \beta_5^I pa_1 + \beta_6^I pa_2 + \beta_7^I bp_1 + \beta_8^I bp_2 + \beta_9^I bp_3 + \beta_{10}^I \log(pa_i) \times (pt_j) \quad (1.6)$$

The NLOGIT® software found the statistically significant parameters to be the constant terms ( $\alpha^A, \alpha^I$ ) and the coefficients for the number of bidders/bid ( $\beta_1^A, \beta_1^I$ ), the log of the award amounts ( $\beta_2^A, \beta_2^I$ ), and for Ideal results only, the combination effect of project amount and type ( $\beta_{10}^I$ ). The results confirmed hypothesis No. 4 that “the risk of awarding a contract increases as the number of bidders decreases”. Coefficient statistics are provided in Table 5.3. The relative risk of achieving an acceptable bid over an unfavorable bid, is defined by Equation 1.7 as follows:

$$\frac{P(bq = A)}{P(bq = U)} = \exp^{\beta_1^A} \times n + \exp^{\beta_2^A} \times \log(pa) = 4.9n + 1.9 \log(pa) \quad (1.7)$$

Each additional bidder increases the likelihood of having an acceptable bid versus an unfavorable bid by almost a factor of 5. In addition, the model shows that the project amount affects the relative

risk of achieving an acceptable bid over an unfavorable bid. As the contract amount increases so does the possibility of getting acceptable results. This is practical, as projects with larger contract amounts, generally should attract a more sophisticated pool of bidders. A better bid pool should reduce negative bidding behavior such as “low balling” or the consequence of a “winners curse” scenario.

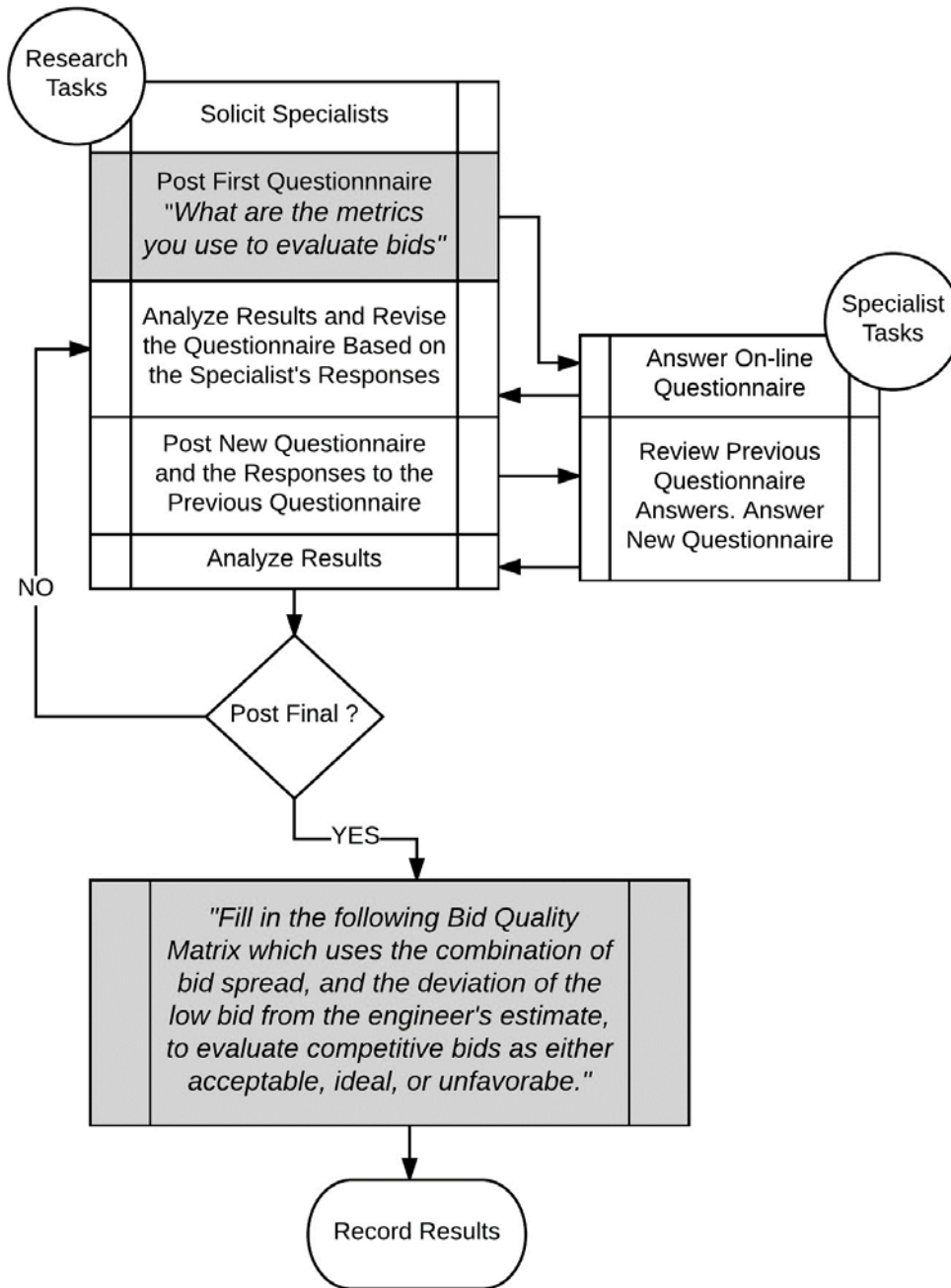
The model for ideal results versus unfavorable results, shows a similar correlation for both the number of bidders and the project amount, but also includes a correlation with the interaction effect of log amount and project type bridge. Equation 1.8 defines the model:

$$\frac{P(bq = I)}{P(bq = U)} = \exp^{\beta_1^I} \times n + \exp^{\beta_2^I} \times \log(pa) + \exp^{\beta_{10}^I} \log(pa) \times pt_{Bridge} \quad (1.8)$$

$$= 4.22n + 3.87 \log(pa) + 4.34 \log(pa) \times pt_{Bridge}$$

The latter correlation can be interpreted that the project amount effect has an increased influence in determining the relative risk of a bid being defined as ideal versus unfavorable when the project type is a bridge. The correlation is not as strong (CI=.05 vs. CI=.01) as the other parameters, but is statistically significant nonetheless. A performance based interpretation of this is that a large bridge project might attract a pool of more sophisticated, and thus, more competitive bidders. A process based interpretation of this is that the WSDOT technique for estimating bridge projects is superior to other project types.

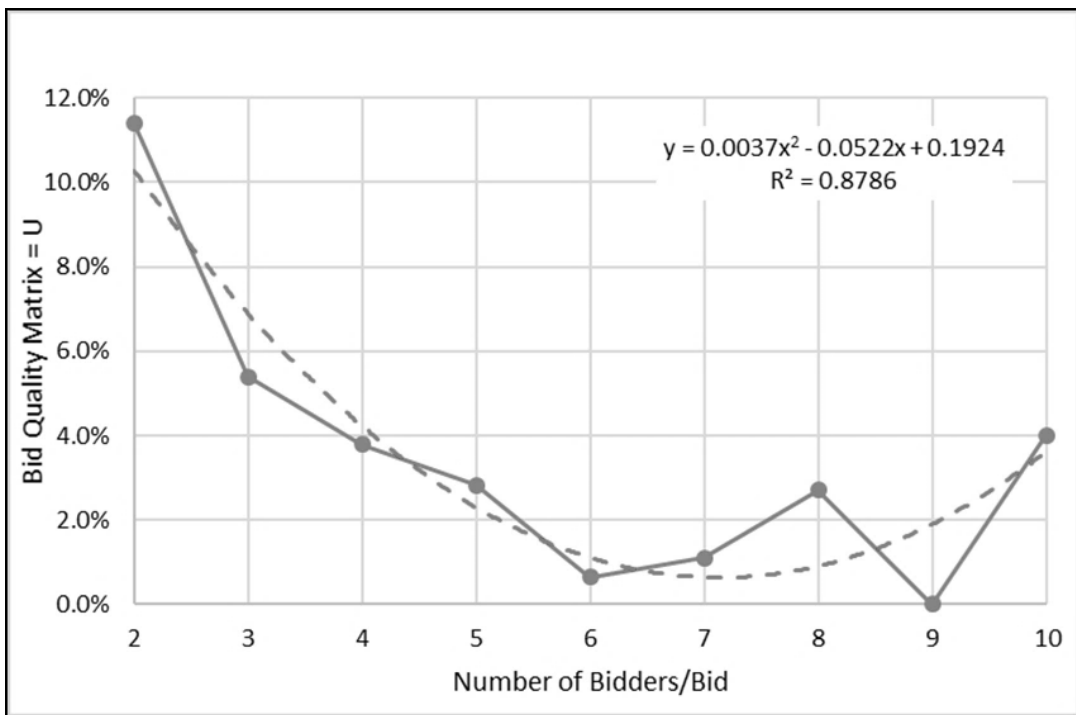




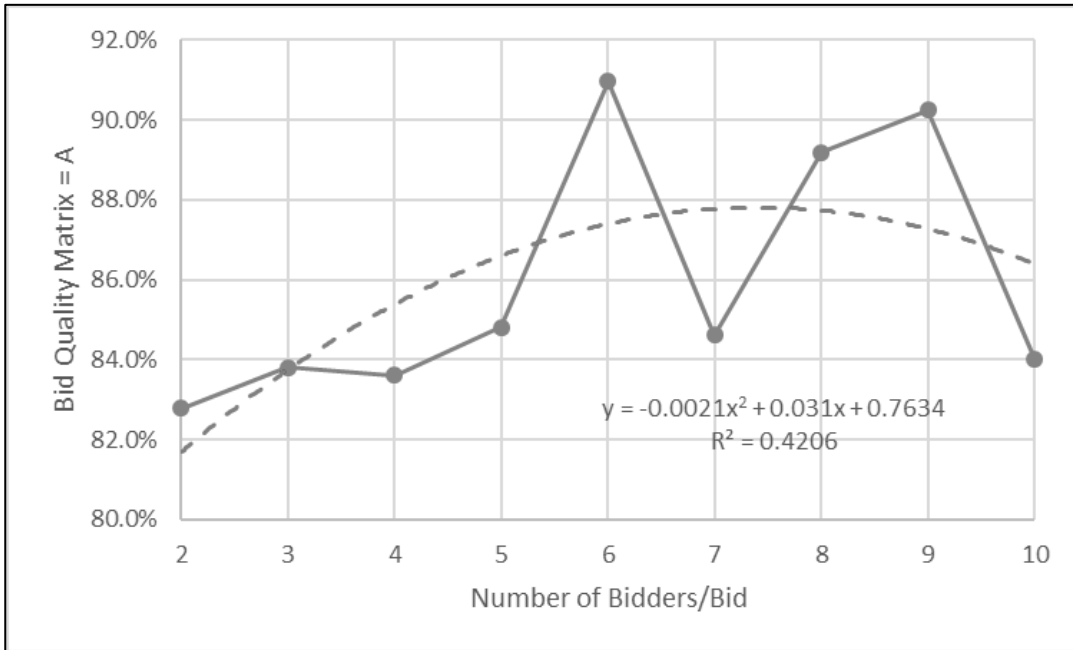
**Figure 5.1 – Delphi Technique**

Bid Quality Matrix			Deviation from the Engineer's Estimate				
			>10%	5% →10%	5% ↔-5%	-5% →-10%	<-10%
			1	2	3	4	5
Bid Spread	>10%	A	U	U	U	U	U
	8% →10%	B	U	A	A	A	A
	6% →8%	C	U	A	A	A	A
	4% →6%	D	U	A	I	A	A
	2% →4%	E	A	A	I	A	A
	0 →2%	F	A	A	I	A	A

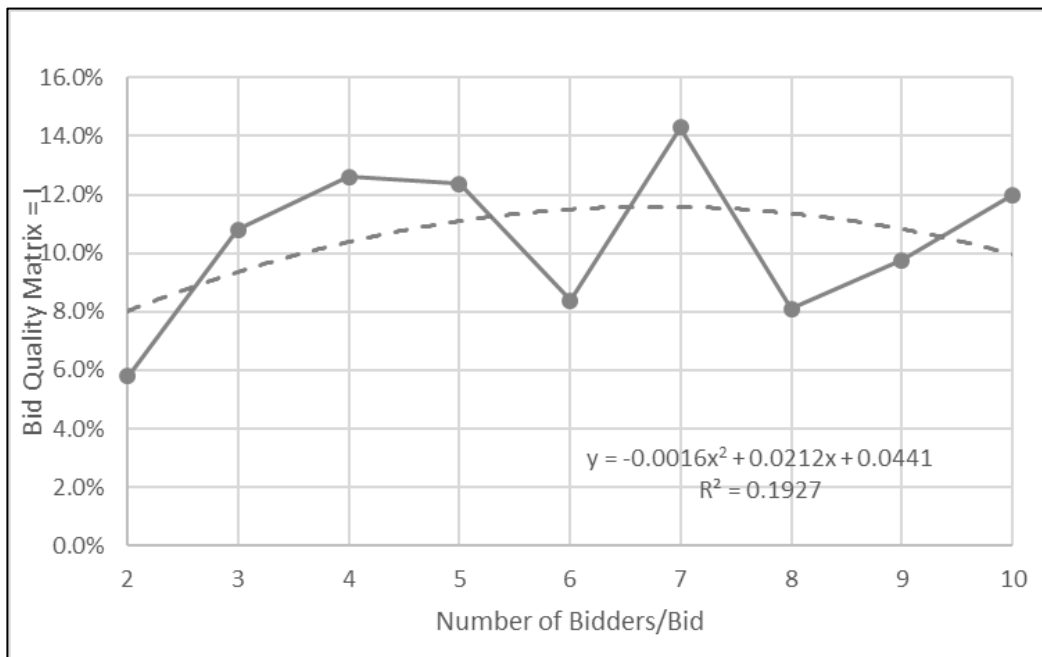
Figure 5.2 – Consensus Bid Quality Matrix



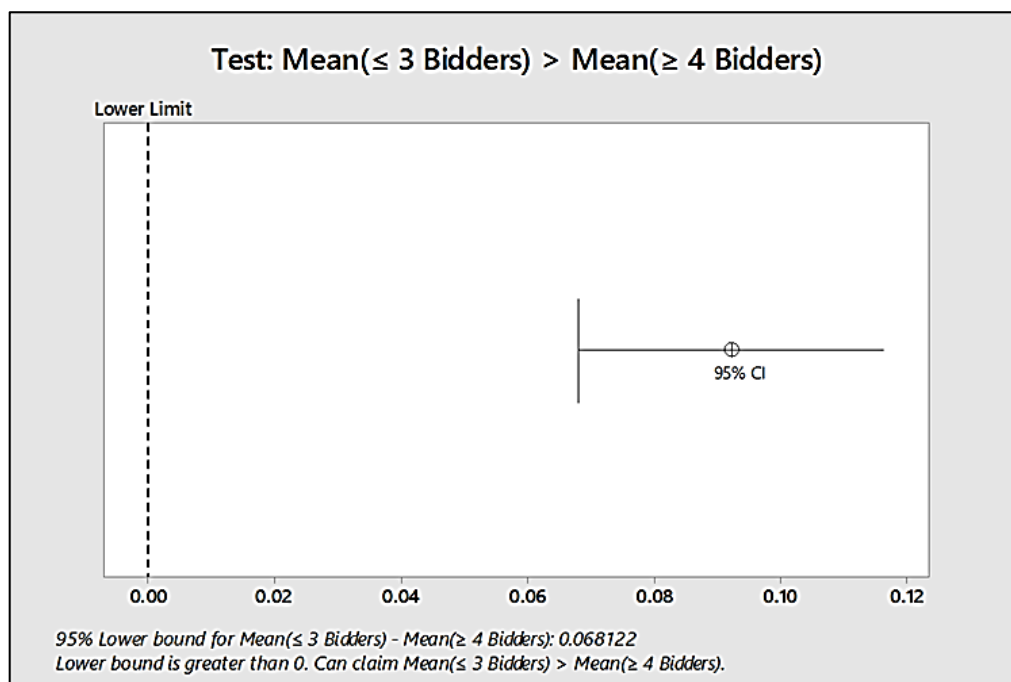
**Figure 5.3 - Competition's Effect on Unfavorable Bid Results**



**Figure 5.4 - Competition's Effect on Acceptable Bid Results**

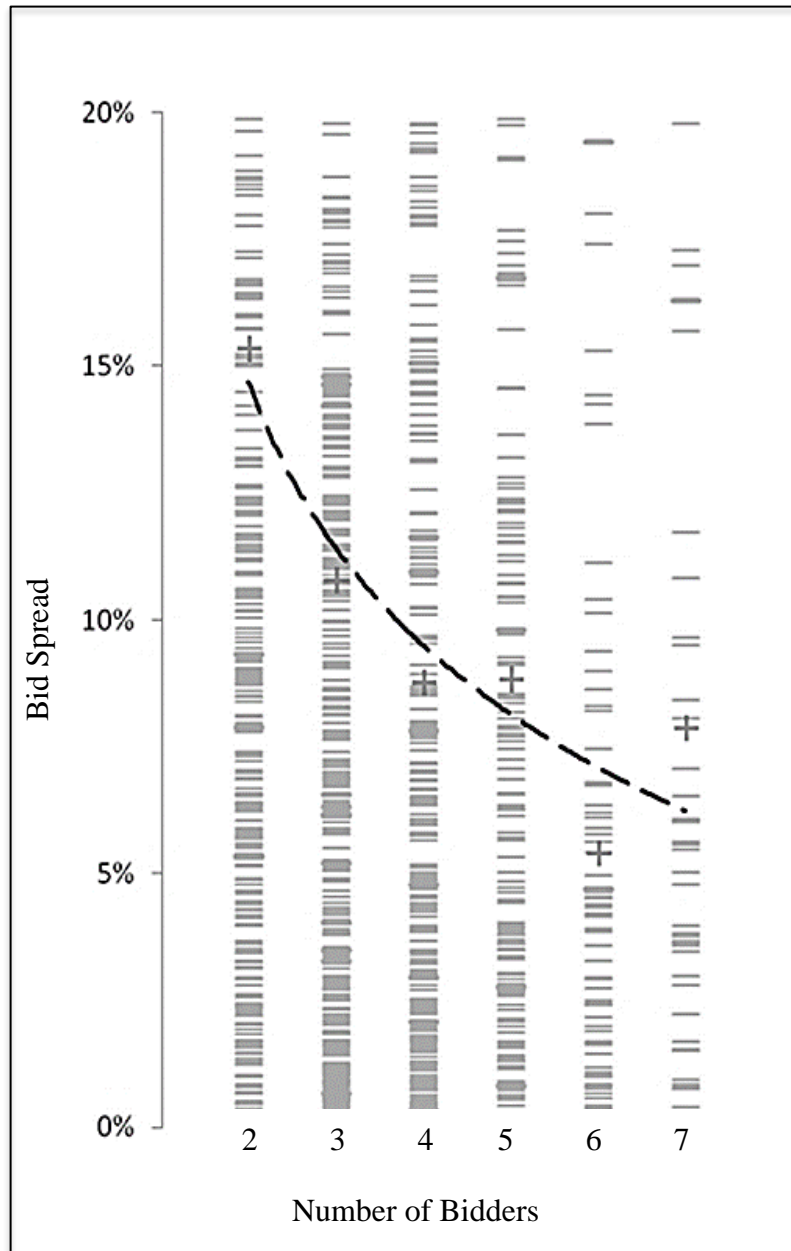


**Figure 5.5 - Competition's Effect on Ideal Bid Results**

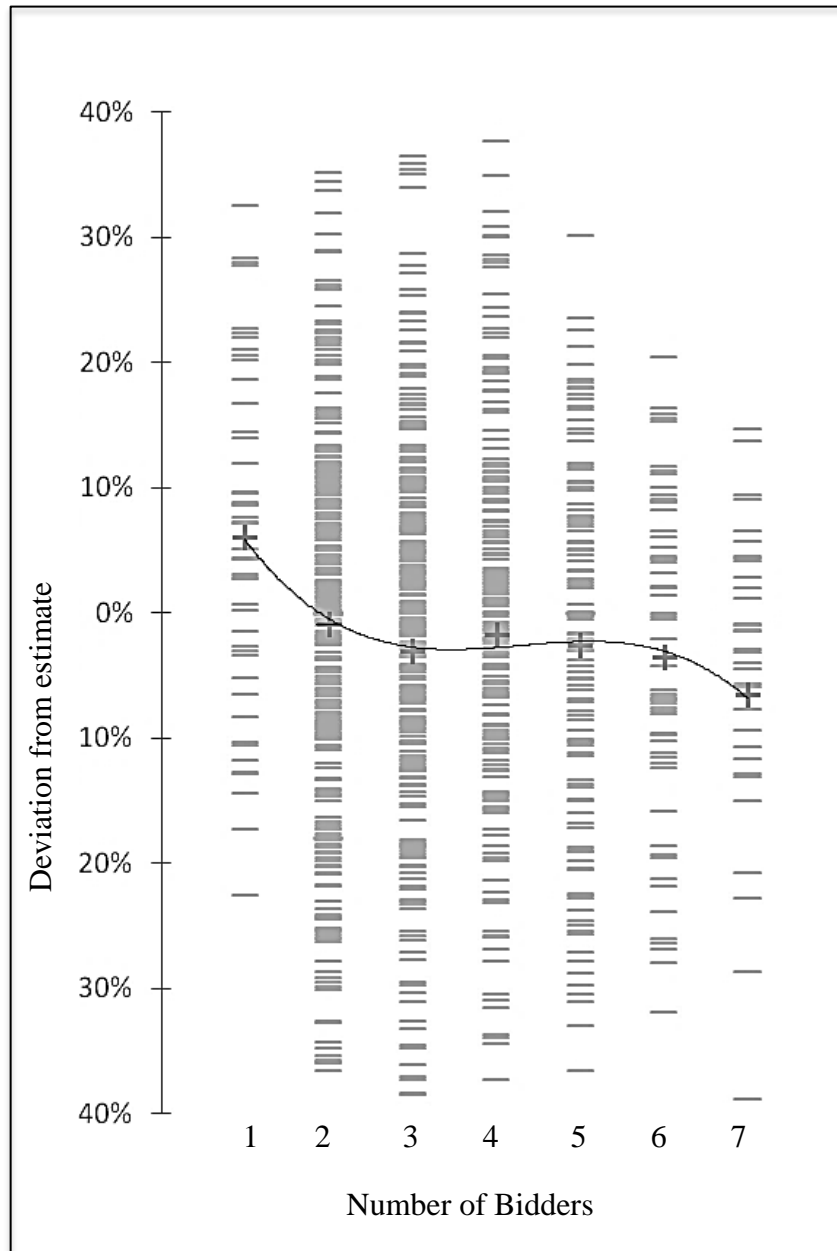


Statistic	Bid Spread Ratio	
	$\leq 3$ Bidders	$\geq 4$ Bidders
Number	247	375
Mean	17.6 percent	8.4 percent
SE	0.014	0.005

**Figure 5.6 - Two Sample Equivalence Test**

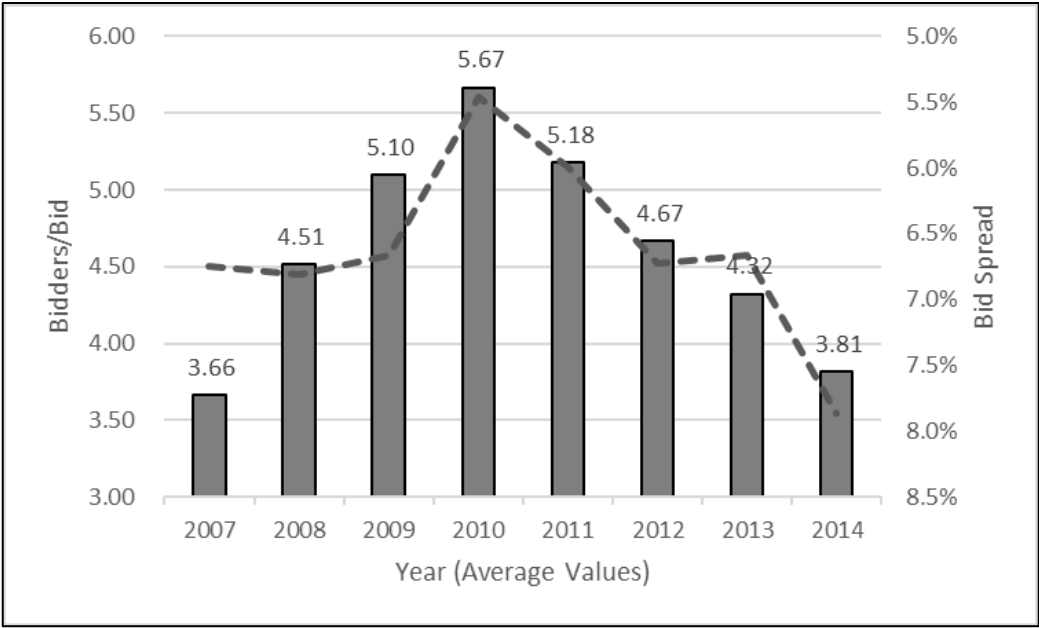


**Figure 5.7 – Competition’s Effect on Bid Spread**

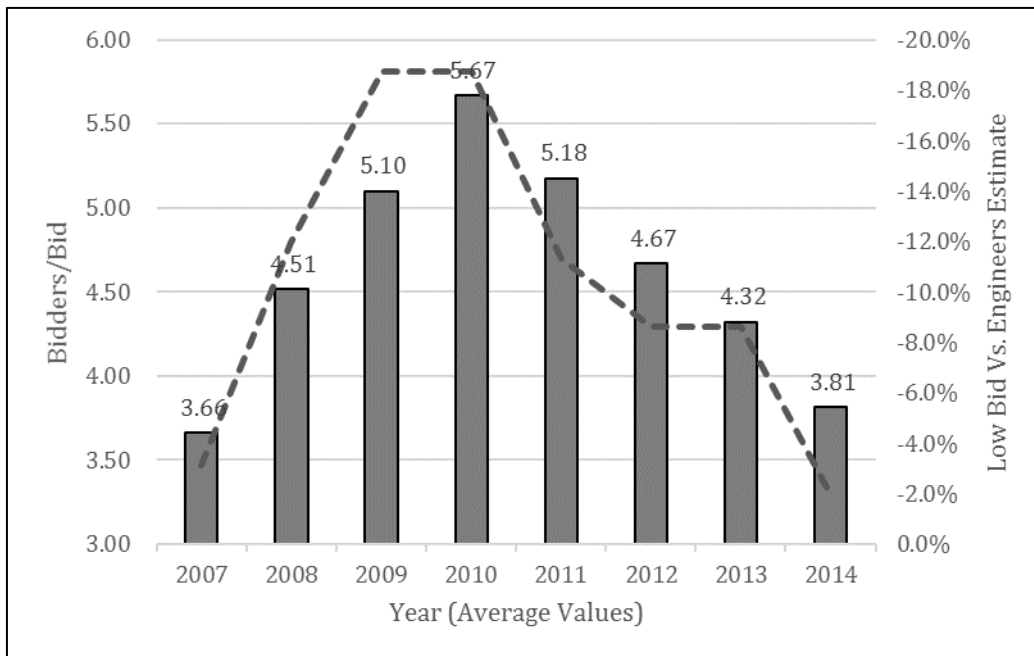


**Figure 5.8 - Competition's Effect on the Deviation from Estimate**

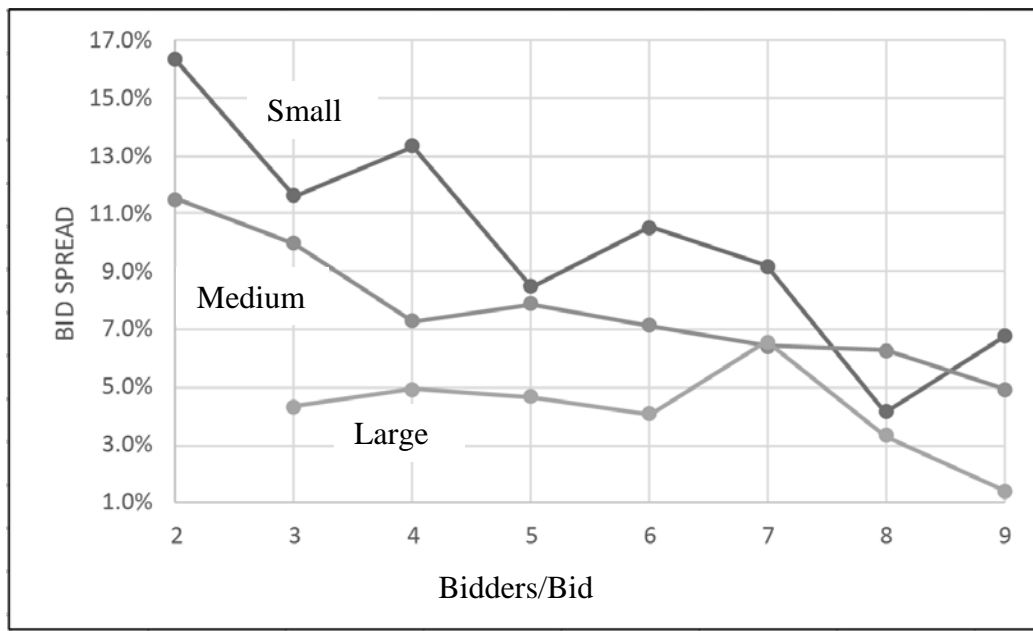




**Figure 5.9 – WSDOT Time Series Analysis – Bid Spread**

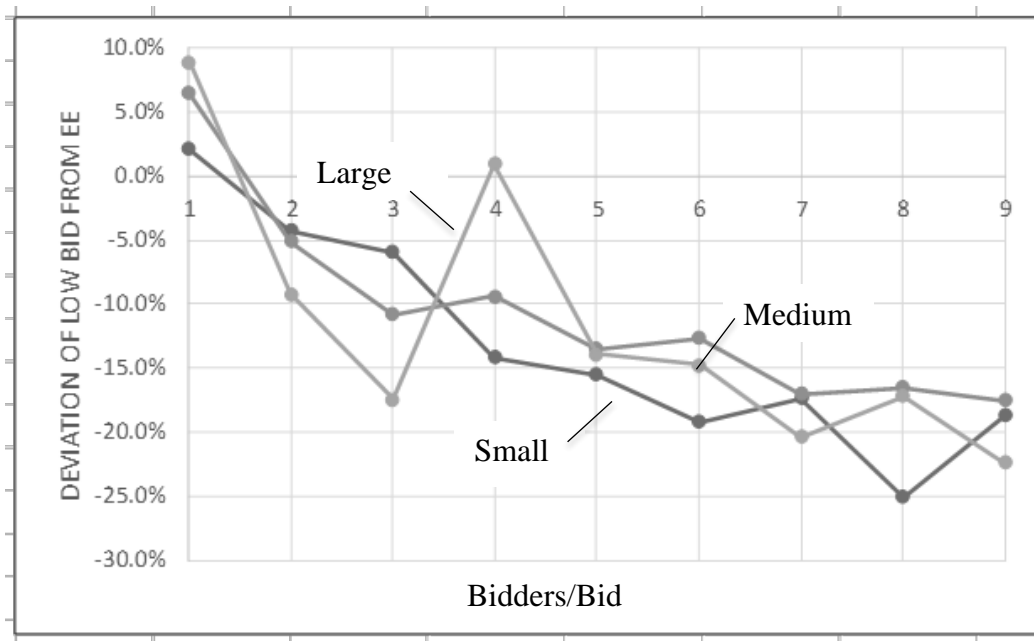


**Figure 5.10 – WSDOT Time Series Analysis – Deviation from Estimate**



Small: Less than \$1,000,000 , Medium: Between \$1,000,001 and \$5,000,000.  
 Large: Greater than \$5,000,000

**Figure 5.11 – WSDOT Time Series Analysis – Bid Spread**



Small: Less than \$1,000,000 , Medium: Between \$1,000,001 and \$5,000,000.  
 Large: Greater than \$5,000,000

**Figure 5.12 – WSDOT Project Size Analysis – Deviation from Estimate**

**Table 5.1- Two Sample Equivalence Test Data**

BIDDERS	WASHINGTON DOT 2013-2015			NEW YORK DOT 2013			TOTALS		
	BIDS	SPREAD	AMOUNT	BIDS	SPREAD	AMOUNT	BIDS	SPREAD	AMOUNT
1	22	-	\$ 31,788,519	12	-	\$ 21,031,698	34	-	\$ 52,820,217
2	84	15.53%	\$ 100,128,608	36	15.44%	\$ 101,833,072	120	15.44%	\$ 201,961,679
3	82	9.61%	\$ 267,545,577	45	11.73%	\$ 86,698,270	127	11.73%	\$ 354,243,847
4	71	6.31%	\$ 297,443,861	46	10.04%	\$ 151,038,432	117	10.04%	\$ 448,482,293
5	35	5.10%	\$ 459,543,090	41	6.92%	\$ 213,919,640	76	5.31%	\$ 673,462,729
6	22	4.04%	\$ 238,852,995	37	5.31%	\$ 117,356,720	59	7.65%	\$ 356,209,714
7	14	3.79%	\$ 96,228,214	28	7.65%	\$ 96,662,793	42	6.02%	\$ 192,891,007
8	14	6.76%	\$ 53,414,121	17	6.02%	\$ 58,761,523	31	2.44%	\$ 112,175,644
9	6	5.62%	\$ 13,308,397	18	2.44%	\$ 74,401,368	24	7.13%	\$ 87,709,765
10	-	-	-	5	7.13%	\$ 16,212,847	5	4.32%	\$ 16,212,847
11	5	5.56%	\$ 23,892,426	5	4.32%	\$ 32,191,345	10	1.84%	\$ 56,083,771
12	3	4.86%	\$ 17,128,869	2	1.84%	\$ 888,191	5	-	\$ 18,017,060
14	1	4.32%	\$ 156,381	2	3.97%	\$ 1,150,393	3	3.97%	\$ 1,306,774
15	1	3.24%	\$ 5,482,395				1	3.24%	\$ 5,482,395
17	-	-	-	1	8.73%	\$ 12,438,425	1	8.73%	\$ 12,438,425
21	-	-	-	1	9.88%	\$ 542,027	1	9.88%	\$ 542,027
<b>TOTALS</b>	<b>360</b>		<b>\$ 1,604,913,452</b>	<b>296</b>		<b>\$ 985,126,743</b>	<b>656</b>		<b>\$ 2,590,040,195</b>

**Table 5.2 - Data Set 2 Cross Tabulation**

No. of Bidders	ACCEPTABLE BID RESULTS										TOTAL
	Award Amount			Project Type			Time of Year				
	Low	Medium	High	Bridge	Highway	Other	Spring	Summer	Autumn	Winter	
1	7	8	3	5	8	5	10	5	2	1	18
2	88	69	8	17	88	60	72	49	19	25	165
3	104	71	19	20	119	55	84	58	22	30	194
4	94	64	21	22	100	57	68	45	31	35	179
5	62	36	12	18	65	27	42	20	21	27	110
6	26	32	13	11	47	13	27	16	13	15	71
7	21	11	8	4	29	7	14	10	6	10	40
8	16	11	16	13	28	2	16	13	2	12	43
9	11	8	6	4	15	6	9	3	3	10	25
10	6	4	4	1	11	2	1	7	1	5	14
11	3	6	2	4	7	0	2	2	2	5	11
12	3	3	6	1	10	1	5	1	2	4	12
13	4	3	1	1	7	0	1	0	3	4	8
14	4	3	1	3	5	0	4	0	0	4	8
15	0	4	2	0	6	0	2	1	2	1	6
16	1	1	0	0	1	1	1	0	1	0	2
17	2	2	0	0	4	0	0	0	1	3	4
18	1	1	0	0	1	1	1	0	0	1	2
19	0	1	0	0	1	0	0	0	0	1	1
<b>TOTAL</b>	<b>453</b>	<b>338</b>	<b>122</b>	<b>124</b>	<b>552</b>	<b>237</b>	<b>359</b>	<b>230</b>	<b>131</b>	<b>193</b>	<b>913</b>
	<b>913</b>			<b>913</b>			<b>913</b>				
	<b>UNFAVORABLE BID RESULTS</b>										
1	24	5	2	7	18	6	13	12	2	4	31
2	16	5	0	3	15	3	6	11	1	3	21
3	8	0	0	0	5	3	2	3	3	0	8
4	2	1	1	2	2	0	2	0	2	0	4
5	0	1	0	0	1	0	0	0	0	1	1
<b>TOTAL</b>	<b>50</b>	<b>12</b>	<b>3</b>	<b>12</b>	<b>41</b>	<b>12</b>	<b>23</b>	<b>26</b>	<b>8</b>	<b>8</b>	<b>65</b>
	<b>65</b>			<b>65</b>			<b>65</b>				
	<b>IDEAL BID RESULTS</b>										
2	6	5	1	2	5	5	4	5	1	2	12
3	7	5	4	1	11	4	7	3	4	2	16
4	4	11	3	3	12	3	9	5	2	2	18
5	3	2	2	1	5	1	1	3	1	2	7
6	0	1	3	0	2	2	3	1	0	0	4
7	0	2	0	0	2	0	0	0	0	2	2
8	0	2	0	1	1	0	0	1	0	1	2
9	1	0	0	0	1	0	0	0	0	1	1
<b>TOTAL</b>	<b>21</b>	<b>28</b>	<b>13</b>	<b>8</b>	<b>39</b>	<b>15</b>	<b>24</b>	<b>18</b>	<b>8</b>	<b>12</b>	<b>62</b>
	<b>62</b>			<b>62</b>			<b>62</b>				

**Table 5.3 – MLR Results**

Bid Quality Model		$\chi^2$	Probability	$R^2$
		191	0.00%	0.2015
Coefficients		$z$	Probability $ z  > Z^*$	Significance Level
$\alpha^A$	-0.0410	-3.44	0.00%	1%
$\beta_1^A$	-0.0218	8.31	0.00%	1%
$\beta_{10}^A$	0.0040	1.32	18.83%	Not Significant
$\beta_2^A$	0.0112	2.47	1.35%	5%
$\alpha^I$	-0.0145	-5.74	0.00%	1%
$\beta_1^I$	-0.0064	7.20	0.00%	1%
$\beta_{10}^I$	0.0060	2.10	3.61%	5%
$\beta_2^I$	-0.0001	3.95	0.00%	1%

## CHAPTER 6

### Competition Versus Final Project Outcomes

#### 6.1 Introduction

Part 1 of the study established a strong positive correlation between the number of bidders/bid and the likelihood of an acceptable, or ideal, bid result. An acceptable, or ideal, bid result is an indication that there is relatively minimal risk in proceeding with the work given the outcome of the bidding process. For this part of the research the relationship between the level of competition during bidding and final project outcomes was modeled. Project outcomes were quantified as cost overrun and time delay percentages at completion. The definitions of Cost Overrun Percentage ( $c$ ) and Time Delay Percentage ( $t$ ) are shown in Equations 1.9 and 1.10 below. In this form, the observed metrics are indicators of the relative success in achieving project management objectives. For the cost overrun percentage, a positive value indicates that the project finished over budget (the final cost was greater than the engineers estimate). For the time delay percentage, a positive value indicates the project finished behind schedule (later than the contractual final acceptance date).

$$c = \frac{AC - EE}{EE} \times 100 \quad (1.9)$$

$$t = 1 - \frac{CF - CS}{AF - CS} \times 100 \quad (1.10)$$



*AC = Final Cost*

*EE = Engineers Estimate*

*AF = Actual Finish*

*CS = Contractual Start*

*CF = Contractual Finish*

As shown in Figures 6.1 and 6.2, both measurements showed a wide distribution of both positive and negative values. For the cost overrun percentage, the average project was completed 7.8 percent over budget. Interestingly, for the time delay percentage, the average project was completed 8.6 percent ahead of schedule.

Time delays and cost overruns are related by the "time is money" principle. If a construction project experiences a schedule impact (to the critical path) then either the lost time must be recovered, or the project will slip - there are no other possibilities. In both cases the cost of the project will most likely go up. State DOTs carry contingencies for cost overruns, but time delays can sometimes be operationally, or politically, unacceptable. Often State DOTs will use cost savings, contingency, or request additional funding, to ensure that a project is completed on time. When this strategy is used to achieve schedule deadlines the associated costs will be included in the observed cost overrun percentage. Likewise, when a project does slip, that additional cost (increased overhead, escalation, etc.) will also be captured in the cost overrun percentage. Because the cost overrun percentage includes all costs, including those associated with schedule impacts, it can be argued it is a truer measure of project performance than the time delay percentage.

To see if a correlation existed between the number of bidders/bid and the project performance metrics ( $t$  and  $c$ ) all significant measurable factors that could potentially affect the results were considered. The Cause/Effect Diagram (Figure 3.2) that was developed in Part 1 of the study was used to identify, and then correlate, these factors. Potential independent variables for Project Type ( $pt$ ), Project Amount ( $pa$ ), Project Start Date ( $ps$ ), Weather Conditions ( $pl$ ), and local Construction Employment Levels ( $la$ ) were considered in addition to the number of bidders/bid ( $n$ ). Selection of the potential factors that might influence project outcomes was based on similar research by others (Anastasopoulos, 2012), the results of data collected in a questionnaire of project managers (Beleiu, 2013), and through practical knowledge based on experience and judgement.

Project success at completion, has historically been defined as reaching the objectives and the planned results in compliance with time, cost and performance requirements (“the golden triangle”). For contractors, project success is also related to aspects of profitability and competitive advantage. In addition, and according to the Project Management Institute (PMI, 2013), aligning projects with strategic business objectives brings value to any organization. As such, a universal definition of project success is problematic as it depends on the different perspectives of the members of the project team. For this research, project success was defined from the perspective of project managers based partially on Beleiu’s survey conducted in 2013. In that survey, project managers were asked to choose from a comprehensive list of success factors the five factors that have the highest influence on a projects’ success. The list of nineteen success factors presented in the

questionnaire was based on previous studies (Pinto, 1987) (Davis, 2014), and on inputs received from the project managers during the survey.

The rankings of the nineteen success factors is provided in Table 6.1. It is interesting to note that competition for the work was not listed as one of the nineteen project success factors. Although competition for the work is often seen as an output to the procurement management process, it can also be considered an input. Competition for the work, for example, can be enhanced in many ways, including:

1. Strategic bundling of the bid packages,
2. The choice of project delivery method,
3. The timing of the bid, and
4. The amount of contractor solicitation.

The factors that were selected by the project managers in Beleiu's survey, represent the most common project management objectives. For this study, it was assumed that the proficiency to achieve those objectives would be observed in the final project results. Based on that premise, measurable factors that may impact achievement of these goals and influence competition levels, were considered. The potential correlation between final project results and each independent variable was hypothesized as follows:

1. **Project Type:** For WSDOT, project type is defined as either a Bridge, Highway, or Other (Paving, Safety, Ferry, and Maintenance). The project type potentially influences the complexity, scale, and scope of a project. A large bridge project, for example, might be much more complicated to manage, than the re-paving of a rural road.
2. **Project Size:** For this research, project size was categorized as award amounts  $\leq \$1,000,000$ , award amounts  $\geq \$1,000,001$  and  $\leq \$5,000,000$ , and award amounts  $\geq \$5,000,001$ . The size of a project potentially influences the complexity, scale, and scope of the project. A \$100 Mil highway project, for example, might be much more complicated to manage, than a \$600,000 road maintenance project. In a study conducted by the FHWA of 20 State DOTs, large projects were more often delivered over budget and behind schedule.
3. **Construction Period:** For this research, the construction period was categorized as the Northern Meteorological Seasons defined as Spring (March 1 – May 31), Summer (June 1 – August 31), Autumn (September 1 – November 30), and Winter (December 1 – February 28/29). The construction period has the potential to influence final project results, as it was hypothesized, that the ability to attract a sufficient pool of bidders is affected by the time of the bid, and project execution if affected by seasonal weather patterns. A project bid early in the Spring, for example, might attract more bidders, than a project bid in late Fall or Winter. This is suspected as contractors are generally eager for work in the Spring, and their bonding capacity may be depleted by late Fall or Winter. In addition, projects with construction starts late in the year are more susceptible to adverse weather conditions that may impact initial project activities, such as earthmoving, leading to time delays.

4. Weather Conditions: Heavy rainfall, which can lead to saturated and unworkable soil conditions, has been proven to have a negative effect on productivity for common highway construction operations, namely: earthmoving, construction of base courses, construction of drainage layers, and paving operations (El-Rayes, 2001). It was hypothesized that transportation projects that experienced above average precipitation during the execution phase would, on average, have higher cost overrun and time delay percentages.
  
5. Construction Employment Levels: Contractors often cite factors which they cannot control as reasons for cost overruns and time delays (Hendrickson, 1998). Factors often cited include:
  - a. Environmental restrictions
  - b. The weather
  - c. Regulatory policies
  - d. Labor laws
  - e. The age, skill and experience of the workforce
  - f. The leadership and motivation of the workforce
  - g. Union labor requirements, including provisions for:
    - i. Absentee time, including late start and early quits
    - ii. Non-working holidays
    - iii. Strikes
    - iv. Apprentice and stewardship obligations

Apart from environmental and weather impacts, all the items noted as “uncontrollable” by the contractors are related specifically to labor productivity. On a construction site, efficiency is commonly measured and categorized as either labor, equipment, or material productivity. A “rule of thumb” in the construction industry is that the total cost for labor (direct cost with labor burden added) comprises approximately 30 to 50 percent of the total cost, and significantly more than equipment and materials. Some contractors, in fact, use the “2x rule” when initially pricing work, which doubles the material costs to estimate labor cost. For WSDOT projects, bidders are required to use the prevailing wage schedule for calculating the direct labor cost and must use a set percentage for labor burden. Therefore, the difference in the total estimated labor costs for the competing firms is not the price of labor, but the means and methods of performing the work and the assumed labor productivity. Because labor cost comprises a sizeable portion of the overall budget, the contractor’s assumed labor productivity percentages play a critical role in determining who is awarded the contract. The actual labor productivity during construction also plays a significant role in the cost overrun and time delay percentages. This is significant because there are many things that effect labor productivity, with the availability of skilled labor being the most critical of the noted “uncontrollable” factors. The law of supply and demand predicts that as the availability of skilled labor becomes scarcer, the quality of the workforce will decrease. It was hypothesized that a lower quality workforce negatively effects productivity which in turn will increase labor costs. For this research, construction employment levels were measured as the difference between the mean level for the study period and the mean level during construction for each project.

## 6.2 Three-Stage Least Squares Regression

Once a complete database of potential predictor variables was established for the cost overrun and time delay percentages, the next step was to develop a mathematical model to represent potential correlations. Using practical knowledge, economic theory, the Beleiu's survey conducted in 2013, and the cause/effect diagram (Figure 3.2) created as part of this research as a guide, the following linear system of equations was developed through trial and error. The trial and error process involved looking at different predictors, various combinations of those predictors, and in some cases transformations of the predictors, and then selecting the model with the best F-statistic. The technique used to show the correlations was three-stage least squares regression (3SLS). The 3SLS regression technique is a combination of Multivariate Regression (SUR estimation) and Two Stage Least Squares (2SLS) regression. This statistical technique is used when a system of equations has endogenous variables on both the left and right-hand sides. This is the case here because of the "time is money" principle. The time delay percentage ( $t$ ) is a predictor variable for the cost overrun percentage ( $c$ ) (Eq. 1.09), and vice versa (Eq. 1.10).

$$\begin{aligned} c = & \alpha^c + \beta_2 n + \beta_3 \log(pa) + \beta_4 pt_1 \\ & + \beta_5 pt_2 + \beta_6 pl + \beta_7 la + \beta^c t + \varepsilon_c \end{aligned} \quad (1.09)$$

$$t = \alpha^t + \beta_8 pl + \beta_9 ps + \beta^t c + \varepsilon_t \quad (1.10)$$

### Predictor Variable Set

$n$	Number of Bidders/Bid	$la$	Labor Availability
$pa$	Project Amount	$ps$	Project Start
$pt_1$	Project Type- Bridge	$\varepsilon_c$	Cost Overrun Disturbance
$pt_2$	Project Type - Highway	$\varepsilon_t$	Time Delay Disturbance
$pl$	Precipitation Level		

The results for the 3SLS models are shown in Tables 6.2. Interesting, the coefficient for the cost overrun percentage variable in the time delay percentage model was shown to be statistically insignificant to a very large degree. This is counterintuitive as it suggests that schedule and cost do not have a simultaneous relationship. On the other hand, the time delay percentage variable in the cost overrun percentage model was shown to be significant (at 99 percent) as an inverse relationship, again counterintuitive.

To further study the correlation between the cost and schedule data in the model, the Durbin Watson statistic was used. The Durbin Watson statistic is a number that tests for autocorrelation in the disturbance terms. As Data Set 2 was time sequenced, the potential for a lagged effect (a previous result affecting the next result) was studied. The Durbin-Watson statistic is always between 0 and 4. A value of 2 means that there is no autocorrelation in the sample. The results for the models were .623 for the cost overrun percentage and .645 for the time delay percentage. Values approaching 0 indicate positive autocorrelation and values toward 4 indicate negative autocorrelation. Positive autocorrelation is not unexpected as both economic conditions and weather impacts would most likely be correlated through the start date of each project. In other



words, two projects that start within a week of each other would experience similar economic and environmental conditions.

To determine the level of contemporaneous (both cross equation and simultaneous) correlation, in addition to the autocorrelation found, the F-statistic (goodness of fit test) for the model was used. Because the 3SLS controls for contemporaneous correlation of the disturbance terms, and the F-statistic for both equations were above the critical values, it can be stated that this form of correlation exists as well. The main cause of contemporaneous correlation in 3SLS regression is omitted variables from the model. When an important independent variable is omitted from a model, its effect on the dependent variable becomes part of the disturbance term. The finding of contemporaneous correlation in the model is not unexpected. Finding a model to predict cost overruns and time delays without such correlation between the dependent terms would be impractical due to the complex nature of project management. For example, the aptitude of the project manager may play a significant role in project outcomes, but this is not a measurable trait and therefore its influence cannot be identified in any form of mathematical model. Another example might be the influence of the number, or amount, of change orders on final project outcomes. Although information on change orders was available from WSDOT, their influence on project outcomes was not considered in this research. This was the case because it was speculated that the recording and reporting of change orders was subjective in nature, and therefore the data was not reliable.

The  $R^2$  statistic can be used to determine how much of the cost overrun and time delay percentages are explained by the predictor variables that were identified as significant. For the cost overrun percentage, 12.6 percent is predicted based on the level of competition, precipitation levels, and labor availability. For the time delay percentage, just 2 percent is predicted based on precipitation levels and the project start date. So, the finding of correlation between the disturbance terms does support the initial hypothesis that a positive simultaneous relationship occurs between cost and schedule performance. It is believed that a direct relationship, which would have been evident by a positive value of the slope coefficients ( $\beta^c$  and  $\beta^t$ ), was not found due to incomplete, or inaccurate, recording of project completion dates. Although the start date of a project is well documented, there is subjectivity in determining the actual period between substantial completion and final acceptance. It is believed that different perceptions on what constitutes “final acceptance” makes it difficult to compare schedule performance between projects. That is not considered the case with cost overruns. Because cost overruns are associated with the expenditure of public funds, the recording of cost overruns is assumed to be very accurate and precise.

Substituting the statistically significant (CI=1 percent) coefficient values, and assuming contemporaneous correlation is revealed in the disturbance terms alone, yields the following model for the cost overrun percentage and time delay percentage. Note that the constant values (y-intercept) for each equation are not shown. The constant terms represent the value of the cost overrun and time delay percentages when all the predictor variables are set to zero Although

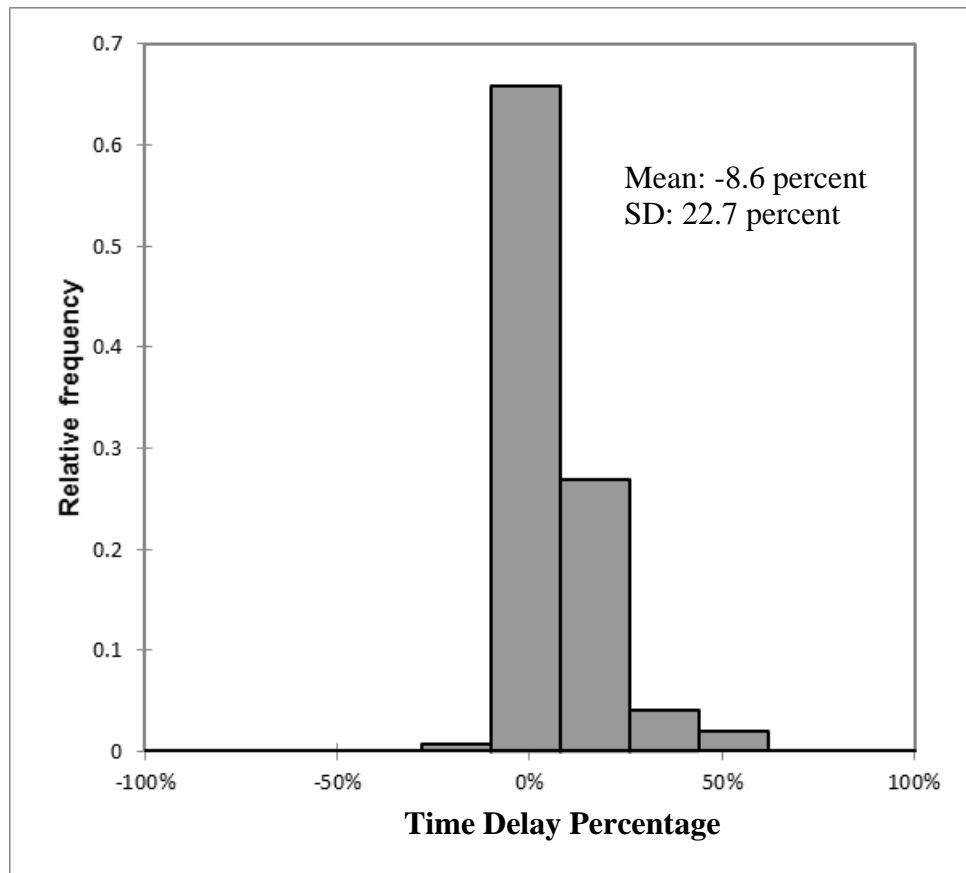
needed for the mathematical computations, a zero setting for all predictors in this model is nonsensical.

$$c = -.022n - .0064pl + .00065la + \varepsilon_c \quad (1.11)$$

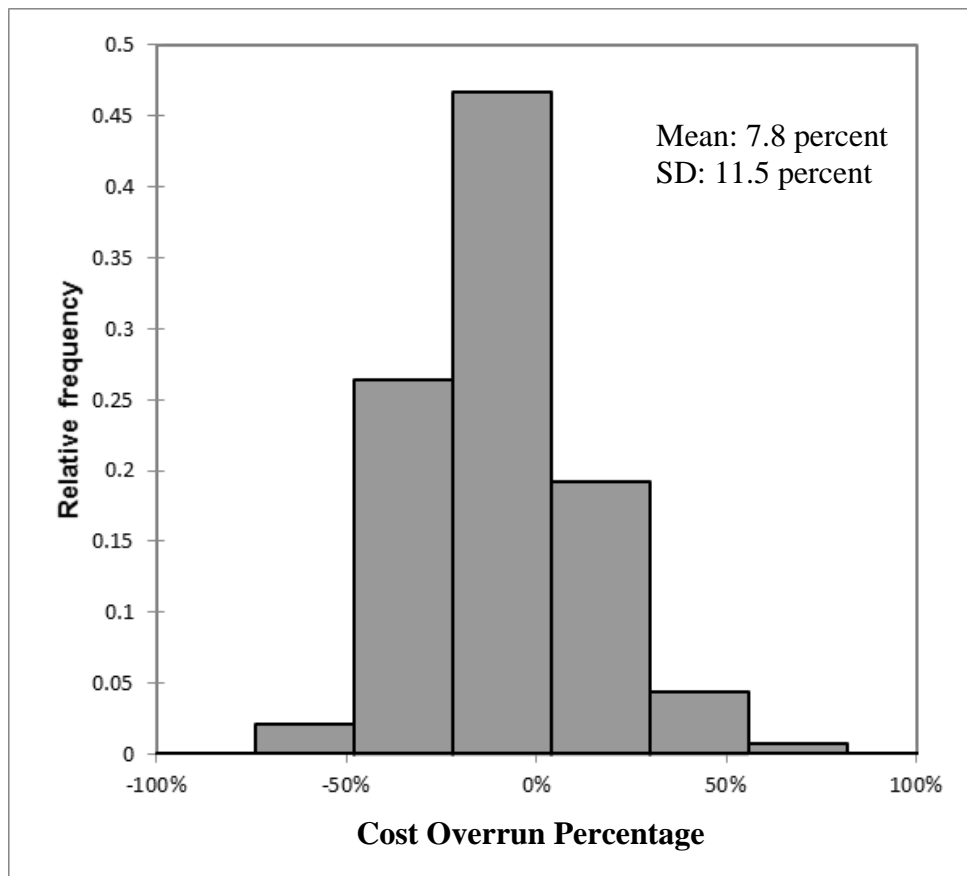
$$t = .004pl + .209ps + \varepsilon_t \quad (1.12)$$

As previously reasoned, it is believed that the cost overrun percentage is the best quantitative measurement of project performance as it is comprised of the cost associated with time delays as well, such as those for schedule recovery or delay. The cost overrun percentage can be forecast using Equation 1.11, and because the model coefficients illustrate the direct effect of each independent variable, the lone effect of the level of competition can easily be determined. And as expected, the model shows that as the number of bidders/bid increase the cost overrun percentage will significantly decrease. For each additional bidder, the model estimated a 2.2 percent decrease in the cost overrun percentage.

Interestingly, the time delay percentage model shows that there is no considerable influence from the level of competition during bidding on schedule performance. The project start date, which positions the project within the seasons, and skilled labor availability, which impacts productivity, are the only identified and measurable contributors to schedule delays.



**Figure 6.1 – Time Delay Histogram**



**Figure 6.2 – Cost Overrun Histogram**

**Table 6.1 – Ranking of Project Success Factors  
(Beleiu, 2013)**

<b>Project Success Criteria</b>	<b>Rank</b>	<b>Response</b>
Well Defined Goals	1	70.2%
Competent Project Team	2	53.2%
Clear Roles and Responsibilities	3	53.2%
Managing the Golden Triangle	4	40.4%
Adequate Communications	5	40.4%
Schedule Accuracy	6	36.2%
Synergy of Team	7	31.9%
Acceptance of Results	8	23.4%
Monitoring and Control	9	21.3%
Experience of PM	10	14.9%
Management Support	11	14.9%
Stakeholder Satisfaction	12	12.8%
Project Management Skills	13	10.6%
Technical Skills	14	10.6%
Risk Management	15	10.6%
Change Management	16	10.6%
Sponsor Involvement	17	6.4%
Timely Direction	18	4.3%
Owner Involvement	19	2.1%

**Table 6.2 - 3SLS Model Results**

Cost Overrun Rate Model		F	Probability	R <sup>2</sup>
		64.5	0.00%	0.12677
Coefficients		z	Probability  z  > Z*	Significance Level
$\alpha^c$	-0.0410	-1.12	26.20%	Not Significant
$\beta_2$	-0.0218	-15.63	0.00%	1%
$\beta_3$	0.0040	1.49	13.50%	Not Significant
$\beta_4$	0.0112	0.88	37.00%	Not Significant
$\beta_5$	-0.0145	-1.60	11.00%	Not Significant
$\beta_6$	-0.0064	-4.29	0.00%	1%
$\beta_7$	0.0060	4.65	0.00%	1%
$\beta_t$	-0.0001	-6.93	0.00%	1%
Time Delay Rate Model		F	Probability	R <sup>2</sup>
		20.8	0.00%	0.0196
Coefficients		z	Probability  z  > Z*	Significance Level
$\alpha^t$	-0.7690	-7.07	0.00%	1%
$\beta_8$	-0.0039	4.79	0.00%	1%
$\beta_9$	0.0000	7.78	0.00%	1%
$\beta_c$	0.0000	-1.17	24.06%	Not Significant

## **CHAPTER 7**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **7.1 Summary of Findings**

The research produced the following six significant findings:

1. The quality of the lowest bid can be defined by a combination of the bid spread, and the deviation of the lowest bid from the engineers estimate, as determined by the Bid Quality Matrix.
2. The observed bid spread was shown to be statistically inversely proportional to the level of competition. On average, the more bidders, the lower the bid spread.
3. The deviation of the lowest bid from the engineers estimate was shown to be statistically inversely proportional to the level of competition. On average, the more bidders, the closer the lowest bid is to the engineers estimate.
4. The likelihood of achieving an acceptable, versus an unfavorable bid result, is increased by 4.9x with each additional bidder/bid.



5. The most significant identified measurable factor that affects the cost overrun percentage is the level of competition during bidding.
6. The observed cost overrun percentages were statistically proven to be inversely proportional to the level of competition during bidding. All other factors being equal, each addition bidder/bid, on average, results in a 2.2 percent reduction in cost overruns.

## **7.2 Significant Contribution to the Profession**

The research has provided the following significant original contribution(s) to the construction management body of knowledge:

1. The development of a tool that can quantitatively define bid quality as acceptable, ideal, or unfavorable, based on the risk of awarding a construction contract to the lowest bidder. Although the tool was developed specifically for State DOT projects, the concept can be applied to any competitive construction bid. The technique of the Bid Quality Matrix improves upon the various “seat of the pants” methods currently being used by practitioners. The Bid Quality Matrix can be used as a standard by the profession to assess bid results. Such a standard would provide a system that can be used in real time (at bid openings) to provide an unambiguous

appraisal of the bid results. The system could also be used to compare bid results across projects and programs.

2. The establishment of a strong statistical correlation between increased competition and improved project performance. This study, and past studies, have proven that increased competition results in reduced bid prices. Past studies have not, however, taken the additional step to see if competition effects cost overruns in an analogous way. Because of the large data set used, and the robust statistical approach taken, it can be stated with certainty that an increase in competition reduces cost overruns on State DOT projects.

## **7.3 Practical Applications**

### **7.3.1 Alternative Project Delivery and PLA's**

The traditional project delivery approach of D-B-B for State DOTs mandates full and open competition for the work. State DOTs receive a sizeable portion of their funding from the Federal Government and therefore they generally follow the rules and regulations of the funding source, in this case the FHWA. The term “full and open competition” [ Public Contracts; Chapter 7. Office of Federal Procurement Policy], when used with respect to a federally sponsored procurement, means that “all responsible sources are permitted to submit sealed bids or competitive proposals on the procurement.” This traditional approach has worked well for transportation projects for some 145 years as the United States

developed the world's largest modern transportation system. Recently State DOTs have explored alternative methods of project delivery, and unconventional procurement strategies, that do not require full and open competition for the work, and in some cases purposely limit competition. For instance, alternative project delivery methods such as Design Build (D-B), Public Private Partnerships (PPP), and Integrated Project Delivery (IPD), and procurement strategies such as Project Labor Agreements (PLA's), are increasingly being used by State DOTs as alternatives to the traditional approach (Design-Bid-Build). Some alternative project delivery methods, like D-B and PPP, artificially limit the number of bidders to 3, or less, through the screening (prequalification) of bidders. Likewise, alternative procurement strategies, like PLA's, restrict the bidding pool to exclusively union contractors. When public-sector projects use alternative project delivery methods, or unconventional procurement strategies, they must be shown to have a proper business purpose, and be consistent with competitive bidding statutes, by providing direct and indirect economic benefits (Kotler, 2008). Generally State DOTs mandate that a "Due Diligence Report" be developed which establishes if the project meets this requirement. Because the phrase "direct and indirect economic benefits" is subject to interpretation, political pressure can often result in the analysis to be in favor of an alternative project delivery method or PLA. That is because the State DOTs who have sponsored the formation of a Due Diligence Report have generally done so as a prerequisite for implementing a PLA or using a delivery method other than the traditional approach. And if a sponsor of a PLA wants a favorable outcome in the Due Diligence Report, Norman

Ralph Augustine (Augustine, 1997) might say “all too many engineering consultants, when asked what is  $2 + 2$ , respond with what do you have in mind?”

This researcher recently had the opportunity to review the Due Diligence Report for the PLA which was subsequently enacted for the \$200 Mil. restoration of the Binghamton Johnson City Joint Sewer Treatment Plant (BJCJSP). The consultant’s report identified favorable attributes of implementing a PLA and concluded the approach would result in a savings of over \$5 million for the BJCJSP. The Due Diligence Report included a statement that read “the advantage of increased competition resulting from the PLA are obvious but not readily quantifiable”. Although this is just one piece of antidotal evidence, it shows that the requirement for “due diligence” is sometimes laxly enforced. The statement is also a direct contradiction to the results of this research.

Full and open competition for the work has several economic advantages over alternative procurement strategies that artificially limit competition. The most obvious benefit of competition is that it results in goods and services being provided to consumers at lower prices (Kolasky - 2002). The statistical analysis in this study confirms that this applies to State DOT procurement programs as well. The research shows that bid prices decrease (become closer to the engineers estimate) as the number of bidders/bid increase and that additional competition during bidding significantly reduces the cost overrun percentage.

It is expected that the results of this research can provide objectivity to the decision-making process by providing a means to quantify the negative effects of limiting competition on bid prices and final project costs. The cost overrun percentage model that was developed through 3SLS regression can be used as a forecasting tool to provide this information. One scenario might be to determine the impact on the cost overrun percentage when deciding between D-B and D-B-B. As shown in Figure 7.1, the average number of bidders for WSDOT D-B-B projects for the 8-year period of the study was significantly higher than 3 (4.5). The mean effect of D-B limiting competition on final project costs can be quantified by multiplying the regression coefficient  $\beta_2$  in Equation 1.09 by the average number of reduced bidders (1.5) as shown in Equation 1.13. When considering D-B an increase in the cost overrun percentage of 3.3 percent should be taken into consideration, with other factors, during the decision-making process.

$$c = -.022 \times (4.5 - 3) = -3.3\% \quad \text{Eq. (1.13)}$$

A second scenario might be to determine the appropriate level of effort to be undertaken to solicit extra competition for a critical infrastructure project. One approach to achieve extra competition is through strategic procurement. Strategic procurement positions a project, so it will be of interest to the greatest number of qualified contractors. This can be done by enhancing the opportunity by developing bid packages to match local/regional contractor interest/capability, by targeting ideal bidding timeframes, by ensuring that the

general and technical specifications are fair and just, and by providing high quality design documents, among others. Another approach to achieve extra competition during bidding is through enhanced contractor solicitation. Contractor interest can be heightened by increasing the scope and scale of the outreach effort. For example, if the project is large enough, or entails complex means and methods, consideration might be given to reach out to contractors in other regions of the state, or across states, to ensure an adequate number of bidders are found. Another approach would be to use additional resources, or expend more effort, to provide deeper engagement with the contractor community about the uniqueness of the opportunity.

A third approach would be to rebid a project when the number of bidders does not reach a specific threshold. For federally funded projects, the State DOTs have the right to reject all bids, and to re-bid, if it is “in the public’s interest” (Federal Acquisition System, Subpart 14.4—Opening of Bids and Award of Contract). Courts say this right should be exercised sparingly (Kamine, 2009) as explained in *Massman Construction Co. v. U.S.* (1945) 102 Ct.Cl. 699, 718, 60 F.Supp. 635, cert. den. 325 U.S. 866, 89 L. Ed 1985, 65 S.Ct. 1403: “To have a set of bids discarded after they are opened, and each bidder has learned his competitor’s price is a serious matter, and it should not be permitted except for cogent reasons”. It can be argued that rejecting a bid due to the lack of competition (1 bidder) or as the result of nominal competition (2 bidders), based on the results of this research, would be “in the public’s best interest” and done for a “cogent reason”. Based on the information from WSDOT for the 8-year period of the study, a threshold of 1

bidder/bid would have resulted in 51 rebids totaling \$92.3 Mil, and a threshold of 2 bidders/bid would have resulted in 255 rebids totaling \$410 Mil. Based on the cost overrun model, if rebids for those projects resulted in an average of 3 bidders/bid there would be a total of \$10.9 Mil. in cost overrun savings. If the number of bidders was mandated to be 4 (the mean was 4.5) then those savings rise to \$33.4 Mil. (Equation 1.14).

$$c = (.022) \times \$622,336,817 - (2 \times -.22) \times \$308,850,440 - (3 \times -.022) \times \$92,520 = -\$33,387,149 \quad \text{Eq. (1.14)}$$

### 7.3.2 Expert System for Bid Quality

It is recommended that a universal definition of bid quality be established by the FHWA so that State DOTs can access procurement risk, and compare bid results, across projects. The Bid Quality Matrix developed as part of this research would be a useful tool for that purpose. To do that, the FHWA's position on posting of the engineers estimate will need to be addressed. The FHWA's current position is to discourage posting of the engineers estimate due to the concern of "bid rigging". But currently there is no mandate, with some State DOTs publicly posting the engineers estimate, while others do not. It is hypothesized that the posing of the engineers estimate may affect the level of competition, an important consideration in the procurement process, and a critical component of the Bid Quality Matrix. A mandate to post, or not, will need to be made so bid quality can be compared across State DOTs. Utilizing the Bid Quality Matrix would take the subjectivity out of the process of accessing bids and enable the FHWA to identify both high and low performers.

That information could be shared as “lessons learned” to improve performance for the underachieving State DOTs. It could also serve as a scoring mechanism, which in turn might encourage healthy competition between the State DOTs.

Using the Bid Quality Matrix as the base, an expert system could be developed which would automatically calculate bid quality based on observed bid results. The State DOTs could assess which procurement strategies to implement based, in part, on the quantitative output of the expert system. In addition, the bid quality data from the 50 State DOTs could be “rolled up” into a FHWA national database. The national database could be used as a tool to assess the relative quality, among peers, for State DOT procurement programs. This would allow the FHWA to focus, and provide organizational assistance, to those State DOT programs that are underperforming. The bid quality database could also be used as a tool by the FHWA to determine which procurement strategies have been successfully implemented by the State DOTs and likewise, which strategies to avoid. In the age of “bid data”, a system could be developed in a way where alternative bidding strategies like D-B, or unique procurement strategies, like PLAs, could be assessed in real time.

To investigate how such a system might work, a pilot study was conducted using an actual bid in real time. A simple expert system (a macro embedded in an Excel Spreadsheet) was developed which calculated bid quality using the Bid Quality Matrix and real-time bid results. Figure 7.2 is a screen shot of the calculated bid quality results for a bid letting in Union Springs, New York, on September 12, 2017. In general, the system



was an excellent tool to give real-time data, and an instant analysis of bid quality. Lessons learned during implementation of the system were:

1. The word “unfavorable” is subjective in nature and therefore is not a recommended way to describe the quality of a bid. Bid quality is a measure of procurement risk. Risk, by definition, is a measure of the potential for something that may happen, not something that has happened. For the pilot study, the adjective “unfavorable” was replaced with the verb “check”.
2. The purpose and limitations of the system must be properly addressed and communicated. The system is intended to provide an indication of bid quality based on the statistical analysis of the research sample data. Characteristics of the research sample data may not match that of the real-time data. Comparison of the sample data to the real-time data is required.
3. Because the system uses the same analysis on all bid packages, and in the case of the pilot study, all bid packages were procured in the same way, it is hypothesized that the system can provide a good indication of the relative level of bid quality. This can be used as an indicator of problematic results which should be focused on first.

### **7.3.3 Bid and Project Results Tracking**

Currently there is no national database for State DOTs to record bid and final project outcomes. It is recommended that the FHWA develop such a national database with information provided from each State DOT. For the database to be worthwhile a standard reporting format, and a standard definition of each reported item, would need to be developed. It is suggested that as a minimum the standardized items included in Table 7.1 would be recorded and reported for each project. In addition to the detailed information for each project, it is recommended that summary information, by each State DOT, be provided by the FHWA and publicly posted each month. Recapitulation of the data for the report could be an automated feature of the system if the structure of the database is carefully considered and properly designed. Like WSDOT's Gray Notebook, the summary information would be used to monitor adherence to standards and to publicly post each State DOT's overall status in reaching procurement and project performance goals. It is believed that publicly posting the monthly summary results would fulfill the intent and requirements of the FOIL (Freedom on Information Law) requirements. It is also imagined that posting each State DOT's results "side by side" would inspire healthy competition between State DOTs and improve results.

### **7.4 Recommendations for Further Study**

The study focused on the effect of competition on cost overrun percentages for State DOT construction projects. Further research is suggested in the following related areas:

1. Studies in other disciplines have linked reduced competition levels to the following negative consequences:

- a. lower quality
- b. less choices and variety,
- c. less innovation and efficiency,
- d. less development and growth,
- e. less wealth equality,
- f. a weaker democracy by concentrating economic power, and
- g. less wellbeing by suppressing individual initiative, liberty, and free association.

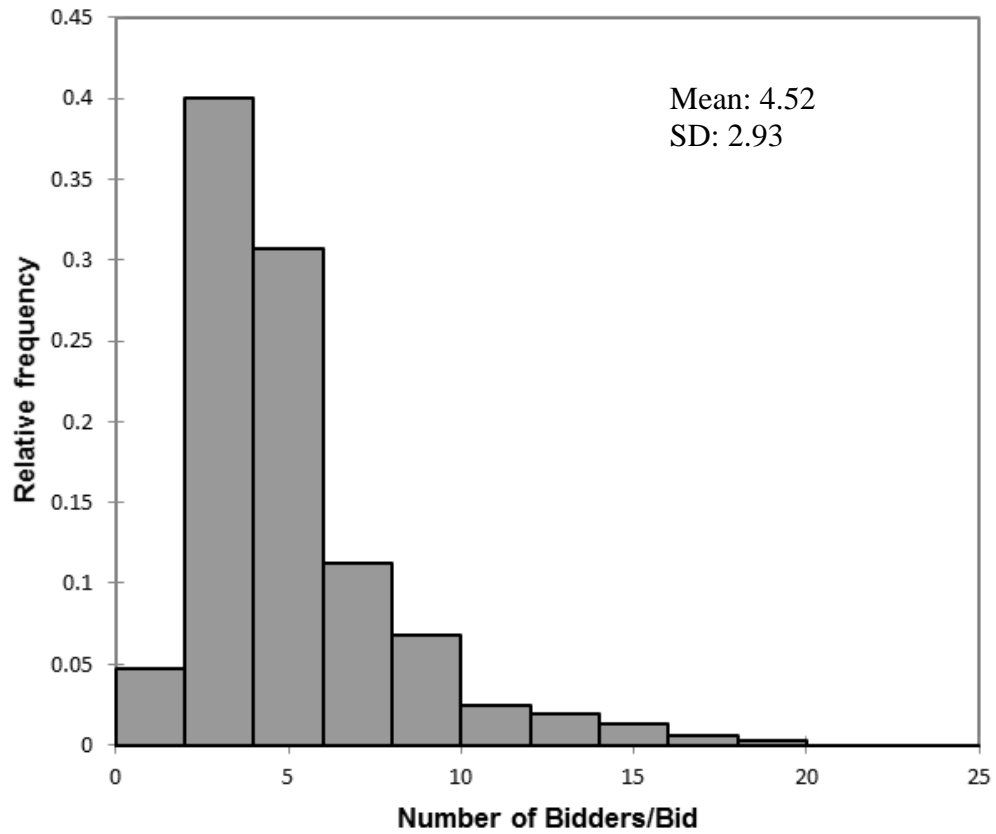
It is recommended that further study on how these additional negative consequences of reduced competition might impact the construction industry.

2. The study made inference to the consequences of reduced competition resulting from the use of alternative project delivery methods and procurement strategies like PLAs. Inference was required because project performance data for these types of projects is currently limited and may be unreliable. It is recommended that when the information is available, and reliable, that a similar study be performed to directly determine the effect of competition on these unique types of projects.

## 7.5 Limitations

Since State DOT procurement processes and construction management practices are similar across the United States, and two very large data sets (a total of 2,457 bid results and 1,040 final project outcomes) were used in the statistical analysis, it is believed that the results of the study can be used as a tool to assess bid quality and forecast project outcomes for all State DOT projects bid competitively, awarded to the lowest bidder, and delivered under the D-B-B method. Clearly though, the results are most applicable to WSDOT projects. Inference from the study for other project delivery methods, other procurement strategies, and other project types, may be done with further study and care.

The study did not take into consideration the effect of the number, nor amount, of contract change orders. It is believed that the acceptance, cost negotiation, and recording of change orders is subjective in nature and therefore, in general, data on contract changes is not comparable across projects.



**Figure 7.1 WSDOT Bidders/Bid Histogram**

UNION SPRINGS CENTRAL SCHOOL DISTRICT  
 Additions and Alterations to A.J. Smith Elementary School

Bid Package	Engineer's Estimate	APPARENT LOWEST BIDS			No. of Bidders	Second Lowest Bid	Bid Metrics		
		Contractor	Amount	Δ Budget			s	e	Quality
GC	\$ 3,750,000	Nicoletta	\$ 3,622,000	\$ 128,000	8	\$ 4,029,000	11%	-3%	Check
Site	\$ 800,000	Landmark Enterprises	\$ 834,000	\$ (34,000)	6	\$ 918,800	10%	4%	Accept
HVAC	\$ 1,000,000	Siracusa Mechanical	\$ 1,128,500	\$ (128,500)	6	\$ 1,140,000	1%	13%	Accept
Electrical	\$ 1,000,000	Kaplan-Schmidt	\$ 880,000	\$ 120,000	9	\$ 985,900	12%	-12%	Check
Plumbing	\$ 450,000	Siracusa Mechanical	\$ 419,700	\$ 30,300	6	\$ 432,000	3%	-7%	Ideal
Kitchen	\$ 100,000	Joseph Fillan	\$ 74,900	\$ 25,100	3	\$ 81,000	8%	-25%	Accept
LOW BID TOTALS			\$ 6,959,100	\$ 140,900	38	\$ 7,586,700	8%	-2%	

**Figure 7.2 – Expert System Output**

**Table 7.1 – Recommended National Database Items**

<b>Bid Quality</b>
Bid Spread
Engineer's Estimate Accuracy
Bid Quality (A,I,U)
Contractor Bids w/Unit Prices
Award Amount
Project Type
<b>Final Project Outcomes</b>
Cost Overrun Rate
Time Overrun Rate
Precipitation Data
Labor Availability

## References

- Ahmad, I., Minkarah, I., (1988). Questionnaire Survey on Bidding in Construction. *Journal of Management in Engineering* 4(3)
- Ahmed, M., Eladaway, I., Coatney, K., and Eid, M. (2015). Construction Bidding and the Winner's Curse: Game Theory Approach. *J. Constr. Eng. Manage.*
- Anastasopoulos, P.Ch., Labi, S., Bhargava, A., Mannering, F.L., (2012). "Empirical Assessment of the Likelihood and Duration of Highway Project Time Delays". *ASCE Journal of Construction Engineering and Management*, 18(3), 390-398.
- Anastasopoulos, P.Ch., Labi, S., McCullouch, B.G., (2009). "Analyzing Duration and Prolongation of Performance-Based Contracts Using Hazard-Based Duration and Zero-Inflated Random Parameters Poisson Models". *Transportation Research Record*, 2136, 11-19.
- Bagies, A., Fortune, C., (2006). "Bid/No-Bid Decision Modelling for Construction Projects". School of the Built Environment, Heriot-Watt University, Riccarton Campus, Edinburgh EH14



Beleiu, I. (2013). "Main Factors Influencing Project Success", Open Access funded by King Saud University

Bhargava, A., Anastasopoulos, P., Labi, S., Sinha, K., Mannering, F., (2010). Three-stage least-squares analysis of time and cost overruns in construction contracts. *ASCE Journal of Construction Engineering and Management* 136 (11), 1207-1218

Bordat, C., McCullouch, B., Labi, S, Sinha, K., (2004). An analysis of cost overruns and time delays of INDOT projects. *Tech Rep. No. FHWA/IN/JTRP-0417*

Carr, P. (2005). Investigation of Bid Price Competition Measured through Prebid Project Estimates, Actual Bid Prices, and Number of Bidders. *Journal of Construction Engineering and Management*.

Carr, R. (1982). General bidding model. *Journal of Construction Division*. 108(4):639-650.

Carr, R. (1983). Impact of number of bidders on competition. *Journal of Construction Engineering and Management*. 109 (1) 61-63

- Caves, R. , & Porter, M (1977). “From entry barriers to mobility barriers: Conjectural and contrived deterrence to new competition”. *Quarterly Journal of Economics*, 91, 241-261
- Chan, D.W.M., Kumaraswamy, M.M., (1997). “A Comparative Study of Causes of Time Overruns in Hong Kong Construction Projects”. *International Journal of Project Management*, 15(1), 55–63.
- Cheung, S., Wong, P., Fung, A., Coffey, P.,(2006). Predicting project performance through neural networks. *International Journal of Project Management*, 24 207–215
- Chia-Chien, H., Sandford, B., (2007). “The Delphi Technique: Making Sense of Consensus”. *Practical Assessment, Research & Evaluation*, Vol 12, No.
- Construction Program: D-B Project Delivery Method, (2016), retrieved from <https://www.fhwa.StateDOTs.gov/construction/cqit/desbuild.cfm>
- Crossett, J. and, Hines, L., (2007). Comparing State DOTs’ Construction Project Cost and Schedule Performance - 28 Best Practices from 9 States -AASHTO Standing Committee. *TransTech Management, Inc. Washington, DC*

Crowley, L and Hancher, D. (1995). Evaluation of competitive bids. *Journal of Construction Engineering and Management* 121 (2): 238-245

Crowley, L and Hancher, D. (1995). Risk assessment of competitive procurement. *Journal of Construction Engineering and Management* 121(2): 230-237.

Crowley, L. (2000). Friedman and Gates – another look. *Journal of Construction Engineering and Management*, 126(4) 306-12.

DBIA “Choosing a Project Delivery Method”

D-B Project Delivery Market Share and Market Size Report. (2014). *Reed Construction Data/RSMMeans Consulting*, pages 1-15.

Delaney, J.W. (2004). “A Case Study in the Effective Use of Schedule Control Techniques - Recovery Schedules”. Construction Management Association of America. *CM eJournal*.

Delaney, J. W. (2006). “Time is Money”. *PMI Global Congress Proceedings*, Bangkok, Thailand

Delaney, J. W. (2013). Construction Program Management (Best Practices and Advances in Program Management), Auerbach Publications

Design Build Done Right. (2013). *The Design Build Institute of America*, pages 3-9.  
Retrieved January 7, 2016, from [www.D-Bia.org](http://www.D-Bia.org)

Drew, D. and Skitmore, R. (1993). Prequalification and Competitiveness. *International Journal of Management Science*, Vol. 21, pp. 363-78.

Eastham, RA, Skitmore, M. (1993). “Construction contractor's project selection: decision making within a portfolio framework” - [eprints.qut.edu.au](http://eprints.qut.edu.au)

Egdom, J. (2012). “Leadership Message – The Money Value of Time”, retrieved from [www.interstates.com/newsletters/](http://www.interstates.com/newsletters/)

El-Rays, K. (2001). “Impact of Rainfall on the Productivity of Highway Construction”, ASCE Magazine

El-Sokhn, N., Othman, A., (2014). “Project failure factors and their impacts on the construction industry”. *Proceedings of the 10th International Conference on Civil and Architecture Engineering (ICCAE-1)*, Cairo, Egypt, Volume: 1

Friedman, L. (1957). A competitive bidding strategy. Doctoral dissertation, Case Institute of Technology

Forsberg, T., (2015) Is more competition always desirable? Evidence from public construction procurements in Finland. *PHD Dissertation*

Fu, W. and Drew, D. (1995). Contractors' bidding behavior in a recurrent bidding situation. Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Hong Kong

Gates, M. (1967). Bidding strategies and probabilities. *Journal of the Construction Division, Proceedings of the American Society of Civil Engineers 93 (CO1), 75-107.*

Gates, M. (1976). Discussion of bidding models: truths and comments. *Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, 102(4) 696-9.*

Gaver, K., Zimmerman, J., (1977). "An Analysis of Competitive Bidding on BART Contracts" *The Journal of Business*, vol. 50, issue 3, 279-95

Gkritska, C. & Labi, S., (2008). Estimating cost discrepancies in highway contracts: Multistep econometric approach. *ASCE Journal of Construction Engineering and Management*. 134(12), 953-62.

Hanak, T., Muchova, P., (2015). Impact of Competition on Prices in Public Sector Procurement. *Article in Procedia Computer Science* 64:729–735

Hong, H., Shum, M., (2002). Increasing Competition and the Winner's Curse: Evidence from Procurement. *The Review of Economic Studies*, Volume 69, Issue 4

Kamine, Bernard, S (2009). “Rebidding Public Construction Work”, *ECA Magazine*, Vol. 45, No. 2, p. 37.

Kolasky, W. (2002). “What is Competition?” Address by Deputy Assistant Attorney General Antitrust Division U.S. Department of Justice, *Seminar on Convergence*, The Hague, Netherlands

Lin, C, Chen, Y., (2004). Bid/no-bid decision-making – a fuzzy linguistic approach International. *International Journal of Project Management* Volume 22, Issue 7

Mahmoud, S. and Scott, S (2002). “The development and use of key performance indicators by the UK construction industry”. *Association of Researchers in Construction Management*, Vol. 2, 587-94.

Milgrom, PR., Glosten, LR. (1985). “Bid, ask and transaction prices in a specialist market with heterogeneously informed traders”. *Journal of Financial Economics*

Mills, A., Skitmore, M., (1999). Comparison of Client and Contractor Attitudes to Prequalification Criteria. *The International Council for Building Research Studies*

Mohammad, S., (2012). Empirical Framework for Making the Bid/No Bid Decision. *Journal of Management in Engineering*, 29,3

Moselhi, O, Hegazy, T, Fazio, P (1991). “The competitive and risk-averse nature of the construction industry and its heuristic problem-solving needs, among other reasons, have contributed to the development of nontraditional decision-making tools”. - *Journal of Construction Engineering - ascelibrary.org*

Michigan Department of Transportation. (2015). Tabulated Bid Results [Data File]

Retrieved from [www.michigan.gov/mState](http://www.michigan.gov/mState) DOTs

Nassar, K., Nassar, M., Hegab, M., (2005). Evaluating cost overruns of asphalt paving project using statistical process control methods. *ASCE Journal of Construction Engineering and Management*. 131(11), 1173-8

New York State Department of Transportation. (2015). Tabulated Bid Results [Data File]  
Retrieved from [www.State DOTs.ny.gov](http://www.StateDOTs.ny.gov)

Nyoman, N., Yasa, K., Gde. P., Henny, S., Giantari, K. (2015). “Effect of Industry Competition and Entrepreneurial Company to Implementation of Differentiation Strategy”, *DireCT access Journal*

Ortega, I., Bisgaard, S., (2000). “Quality improvement in the construction industry: Three Systematic Approaches”. *Technology Law and Insurance*

Owners Guide to Project Delivery Methods. (2013). *The Construction Management Association of America*, pages 3-9. Retrieved January 11, 2016, from [http://cmaanet.org/files/Owners Guide to Project Delivery Methods Final.pdf](http://cmaanet.org/files/Owners%20Guide%20to%20Project%20Delivery%20Methods%20Final.pdf)

Petroutsatou, K., Georgopoulos, E., Lambropoulos, S. & Pantouvakis, J., (2011). Early Cost Estimating of Road Tunnel Construction Using Neural Networks, *ASCE Journal of Construction Engineering and Management*. 138(6), 679-87



Pratt, D., Fundamentals of Construction Estimating (2nd Edition), 2004

Project Delivery Method Definition. *Wikipedia*. Retrieved January 12, 2016, from [https://en.wikipedia.org/wiki/Project\\_delivery\\_method](https://en.wikipedia.org/wiki/Project_delivery_method)

Kotler, F. (2009). "Project Labor Agreements in New York State: In the Public Interest"  
School of Industrial and Labor Relations, Cornell University

Serbu, J. (2013). "Critics say federal D-B construction contracts stifling competition",  
Federal News. Retrieved from <http://federalnewsradio.com>

Skitmore, M., Pettitt, A., MClinish R., (2007). Gates' Bidding Model. *ASCE Journal of Construction Engineering and Management* 133(11)

Son, H., Kim, C., (2012). Hybrid principal component analysis and support vector machine model for predicting the cost performance of commercial building projects using pre-project planning variables, *Journal of Automated Construction*, 27, 60

Theriault, K. (2004). "Determination of Lowest Responsible Bidder." *The Procurement Connection*. Retrieved from [www.theprocurementconnection.com/articles/defbid.html](http://www.theprocurementconnection.com/articles/defbid.html)

Trost, S., Oberlender, G., (2003). Predicting accuracy of early cost estimates using factor analysis and multivariate regression, *ASCE Journal of Construction Engineering and Management* 129(2), 198-204

Tuerck, D., Glassman, S., and Bachman, P., (2009). Project Labor Agreements on Federal Construction Projects, *Beacon Hill Policy Study*

Vidalis, S., and Najafi, F., (2002). Cost and time overruns in highway construction. *Proceedings of the 4th Transportation Specification. Conference of the Canadian Society for Civil Engineering*, pp. 2799–2808

Washington State Department of Transportation. (2015). Tabulated Bid Results [Data File]. Retrieved from [www.wsState DOTs.wa.gov](http://www.wsState DOTs.wa.gov)

Williams, T., (2002). Predicting completed project cost using bidding data. *Journal of Construction Management and Economics* 20(3): 225–235

21st Century Construction - 20th Century Construction Law. (2014). *The Construction Law Committee of the New York City Bar Association*, pages 11-12. Retrieved January 5, 2016, from [www.nycbar.org](http://www.nycbar.org)

## **APPENDIX**

### **BID QUALITY DATABASE**

## BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
8438	2	\$ 1,229,151	0.0%	-3.0%	1	0	0	7610	5	\$ 42,849,074	7.3%	-28.3%	1	0	0
7466	5	\$ 1,812,110	0.0%	-0.5%	1	0	0	7524	4	\$ 1,548,525	7.3%	-4.1%	1	0	0
7959	3	\$ 1,434,794	0.0%	-27.3%	1	0	0	131	2	\$ 169,778	7.4%	34.7%	1	0	0
8052	4	\$ 1,345,052	0.0%	-8.6%	1	0	0	338	2	\$ 746,061	7.4%	-2.1%	1	0	0
7795	6	\$ 689,077	0.0%	-34.9%	1	0	0	7958	2	\$ 2,274,274	7.4%	-17.8%	1	0	0
7641	6	\$ 1,081,050	0.0%	-3.7%	1	0	0	968	3	\$ 1,431,357	7.4%	-5.6%	1	0	0
8602	4	\$ 7,365,713	0.0%	13.7%	1	0	0	8279	3	\$ 1,291,496	7.4%	-28.9%	1	0	0
8594	5	\$ 3,389,833	0.0%	14.8%	1	0	0	268	2	\$ 488,834	7.4%	-7.7%	1	0	0
8443	3	\$ 5,359,359	0.0%	9.9%	1	0	0	936	4	\$ 1,018,074	7.4%	-11.6%	1	0	0
8421	4	\$ 3,791,714	0.0%	-6.9%	1	0	0	8383	6	\$ 1,193,874	7.4%	-16.4%	1	0	0
8416	2	\$ 1,685,790	0.0%	9.3%	1	0	0	661	5	\$ 20,471,129	7.4%	-2.2%	1	0	0
8405	4	\$ 4,878,672	0.0%	5.8%	1	0	0	1001	6	\$ 1,918,000	7.5%	-24.2%	1	0	0
8374	5	\$ 283,032	0.0%	39.6%	1	0	0	8012	16	\$ 1,939,941	7.5%	-32.4%	1	0	0
8296	5	\$ 14,045,943	0.0%	-12.0%	1	0	0	8179	2	\$ 184,699	7.5%	7.2%	1	0	0
8270	6	\$ 1,407,513	0.0%	0.8%	1	0	0	7298	7	\$ 882,429	7.5%	-11.0%	1	0	0
8266	4	\$ 1,951,774	0.0%	6.5%	1	0	0	896	4	\$ 778,868	7.6%	-15.1%	1	0	0
8239	6	\$ 5,343,783	0.0%	-8.6%	1	0	0	7445	2	\$ 2,042,210	7.6%	-11.1%	1	0	0
8226	8	\$ 134,654	0.0%	30.3%	1	0	0	1160	11	\$ 446,979	7.6%		1	0	0
8088	4	\$ 126,615	0.0%	1.8%	1	0	0	7944	6	\$ 3,847,643	7.6%	25.0%	1	0	0
8070	5	\$ 941,632	0.0%	-5.1%	1	0	0	8112	3	\$ 3,206,518	7.6%	-15.6%	1	0	0
8067	2	\$ 110,654	0.0%	-16.5%	1	0	0	1210	5	\$ 5,546,481	7.6%		1	0	0
8060	14	\$ 3,297,816	0.0%	-5.9%	1	0	0	576	3	\$ 212,964	7.7%	7.3%	1	0	0
8059	4	\$ 443,270	0.0%	-27.2%	1	0	0	862	4	\$ 585,867	7.7%	7.9%	1	0	0
8035	3	\$ 774,134	0.0%	-21.0%	1	0	0	7980	3	\$ 114,383	7.7%	-26.8%	1	0	0
8008	5	\$ 2,193,673	0.0%	1.6%	1	0	0	488	3	\$ 2,271,255	7.7%	27.6%	1	0	0
7992	3	\$ 228,079	0.0%	2.6%	1	0	0	7276	5	\$ 310,964	7.7%	-24.4%	1	0	0
7962	10	\$ 4,439,672	0.0%	-25.1%	1	0	0	7551	4	\$ 8,240,279	7.7%	-11.3%	1	0	0
7917	9	\$ 1,305,983	0.0%	-24.6%	1	0	0	8464	8	\$ 4,077,490	7.7%	-11.8%	1	0	0
7908	3	\$ 1,380,004	0.0%	51.6%	1	0	0	1108	5	\$ 15,194,812	7.7%	-9.2%	1	0	0
7884	3	\$ 57,900	0.0%	-24.9%	1	0	0	1322	3	\$ 1,009,486	7.7%		1	0	0
7858	12	\$ 19,079,869	0.0%	-18.2%	1	0	0	151	4	\$ 193,165	7.7%	-3.9%	1	0	0
7855	5	\$ 665,000	0.0%	-8.9%	1	0	0	175	5	\$ 233,751	7.7%	2.0%	1	0	0
7842	3	\$ 125,999	0.0%	-2.1%	1	0	0	8436	6	\$ 1,761,155	7.7%	5.6%	1	0	0
7798	8	\$ 1,475,061	0.0%	-21.1%	1	0	0	8529	4	\$ 160,116	7.8%	-4.1%	1	0	0
7761	3	\$ 19,263,000	0.0%	-35.8%	1	0	0	1209	5	\$ 3,424,380	7.8%		1	0	0
7726	3	\$ 107,500,000	0.0%	-38.4%	1	0	0	766	4	\$ 241,990	7.8%	3.0%	1	0	0
7681	14	\$ 11,646,361	0.0%	-22.2%	1	0	0	971	3	\$ 1,395,345	7.8%	5.7%	1	0	0
7529	2	\$ 7,991,000	0.0%	9.7%	1	0	0	189	4	\$ 259,499	7.8%	-7.6%	1	0	0
7496	3	\$ 2,282,000	0.0%	-12.7%	1	0	0	8404	4	\$ 1,332,332	7.8%	-8.5%	1	0	0
7467	8	\$ 555,203	0.0%	-43.5%	1	0	0	953	2	\$ 1,128,160	7.8%	13.7%	1	0	0

## BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7443	10	\$ 1,515,944	0.0%	-0.1%	1	0	0	8294	5	\$ 1,667,683	7.8%	-26.6%	1	0	0
7434	3	\$ 1,257,163	0.0%	34.3%	1	0	0	794	2	\$ 314,223	7.8%	36.0%	1	0	0
678	2	\$ 196,712	0.0%	-4.5%	1	0	0	272	2	\$ 466,332	7.8%	-6.0%	1	0	0
677	2	\$ 196,712	0.0%	0.0%	1	0	0	7305	4	\$ 1,407,402	7.8%	-11.6%	1	0	0
676	2	\$ 196,712	0.0%	0.0%	1	0	0	8413	5	\$ 256,646	7.8%	-8.8%	1	0	0
1	2	\$ 289,221	0.0%	20.1%	1	0	0	567	4	\$ 74,551	7.8%	9.5%	1	0	0
8153	5	\$ 19,949,910	0.0%	-3.1%	0	0	1	7698	8	\$ 582,578	7.8%	-26.9%	1	0	0
8005	4	\$ 1,703,588	0.0%	-26.2%	1	0	0	624	3	\$ 1,777,777	7.8%	-9.5%	1	0	0
7834	4	\$ 1,414,731	0.0%	-17.1%	1	0	0	1256	4	\$ 3,835,502	7.8%		1	0	0
7886	5	\$ 154,793	0.0%	-21.0%	1	0	0	1255	4	\$ 3,835,502	7.8%		1	0	0
7744	4	\$ 5,446,766	0.0%	-18.4%	1	0	0	790	2	\$ 307,455	7.8%	5.7%	1	0	0
2	4	\$ 4,469,999	0.0%	8.0%	1	0	0	859	5	\$ 551,858	7.8%	29.2%	1	0	0
1230	5	\$ 1,780,753	0.0%		0	0	1	80	4	\$ 88,572	7.8%	-10.8%	1	0	0
679	5	\$ 535,348	0.0%	19.8%	1	0	0	7797	2	\$ 249,878	7.9%	8.1%	1	0	0
10	6	\$ 1,668,981	0.0%	12.4%	1	0	0	593	5	\$ 423,499	7.9%	23.5%	1	0	0
14	3	\$ 1,475,351	0.0%	11.1%	1	0	0	8218	11	\$ 539,880	7.9%	-23.3%	1	0	0
7660	5	\$ 2,040,840	0.1%	-10.8%	1	0	0	1386	2	\$ 968,395	7.9%		1	0	0
7599	4	\$ 666,148	0.1%	-4.4%	0	0	1	1385	2	\$ 968,395	7.9%		1	0	0
1292	4	\$ 362,933	0.1%		0	0	1	275	5	\$ 465,962	7.9%	-2.3%	1	0	0
17	5	\$ 1,609,505	0.1%	22.0%	1	0	0	273	5	\$ 461,975	7.9%	11.5%	1	0	0
18	5	\$ 1,567,413	0.1%	0.0%	0	0	1	7252	2	\$ 1,060,810	7.9%	-19.4%	1	0	0
7942	3	\$ 1,969,191	0.1%	-24.0%	1	0	0	8530	2	\$ 401,568	7.9%	-5.2%	1	0	0
3	4	\$ 290,925	0.1%	5.4%	1	0	0	875	4	\$ 599,929	7.9%	-9.8%	1	0	0
8046	6	\$ 2,427,551	0.1%	-21.1%	1	0	0	7425	3	\$ 737,984	7.9%	-2.5%	1	0	0
7696	4	\$ 2,355,049	0.1%	-20.2%	1	0	0	865	2	\$ 574,499	7.9%	14.2%	1	0	0
7720	2	\$ 2,165,345	0.1%	-17.8%	1	0	0	1016	2	\$ 2,104,000	7.9%	-12.6%	1	0	0
565	2	\$ 3,400,000	0.1%	30.3%	1	0	0	346	4	\$ 717,778	8.0%	6.4%	1	0	0
8502	3	\$ 987,094	0.1%	-15.9%	1	0	0	540	3	\$ 8,479,474	8.0%	3.3%	1	0	0
7418	12	\$ 9,776,446	0.1%	-14.5%	1	0	0	361	2	\$ 805,583	8.0%	11.8%	1	0	0
7587	10	\$ 7,854,340	0.1%	-15.0%	1	0	0	7399	3	\$ 499,744	8.0%	-2.6%	1	0	0
8240	14	\$ 4,083,066	0.1%	-34.7%	1	0	0	1094	4	\$ 8,467,203	8.0%	-13.1%	1	0	0
7308	3	\$ 3,891,541	0.1%	-6.4%	1	0	0	7873	5	\$ 1,560,038	8.0%	-41.5%	1	0	0
685	2	\$ 695,596	0.1%	24.9%	1	0	0	7851	4	\$ 987,617	8.0%	-30.9%	1	0	0
7957	5	\$ 881,188	0.2%	-29.4%	1	0	0	8341	2	\$ 204,210	8.0%	1.3%	1	0	0
8395	8	\$ 497,992	0.2%	-25.3%	1	0	0	827	7	\$ 411,017	8.0%	-13.1%	1	0	0
8672	5	\$ 105,724	0.2%	3.8%	0	0	1	1174	7	\$ 3,946,409	8.1%		1	0	0
684	3	\$ 615,790	0.2%	27.5%	1	0	0	842	5	\$ 459,500	8.1%	22.5%	1	0	0
13	2	\$ 415,416	0.2%	10.6%	1	0	0	1384	2	\$ 6,398,276	8.1%		1	0	0
8411	4	\$ 376,898	0.2%	-5.1%	1	0	0	7741	3	\$ 73,220	8.1%	-15.6%	1	0	0
8045	4	\$ 3,829,670	0.2%	-19.6%	1	0	0	980	3	\$ 1,497,846	8.1%	11.8%	1	0	0

## BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
8	3	\$ 309,000	0.2%	-4.1%	0	0	1	428	2	\$ 1,265,675	8.1%	-14.8%	1	0	0
7515	2	\$ 735,529	0.2%	9.6%	1	0	0	7611	8	\$ 896,908	8.1%	-37.3%	1	0	0
7631	11	\$ 12,975,832	0.2%	-39.4%	1	0	0	70	3	\$ 69,333	8.1%	-7.9%	1	0	0
16	2	\$ 547,420	0.2%	9.5%	1	0	0	438	3	\$ 1,368,087	8.1%	-6.4%	1	0	0
568	5	\$ 3,436,409	0.2%	-3.0%	0	0	1	628	3	\$ 1,842,716	8.2%	-2.8%	1	0	0
706	3	\$ 2,177,080	0.2%	-2.5%	0	0	1	83	5	\$ 89,488	8.2%	-19.7%	1	0	0
6	5	\$ 265,671	0.2%	-10.3%	1	0	0	7629	3	\$ 5,703,222	8.2%	-38.8%	1	0	0
693	5	\$ 1,171,180	0.2%	-5.8%	1	0	0	8342	4	\$ 597,958	8.2%	-12.8%	1	0	0
1291	4	\$ 869,018	0.2%		0	0	1	946	6	\$ 1,017,813	8.2%	-10.7%	1	0	0
7956	2	\$ 834,004	0.2%	3.2%	0	0	1	8539	4	\$ 872,473	8.2%	-20.6%	1	0	0
8468	4	\$ 151,176	0.2%	34.6%	1	0	0	656	3	\$ 6,984,887	8.2%	3.8%	1	0	0
702	4	\$ 1,652,403	0.2%	-9.2%	1	0	0	1321	3	\$ 7,989,940	8.2%		1	0	0
686	4	\$ 518,853	0.2%	-18.8%	1	0	0	7701	4	\$ 2,109,725	8.2%	-50.4%	1	0	0
7831	5	\$ 147,694	0.2%	31.2%	1	0	0	844	4	\$ 464,722	8.2%	12.0%	1	0	0
24	11	\$ 619,601	0.2%	-23.6%	1	0	0	7395	5	\$ 277,004	8.3%	-8.0%	1	0	0
8330	4	\$ 71,504	0.2%	-34.5%	1	0	0	495	3	\$ 2,286,497	8.3%	-5.6%	1	0	0
33	6	\$ 1,034,244	0.2%	-6.5%	1	0	0	1037	3	\$ 2,777,846	8.3%	-16.3%	1	0	0
7684	4	\$ 239,716	0.2%	-27.0%	1	0	0	524	6	\$ 4,328,690	8.3%	0.0%	1	0	0
7979	3	\$ 465,899	0.2%	22.1%	1	0	0	8540	5	\$ 3,687,413	8.3%	-32.7%	1	0	0
51	3	\$ 1,481,699	0.2%	7.3%	1	0	0	7409	4	\$ 681,998	8.3%	15.3%	1	0	0
690	3	\$ 815,300	0.2%	30.4%	1	0	0	7397	3	\$ 399,908	8.3%	-22.6%	1	0	0
31	3	\$ 925,625	0.2%	-4.5%	0	0	1	877	3	\$ 599,968	8.3%	37.3%	1	0	0
1290	4	\$ 5,873,519	0.2%		0	0	1	7652	5	\$ 777,189	8.3%	-30.3%	1	0	0
58	2	\$ 1,581,574	0.2%	-31.6%	1	0	0	395	6	\$ 951,673	8.3%	4.6%	1	0	0
28	8	\$ 761,910	0.2%	-0.2%	0	0	1	828	5	\$ 402,315	8.3%	11.1%	1	0	0
8536	4	\$ 4,285,224	0.3%	0.8%	0	0	1	8077	11	\$ 3,198,801	8.4%	-9.6%	1	0	0
7541	3	\$ 245,412	0.3%	-13.2%	1	0	0	7461	2	\$ 5,133,753	8.4%	-7.9%	1	0	0
38	5	\$ 885,379	0.3%	-0.3%	0	0	1	1383	2	\$ 13,957,000	8.4%		1	0	0
562	2	\$ 1,364,059	0.3%	9.8%	1	0	0	575	3	\$ 184,000	8.4%	17.9%	1	0	0
7421	2	\$ 381,854	0.3%	39.2%	1	0	0	997	7	\$ 1,626,122	8.4%	2.1%	1	0	0
1229	5	\$ 1,946,000	0.3%		0	0	1	126	3	\$ 139,406	8.4%	-5.9%	1	0	0
7346	3	\$ 1,994,482	0.3%	-2.5%	0	0	1	1208	5	\$ 1,479,195	8.5%		1	0	0
680	4	\$ 57,427	0.3%	-70.8%	1	0	0	7564	4	\$ 1,105,105	8.5%	6.7%	1	0	0
89	4	\$ 2,591,545	0.3%	12.8%	1	0	0	356	5	\$ 741,830	8.5%	0.7%	1	0	0
1358	3	\$ 1,082,890	0.3%		0	0	1	601	2	\$ 608,449	8.5%	10.1%	1	0	0
691	4	\$ 634,369	0.3%	-36.6%	1	0	0	7902	4	\$ 637,777	8.5%	-8.5%	1	0	0
8302	3	\$ 849,929	0.3%	6.2%	1	0	0	7266	3	\$ 228,771	8.5%	-5.2%	1	0	0
733	4	\$ 3,748,039	0.3%	-13.4%	1	0	0	60	3	\$ 51,697	8.5%	-10.5%	1	0	0
29	6	\$ 618,558	0.3%	-0.3%	0	0	1	646	3	\$ 3,656,924	8.5%	11.2%	1	0	0
1289	4	\$ 2,465,994	0.3%		0	0	1	7659	17	\$ 395,155	8.5%	-15.5%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
1288	4	\$ 2,465,994	0.3%		0	0	1	220	4	\$ 309,950	8.5%	1.0%	1	0	0
36	9	\$ 710,835	0.3%	19.7%	1	0	0	867	2	\$ 537,600	8.5%	-16.4%	1	0	0
9	3	\$ 169,874	0.3%	-24.6%	1	0	0	7754	8	\$ 546,629	8.5%	-43.4%	1	0	0
8159	4	\$ 2,854,900	0.3%	-2.6%	0	0	1	124	5	\$ 134,678	8.6%	-7.9%	1	0	0
8175	4	\$ 730,060	0.3%	16.6%	1	0	0	8321	2	\$ 350,493	8.6%	-2.3%	1	0	0
15	4	\$ 231,526	0.3%	23.8%	1	0	0	380	4	\$ 814,861	8.6%	24.0%	1	0	0
7344	5	\$ 123,147	0.3%	12.6%	1	0	0	7738	4	\$ 1,407,300	8.6%	-36.0%	1	0	0
1164	10	\$ 791,638	0.4%		0	0	1	84	4	\$ 87,241	8.6%	47.1%	1	0	0
8058	9	\$ 528,361	0.4%	12.4%	1	0	0	1065	2	\$ 3,621,398	8.6%	5.2%	1	0	0
7753	2	\$ 5,311,989	0.4%	-20.0%	1	0	0	7672	6	\$ 179,756	8.6%	-16.4%	1	0	0
697	6	\$ 754,815	0.4%	-56.1%	1	0	0	7780	2	\$ 162,566	8.6%	14.4%	1	0	0
7264	7	\$ 1,163,881	0.4%	2.3%	0	0	1	1114	3	\$ 18,405,000	8.6%	11.6%	1	0	0
106	6	\$ 2,520,192	0.4%	6.5%	1	0	0	8437	4	\$ 5,059,747	8.6%	-10.1%	1	0	0
144	2	\$ 3,712,188	0.4%	-5.3%	1	0	0	424	4	\$ 1,158,889	8.6%	5.9%	1	0	0
21	10	\$ 307,392	0.4%	14.1%	1	0	0	1189	6	\$ 2,390,000	8.6%		1	0	0
8547	3	\$ 5,944,899	0.4%	0.5%	0	0	1	1023	3	\$ 2,050,408	8.6%	-18.9%	1	0	0
56	4	\$ 995,555	0.4%	-13.5%	1	0	0	7649	8	\$ 17,747,153	8.6%	-19.1%	1	0	0
737	3	\$ 3,295,294	0.4%	2.2%	0	0	1	7888	8	\$ 49,859	8.7%	8.2%	1	0	0
758	4	\$ 4,350,930	0.4%	29.4%	1	0	0	920	3	\$ 754,106	8.7%	-0.6%	1	0	0
43	7	\$ 673,848	0.4%	15.9%	1	0	0	1320	3	\$ 1,547,903	8.7%		1	0	0
52	3	\$ 888,434	0.4%	19.8%	1	0	0	1254	4	\$ 2,305,894	8.7%		1	0	0
8191	4	\$ 197,748	0.4%	-21.2%	1	0	0	286	2	\$ 441,790	8.7%	-21.8%	1	0	0
8145	2	\$ 1,839,306	0.4%	-13.0%	1	0	0	7690	6	\$ 1,126,478	8.7%	-32.1%	1	0	0
97	3	\$ 2,096,592	0.4%	-0.4%	0	0	1	412	2	\$ 1,074,663	8.8%	17.9%	1	0	0
1357	3	\$ 1,070,000	0.4%		0	0	1	1382	2	\$ 1,469,797	8.8%		1	0	0
8587	4	\$ 8,876,791	0.4%	1.8%	0	0	1	7732	5	\$ 518,400	8.8%	-23.2%	1	0	0
7588	4	\$ 531,698	0.4%	-1.2%	0	0	1	1089	3	\$ 6,652,178	8.8%	-0.7%	1	0	0
596	6	\$ 8,158,480	0.4%	-11.5%	1	0	0	1319	3	\$ 7,942,000	8.8%		1	0	0
1228	5	\$ 8,350,000	0.4%		0	0	1	969	3	\$ 1,211,246	8.8%	-4.9%	1	0	0
1227	5	\$ 672,286	0.4%		0	0	1	773	2	\$ 225,558	8.8%	35.1%	1	0	0
35	11	\$ 542,163	0.4%	6.6%	1	0	0	8180	3	\$ 2,814,007	8.9%	7.0%	1	0	0
722	4	\$ 2,175,327	0.4%	15.1%	1	0	0	1381	2	\$ 2,727,371	8.9%		1	0	0
187	3	\$ 4,488,929	0.4%	8.7%	1	0	0	434	8	\$ 1,216,918	8.9%	-25.0%	1	0	0
1287	4	\$ 1,064,000	0.4%		0	0	1	7745	3	\$ 4,690,744	8.9%	-40.5%	1	0	0
8074	2	\$ 2,014,000	0.5%	-13.3%	1	0	0	8564	4	\$ 1,105,094	8.9%	1.8%	1	0	0
683	2	\$ 136,032	0.5%	-15.0%	1	0	0	7592	3	\$ 123,279	8.9%	8.9%	1	0	0
7363	3	\$ 7,087,089	0.5%	11.7%	1	0	0	588	4	\$ 343,428	8.9%	-6.3%	1	0	0
101	4	\$ 1,939,370	0.5%	-5.3%	1	0	0	918	2	\$ 727,933	8.9%	13.7%	1	0	0
8471	5	\$ 947,436	0.5%	-10.7%	1	0	0	362	4	\$ 721,171	8.9%	-2.0%	1	0	0
682	3	\$ 128,914	0.5%	-4.5%	0	0	1	7517	2	\$ 2,470,584	8.9%	6.9%	1	0	0

## BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7971	5	\$ 14,807,103	0.5%	-9.5%	1	0	0	8122	6	\$ 1,415,245	9.0%	-38.3%	1	0	0
32	2	\$ 456,410	0.5%	-20.7%	1	0	0	392	2	\$ 850,394	9.0%	-1.1%	1	0	0
7967	4	\$ 21,455,921	0.5%	-12.4%	1	0	0	225	2	\$ 312,032	9.0%	-8.3%	1	0	0
7637	8	\$ 37,736,270	0.5%	-29.7%	1	0	0	7644	3	\$ 158,535	9.0%	-29.5%	1	0	0
8618	2	\$ 3,806,280	0.5%	23.6%	1	0	0	8231	8	\$ 4,220,000	9.0%	3.6%	1	0	0
46	4	\$ 593,551	0.5%	-12.6%	1	0	0	7404	3	\$ 501,839	9.0%	21.8%	1	0	0
1403	2	\$ 280,000	0.5%		0	0	1	446	6	\$ 1,286,806	9.0%	4.2%	1	0	0
50	8	\$ 649,421	0.5%	-8.2%	1	0	0	7699	5	\$ 135,127	9.0%	-22.5%	1	0	0
8506	3	\$ 375,119	0.5%	8.3%	1	0	0	8495	2	\$ 1,217,332	9.0%	10.1%	1	0	0
94	3	\$ 1,643,764	0.5%	27.5%	1	0	0	8051	4	\$ 710,668	9.0%	-6.2%	1	0	0
11	2	\$ 120,131	0.5%	-20.6%	1	0	0	8041	2	\$ 287,168	9.0%	-24.8%	1	0	0
7577	10	\$ 7,697,284	0.5%	-19.8%	1	0	0	712	2	\$ 67,997	9.0%	6.2%	1	0	0
7248	4	\$ 2,661,000	0.5%	1.4%	0	0	1	208	3	\$ 271,436	9.1%	0.6%	1	0	0
7431	8	\$ 36,650,726	0.5%	17.1%	1	0	0	882	3	\$ 590,916	9.1%	-31.3%	1	0	0
8055	5	\$ 694,859	0.5%	-18.7%	1	0	0	426	5	\$ 1,108,084	9.1%	-2.1%	1	0	0
107	4	\$ 1,772,458	0.5%	13.5%	1	0	0	943	4	\$ 884,688	9.1%	-1.3%	1	0	0
7590	6	\$ 463,095	0.5%	15.3%	1	0	0	1021	3	\$ 1,907,360	9.1%	14.2%	1	0	0
177	5	\$ 3,296,499	0.6%	-14.4%	1	0	0	8333	5	\$ 3,068,815	9.2%	17.3%	1	0	0
8369	5	\$ 179,997	0.6%	-29.0%	1	0	0	7875	11	\$ 2,138,448	9.2%	-22.9%	1	0	0
22	3	\$ 214,862	0.6%	34.8%	1	0	0	937	2	\$ 829,515	9.2%	27.2%	1	0	0
701	3	\$ 543,719	0.6%	2.2%	0	0	1	188	2	\$ 220,160	9.2%	-3.0%	1	0	0
27	6	\$ 251,052	0.6%	-6.4%	1	0	0	528	3	\$ 4,257,376	9.2%	0.9%	1	0	0
7983	3	\$ 1,663,275	0.6%	-12.7%	1	0	0	8337	2	\$ 274,174	9.2%	-7.3%	1	0	0
709	6	\$ 887,999	0.6%	-19.3%	1	0	0	8418	8	\$ 2,149,052	9.2%	-22.6%	1	0	0
1286	4	\$ 890,910	0.6%		0	0	1	8442	4	\$ 683,830	9.2%	-6.0%	1	0	0
734	5	\$ 1,981,625	0.6%	-2.4%	0	0	1	269	2	\$ 392,251	9.2%	-11.1%	1	0	0
692	3	\$ 330,333	0.6%	23.3%	1	0	0	8130	4	\$ 1,521,958	9.2%	6.1%	1	0	0
1226	5	\$ 15,653,249	0.6%		0	0	1	7874	7	\$ 2,765,789	9.2%	-40.7%	1	0	0
694	4	\$ 359,453	0.6%	53.6%	1	0	0	8003	2	\$ 414,004	9.3%	25.5%	1	0	0
79	5	\$ 1,053,138	0.6%	13.5%	1	0	0	169	5	\$ 183,875	9.3%	-2.1%	1	0	0
797	3	\$ 3,872,217	0.6%	13.8%	1	0	0	7401	2	\$ 420,659	9.3%	17.8%	1	0	0
23	6	\$ 186,593	0.7%	-5.8%	1	0	0	732	3	\$ 126,756	9.3%	-10.7%	1	0	0
1402	2	\$ 5,990,479	0.7%		0	0	1	8282	3	\$ 766,200	9.3%	0.4%	1	0	0
7810	4	\$ 757,766	0.7%	-10.8%	1	0	0	1380	2	\$ 6,988,750	9.3%		1	0	0
7862	8	\$ 6,704,333	0.7%	-35.1%	1	0	0	1379	2	\$ 6,988,750	9.3%		1	0	0
1356	3	\$ 218,085	0.7%		0	0	1	1032	2	\$ 2,171,786	9.3%	12.2%	1	0	0
1355	3	\$ 218,085	0.7%		0	0	1	8419	6	\$ 3,526,489	9.4%	-5.1%	1	0	0
8038	9	\$ 518,763	0.7%	-16.0%	1	0	0	7282	2	\$ 1,050,730	9.4%	27.0%	1	0	0
45	10	\$ 425,710	0.7%	-13.7%	1	0	0	1188	6	\$ 425,440	9.4%		1	0	0
114	2	\$ 1,478,984	0.7%	7.3%	1	0	0	7271	2	\$ 229,748	9.4%	-8.0%	1	0	0



BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7941	6	\$ 311,928	0.7%	-31.5%	1	0	0	904	3	\$ 652,562	9.4%	15.1%	1	0	0
8452	5	\$ 1,131,004	0.7%	-18.9%	1	0	0	972	3	\$ 1,163,038	9.4%	3.8%	1	0	0
7498	4	\$ 404,404	0.7%	-29.2%	1	0	0	411	3	\$ 988,769	9.5%	-9.4%	1	0	0
65	5	\$ 698,886	0.7%	-3.7%	0	0	1	992	2	\$ 1,398,358	9.5%	-3.6%	1	0	0
8116	5	\$ 1,678,914	0.7%	-27.8%	1	0	0	8516	5	\$ 438,096	9.5%	-6.9%	1	0	0
1285	4	\$ 918,895	0.7%		0	0	1	7513	3	\$ 779,950	9.5%	-25.2%	1	0	0
1225	5	\$ 1,499,900	0.7%		0	0	1	441	7	\$ 1,192,926	9.5%	-1.4%	1	0	0
8345	8	\$ 15,345,188	0.7%	-7.4%	1	0	0	8541	2	\$ 40,001	9.5%	-28.6%	1	0	0
53	6	\$ 469,897	0.8%	-7.3%	1	0	0	7680	14	\$ 346,124	9.5%	-34.7%	1	0	0
689	3	\$ 245,129	0.8%	24.4%	1	0	0	7583	2	\$ 698,000	9.5%	-8.9%	1	0	0
8449	3	\$ 5,644,683	0.8%	2.3%	0	0	1	1005	4	\$ 1,562,325	9.5%	11.1%	1	0	0
1284	4	\$ 393,999	0.8%		0	0	1	486	3	\$ 1,783,825	9.5%	-0.4%	1	0	0
1182	7	\$ 9,655,900	0.8%		0	0	1	1082	2	\$ 4,815,529	9.6%	-2.0%	1	0	0
7830	5	\$ 1,252,319	0.8%	-17.2%	1	0	0	7250	2	\$ 1,167,329	9.6%	39.7%	1	0	0
8565	6	\$ 4,644,837	0.8%	-5.5%	1	0	0	7808	6	\$ 99,140	9.6%	-46.2%	1	0	0
993	4	\$ 17,265,996	0.8%	1.7%	0	0	1	798	4	\$ 276,120	9.6%	-2.4%	1	0	0
8081	4	\$ 2,664,395	0.8%	2.4%	0	0	1	8305	2	\$ 1,849,849	9.6%	0.9%	1	0	0
12	7	\$ 84,668	0.8%	1.2%	0	0	1	832	7	\$ 357,505	9.6%	6.1%	1	0	0
222	2	\$ 3,437,016	0.8%	1.3%	0	0	1	506	2	\$ 2,278,930	9.6%	9.8%	1	0	0
7973	4	\$ 353,031	0.8%	-22.3%	1	0	0	7791	3	\$ 889,919	9.7%	-11.0%	1	0	0
81	3	\$ 886,385	0.8%	-1.4%	0	0	1	8340	4	\$ 615,910	9.7%	-7.4%	1	0	0
8050	4	\$ 2,487,893	0.8%	-9.8%	1	0	0	899	4	\$ 612,059	9.7%	32.2%	1	0	0
68	3	\$ 656,829	0.8%	-6.2%	1	0	0	357	3	\$ 652,313	9.7%	-5.0%	1	0	0
570	3	\$ 1,257,421	0.8%	-13.2%	1	0	0	1207	5	\$ 13,287,554	9.7%		1	0	0
30	6	\$ 254,284	0.8%	10.4%	1	0	0	1378	2	\$ 754,447	9.7%		1	0	0
1224	5	\$ 19,823,337	0.8%		0	0	1	8427	2	\$ 3,019,525	9.8%	2.4%	1	0	0
1223	5	\$ 19,823,337	0.8%		0	0	1	1206	5	\$ 1,111,111	9.8%		1	0	0
7693	5	\$ 1,151,617	0.8%	-19.3%	1	0	0	1205	5	\$ 1,111,111	9.8%		1	0	0
1401	2	\$ 1,449,897	0.8%		0	0	1	1022	3	\$ 1,787,922	9.8%	-15.7%	1	0	0
7417	6	\$ 13,866,639	0.8%	-10.8%	1	0	0	8492	6	\$ 995,364	9.8%	-17.4%	1	0	0
7289	2	\$ 1,386,491	0.8%	-10.9%	1	0	0	8093	6	\$ 291,331	9.8%	-19.2%	1	0	0
582	5	\$ 2,367,709	0.8%	3.3%	0	0	1	7620	5	\$ 582,716	9.8%	-21.6%	1	0	0
818	3	\$ 3,548,167	0.9%	5.4%	1	0	0	335	2	\$ 541,996	9.8%	9.6%	1	0	0
207	7	\$ 2,872,863	0.9%	-0.8%	0	0	1	8371	7	\$ 354,900	9.8%	-27.6%	1	0	0
7922	5	\$ 1,878,998	0.9%	-9.9%	1	0	0	7763	3	\$ 5,182,153	9.8%	-18.9%	1	0	0
800	5	\$ 3,123,143	0.9%	11.5%	1	0	0	7954	2	\$ 499,728	9.9%	24.4%	1	0	0
34	6	\$ 276,012	0.9%	3.3%	0	0	1	7518	5	\$ 243,154	9.9%	-21.9%	1	0	0
5	4	\$ 39,339	0.9%	-12.7%	1	0	0	7532	6	\$ 11,125,547	9.9%	-10.1%	1	0	0
726	4	\$ 1,145,906	0.9%	-1.9%	0	0	1	511	3	\$ 2,405,502	10.0%	17.2%	1	0	0
8631	2	\$ 124,086	0.9%	-2.5%	0	0	1	8213	5	\$ 335,464	10.0%	9.0%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7553	6	\$ 19,354,287	0.9%	-14.3%	1	0	0	988	3	\$ 1,269,468	10.0%	7.1%	1	0	0
696	4	\$ 299,064	0.9%	34.1%	1	0	0	1014	2	\$ 1,625,895	10.0%	-14.5%	1	0	0
7520	2	\$ 3,350,350	0.9%	8.4%	1	0	0	7531	3	\$ 816,491	10.1%	10.8%	0	1	0
25	3	\$ 145,546	0.9%	-3.2%	0	0	1	7270	2	\$ 1,239,614	10.1%	-0.7%	1	0	0
26	8	\$ 153,047	0.9%	-16.4%	1	0	0	8358	2	\$ 864,989	10.1%	-6.3%	1	0	0
8010	13	\$ 194,421	0.9%	-31.4%	1	0	0	7621	6	\$ 2,799,874	10.1%	-21.5%	1	0	0
49	3	\$ 350,367	0.9%	-9.5%	1	0	0	170	4	\$ 171,314	10.1%	25.5%	0	1	0
209	4	\$ 2,687,492	0.9%	-4.2%	0	0	1	8076	5	\$ 1,590,110	10.1%	-2.5%	1	0	0
186	5	\$ 2,143,129	0.9%	-12.0%	1	0	0	7633	9	\$ 233,425	10.1%	-30.7%	1	0	0
8234	9	\$ 260,401	0.9%	-12.5%	1	0	0	1187	6	\$ 1,476,000	10.1%		1	0	0
7634	12	\$ 104,876	0.9%	-38.1%	1	0	0	7476	3	\$ 2,117,132	10.1%	8.1%	1	0	0
8183	3	\$ 264,935	0.9%	9.9%	1	0	0	7302	2	\$ 3,019,746	10.1%	-15.0%	1	0	0
564	8	\$ 488,888	0.9%	-18.2%	1	0	0	8131	6	\$ 71,349	10.2%	-36.7%	1	0	0
57	7	\$ 414,320	0.9%	4.7%	0	0	1	977	2	\$ 1,137,079	10.2%	0.2%	1	0	0
8047	17	\$ 2,867,054	0.9%	-39.2%	1	0	0	1318	3	\$ 1,380,159	10.2%		1	0	0
7422	2	\$ 695,730	0.9%	23.6%	1	0	0	259	2	\$ 339,867	10.2%	-7.3%	1	0	0
8114	4	\$ 1,394,859	0.9%	-16.9%	1	0	0	387	2	\$ 729,655	10.2%	-1.7%	1	0	0
8668	4	\$ 931,602	0.9%	13.2%	1	0	0	257	4	\$ 333,025	10.2%	2.5%	1	0	0
890	4	\$ 6,086,000	0.9%	24.5%	1	0	0	103	4	\$ 88,161	10.2%	-0.1%	1	0	0
1283	4	\$ 890,539	0.9%		0	0	1	62	4	\$ 44,897	10.3%	-10.0%	1	0	0
688	3	\$ 191,751	0.9%	-4.1%	0	0	1	458	4	\$ 1,272,677	10.3%	-18.7%	1	0	0
20	4	\$ 117,483	1.0%	-2.2%	0	0	1	8393	3	\$ 7,277,888	10.3%	-12.3%	1	0	0
7686	12	\$ 6,764,418	1.0%	-31.5%	1	0	0	8493	2	\$ 571,143	10.3%	-9.6%	1	0	0
7589	5	\$ 1,264,055	1.0%	-36.0%	1	0	0	359	2	\$ 618,378	10.3%	9.9%	1	0	0
130	3	\$ 1,295,349	1.0%	4.9%	0	0	1	751	2	\$ 151,115	10.3%	-20.5%	1	0	0
7343	3	\$ 30,695,477	1.0%	6.9%	1	0	0	8162	2	\$ 1,512,099	10.3%	9.8%	1	0	0
8241	7	\$ 4,235,607	1.0%	-7.6%	1	0	0	494	5	\$ 1,784,723	10.3%	-12.2%	1	0	0
730	4	\$ 1,166,500	1.0%	-7.4%	1	0	0	8063	6	\$ 439,926	10.4%	-21.5%	1	0	0
8104	3	\$ 2,095,096	1.0%	-6.7%	1	0	0	1317	3	\$ 408,887	10.4%		1	0	0
1197	6	\$ 2,882,015	1.0%		0	0	1	378	6	\$ 668,079	10.4%	18.0%	0	1	0
7432	7	\$ 186,253	1.0%	6.3%	1	0	0	8121	7	\$ 338,103	10.4%	-27.0%	1	0	0
7870	9	\$ 11,578,632	1.0%	-24.3%	1	0	0	1204	5	\$ 1,339,750	10.4%		1	0	0
687	2	\$ 152,982	1.0%	-19.5%	1	0	0	652	2	\$ 4,404,404	10.4%	0.2%	1	0	0
48	2	\$ 292,674	1.0%	-4.3%	0	0	1	1062	2	\$ 2,852,971	10.5%	-2.4%	1	0	0
7752	4	\$ 13,262,231	1.0%	-14.7%	1	0	0	406	5	\$ 838,627	10.5%	-13.0%	1	0	0
572	4	\$ 1,320,999	1.0%	3.3%	0	0	1	1057	3	\$ 2,597,741	10.5%	-14.2%	1	0	0
710	6	\$ 513,900	1.0%	-6.6%	1	0	0	8306	2	\$ 2,891,203	10.5%	8.9%	1	0	0
8403	9	\$ 489,405	1.0%	-2.9%	0	0	1	8423	12	\$ 5,164,771	10.5%	-33.9%	1	0	0
183	2	\$ 1,876,501	1.0%	3.6%	0	0	1	7370	2	\$ 533,706	10.5%	-6.4%	1	0	0
74	3	\$ 559,889	1.0%	19.4%	1	0	0	985	2	\$ 1,195,900	10.5%	-7.4%	1	0	0

## BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
704	9	\$ 351,405	1.0%	34.1%	1	0	0	645	3	\$ 2,789,761	10.5%	-8.9%	1	0	0
7707	8	\$ 2,667,541	1.1%	-29.6%	1	0	0	7852	11	\$ 76,699,233	10.5%	-30.5%	1	0	0
7859	13	\$ 4,794,882	1.1%	-33.6%	1	0	0	8049	4	\$ 379,379	10.6%	-21.9%	1	0	0
1354	3	\$ 2,811,052	1.1%		0	0	1	7581	2	\$ 549,201	10.6%	-16.1%	1	0	0
7657	14	\$ 572,409	1.1%	-39.9%	1	0	0	7764	10	\$ 188,897	10.6%	-48.2%	1	0	0
234	9	\$ 2,748,790	1.1%	22.3%	1	0	0	8132	5	\$ 49,599	10.6%	7.4%	1	0	0
289	11	\$ 3,744,930	1.1%	-18.0%	1	0	0	326	2	\$ 487,332	10.6%	-18.0%	1	0	0
8099	4	\$ 681,879	1.1%	1.9%	0	0	1	318	3	\$ 463,883	10.6%	-16.3%	1	0	0
8379	9	\$ 9,213,158	1.1%	-25.7%	1	0	0	636	2	\$ 2,028,765	10.6%	-8.5%	1	0	0
8181	2	\$ 101,588	1.1%	0.4%	0	0	1	7929	4	\$ 1,933,142	10.6%	-9.2%	1	0	0
754	3	\$ 1,457,337	1.1%	-4.0%	0	0	1	8251	9	\$ 265,423	10.6%	-22.8%	1	0	0
7675	5	\$ 1,096,250	1.1%	-44.2%	1	0	0	944	5	\$ 757,393	10.7%	8.2%	1	0	0
7867	13	\$ 286,704	1.1%	-14.9%	1	0	0	1007	3	\$ 1,430,341	10.7%	-6.0%	1	0	0
7501	4	\$ 146,348	1.1%	-6.7%	1	0	0	7677	4	\$ 12,884,988	10.7%	21.5%	0	1	0
7876	8	\$ 721,771	1.1%	-33.9%	1	0	0	8675	3	\$ 931,984	10.7%	28.9%	0	1	0
224	3	\$ 2,449,058	1.1%	4.5%	0	0	1	487	3	\$ 1,599,254	10.7%	-11.6%	1	0	0
7812	6	\$ 2,756,201	1.1%	-34.0%	1	0	0	7630	2	\$ 2,151,389	10.7%	-21.1%	1	0	0
1282	4	\$ 1,925,160	1.1%		0	0	1	898	5	\$ 549,649	10.7%	18.2%	0	1	0
8113	11	\$ 3,707,899	1.1%	-11.7%	1	0	0	1316	3	\$ 4,820,872	10.8%		1	0	0
716	5	\$ 643,858	1.1%	22.9%	1	0	0	1066	3	\$ 2,988,277	10.8%	-11.2%	1	0	0
760	8	\$ 1,511,886	1.1%	-12.0%	1	0	0	7569	2	\$ 959,281	10.8%	3.4%	1	0	0
7782	11	\$ 763,267	1.1%	-29.0%	1	0	0	999	3	\$ 1,296,792	10.8%	-21.7%	1	0	0
64	3	\$ 429,761	1.1%	-7.9%	1	0	0	7647	4	\$ 1,325,768	10.8%	-22.3%	1	0	0
8482	4	\$ 4,468,700	1.2%	-9.1%	1	0	0	1173	7	\$ 2,052,520	10.8%		1	0	0
7940	5	\$ 935,794	1.2%	-16.8%	1	0	0	8484	4	\$ 344,401	10.8%	-6.1%	1	0	0
7801	3	\$ 263,900	1.2%	68.1%	1	0	0	7687	4	\$ 521,125	10.8%	-33.0%	1	0	0
205	4	\$ 2,038,399	1.2%	7.1%	1	0	0	7514	3	\$ 2,595,963	10.8%	-28.7%	1	0	0
353	6	\$ 5,237,129	1.2%	-6.5%	1	0	0	491	4	\$ 1,664,684	10.8%	-31.1%	1	0	0
135	3	\$ 1,085,065	1.2%	17.6%	1	0	0	632	4	\$ 1,627,907	10.9%	-27.8%	1	0	0
244	6	\$ 2,658,156	1.2%	-6.1%	1	0	0	7843	4	\$ 1,079,866	10.9%	-16.7%	1	0	0
8068	5	\$ 4,431,969	1.2%	-24.0%	1	0	0	655	2	\$ 4,798,211	10.9%	-24.2%	1	0	0
8309	2	\$ 2,655,868	1.2%	2.7%	0	0	1	571	5	\$ 108,230	10.9%	5.1%	1	0	0
117	3	\$ 877,429	1.2%	-4.3%	0	0	1	1168	8	\$ 3,135,954	10.9%		1	0	0
699	5	\$ 246,802	1.2%	-7.6%	1	0	0	7572	2	\$ 2,559,062	10.9%	8.7%	1	0	0
55	3	\$ 310,193	1.2%	4.3%	0	0	1	403	3	\$ 785,118	10.9%	-0.1%	1	0	0
7626	4	\$ 492,819	1.2%	-17.9%	1	0	0	8386	5	\$ 1,196,590	10.9%	18.4%	0	1	0
776	3	\$ 1,695,993	1.2%	1.5%	0	0	1	967	2	\$ 968,318	10.9%	23.2%	0	1	0
590	4	\$ 2,512,023	1.2%	-10.9%	1	0	0	8583	3	\$ 2,139,175	10.9%	-1.7%	1	0	0
8299	4	\$ 5,194,043	1.3%	-27.4%	1	0	0	7880	5	\$ 1,147,247	10.9%	-25.5%	1	0	0
102	2	\$ 709,736	1.3%	-8.1%	1	0	0	1253	4	\$ 6,157,577	10.9%		1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
1400	2	\$ 2,207,000	1.3%		0	0	1	1252	4	\$ 6,157,577	10.9%		1	0	0
197	2	\$ 1,785,783	1.3%	13.4%	1	0	0	925	2	\$ 628,973	10.9%	72.3%	0	1	0
574	3	\$ 1,224,269	1.3%	-1.7%	0	0	1	7472	7	\$ 206,306	11.0%	-9.0%	1	0	0
7625	7	\$ 526,870	1.3%	-35.8%	1	0	0	437	4	\$ 1,013,063	11.0%	3.7%	1	0	0
178	4	\$ 1,443,758	1.3%	-11.6%	1	0	0	7939	3	\$ 1,453,915	11.0%	-25.5%	1	0	0
1104	4	\$ 72,532,263	1.3%	3.3%	0	0	1	339	3	\$ 499,813	11.0%	3.5%	1	0	0
132	8	\$ 987,292	1.3%	-7.2%	1	0	0	8096	3	\$ 550,284	11.0%	-40.8%	1	0	0
7757	6	\$ 13,812,439	1.3%	-19.1%	1	0	0	7438	5	\$ 4,251,940	11.1%	-19.0%	1	0	0
350	5	\$ 4,724,037	1.3%	-4.5%	0	0	1	492	3	\$ 1,632,506	11.1%	7.6%	1	0	0
7563	6	\$ 2,191,620	1.3%	2.2%	0	0	1	1315	3	\$ 7,729,067	11.1%		1	0	0
86	4	\$ 589,974	1.3%	19.4%	1	0	0	8324	4	\$ 28,499	11.1%	-37.2%	1	0	0
724	8	\$ 743,292	1.3%	-3.8%	0	0	1	8087	6	\$ 217,237	11.1%	-22.8%	1	0	0
7850	11	\$ 2,301,454	1.3%	-9.0%	1	0	0	137	4	\$ 117,923	11.1%	38.8%	0	1	0
727	4	\$ 773,141	1.3%	43.2%	1	0	0	7426	7	\$ 665,000	11.1%	-14.0%	1	0	0
7263	2	\$ 1,631,818	1.3%	-2.0%	0	0	1	7947	7	\$ 1,169,752	11.1%	-29.9%	1	0	0
71	9	\$ 434,884	1.3%	0.0%	0	0	1	1084	6	\$ 4,493,976	11.1%	5.5%	1	0	0
8615	3	\$ 3,383,659	1.3%	-1.2%	0	0	1	255	3	\$ 303,095	11.1%	-25.7%	1	0	0
113	12	\$ 774,000	1.3%	8.6%	1	0	0	785	2	\$ 205,591	11.2%	-18.7%	1	0	0
185	5	\$ 1,494,078	1.3%	-16.6%	1	0	0	550	5	\$ 11,867,158	11.2%	-24.8%	1	0	0
7779	7	\$ 31,015,383	1.3%	-25.0%	1	0	0	8636	8	\$ 8,791,665	11.2%	-13.6%	1	0	0
714	2	\$ 521,548	1.3%	165.1%	1	0	0	298	3	\$ 377,342	11.2%	-15.3%	1	0	0
1167	9	\$ 9,471,045	1.3%		0	0	1	180	2	\$ 169,365	11.2%	4.8%	1	0	0
7359	2	\$ 501,876	1.3%	3.0%	0	0	1	1251	4	\$ 2,527,502	11.2%		1	0	0
771	2	\$ 1,468,612	1.3%	-24.7%	1	0	0	908	4	\$ 558,978	11.3%	-21.2%	1	0	0
96	5	\$ 630,471	1.4%	-6.6%	1	0	0	8673	5	\$ 1,547,080	11.3%	1.1%	1	0	0
66	2	\$ 376,303	1.4%	13.7%	1	0	0	499	5	\$ 1,778,553	11.3%	-9.2%	1	0	0
7916	9	\$ 2,932,708	1.4%	-32.2%	1	0	0	7392	7	\$ 374,634	11.3%	5.1%	1	0	0
7469	5	\$ 53,986,542	1.4%	-2.2%	0	0	1	279	2	\$ 329,916	11.3%	-10.7%	1	0	0
8092	5	\$ 5,509,208	1.4%	-16.2%	1	0	0	292	4	\$ 356,850	11.3%	-11.1%	1	0	0
8141	3	\$ 2,269,936	1.4%	9.8%	1	0	0	901	2	\$ 529,171	11.3%	15.3%	0	1	0
463	4	\$ 9,896,837	1.4%	-1.4%	0	0	1	834	3	\$ 312,455	11.4%	53.9%	0	1	0
7912	5	\$ 1,741,830	1.4%	-21.4%	1	0	0	637	2	\$ 1,906,880	11.4%	-4.3%	1	0	0
7525	4	\$ 1,497,946	1.4%	6.1%	1	0	0	323	3	\$ 439,942	11.4%	-7.9%	1	0	0
775	5	\$ 1,483,047	1.4%	-1.7%	0	0	1	1088	4	\$ 5,110,856	11.4%	19.4%	0	1	0
140	3	\$ 962,500	1.4%	3.8%	0	0	1	7847	6	\$ 114,569,194	11.4%	-24.9%	1	0	0
8262	6	\$ 8,374,296	1.4%	3.8%	0	0	1	448	2	\$ 1,019,959	11.4%	0.0%	1	0	0
8148	4	\$ 2,070,070	1.4%	-16.1%	1	0	0	1059	4	\$ 2,485,750	11.4%	38.1%	0	1	0
82	6	\$ 498,952	1.5%	13.3%	1	0	0	405	3	\$ 763,910	11.4%	-10.3%	1	0	0
8429	3	\$ 146,654	1.5%	-13.1%	1	0	0	7746	3	\$ 5,399,568	11.4%	-18.5%	1	0	0
7574	5	\$ 807,347	1.5%	-4.9%	0	0	1	7485	2	\$ 599,978	11.5%	-4.0%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
157	2	\$ 1,066,384	1.5%	-5.8%	1	0	0	1004	2	\$ 1,293,588	11.5%	-19.2%	1	0	0
253	2	\$ 2,292,159	1.5%	17.9%	1	0	0	351	3	\$ 537,275	11.5%	11.1%	0	1	0
840	3	\$ 2,491,756	1.5%	8.3%	1	0	0	1203	5	\$ 3,496,833	11.5%		1	0	0
8558	3	\$ 6,425,000	1.5%	1.2%	0	0	1	7974	11	\$ 1,487,229	11.5%	-46.2%	1	0	0
681	4	\$ 33,502	1.5%	-39.1%	1	0	0	265	5	\$ 312,005	11.5%	24.7%	0	1	0
7951	3	\$ 303,451	1.5%	5.5%	1	0	0	7662	4	\$ 5,148,109	11.6%	-31.2%	1	0	0
8334	4	\$ 889,753	1.5%	-10.4%	1	0	0	1250	4	\$ 5,649,450	11.6%		1	0	0
118	7	\$ 720,574	1.5%	10.4%	1	0	0	651	2	\$ 3,573,055	11.6%	-8.9%	1	0	0
7713	5	\$ 265,995	1.5%	-21.5%	1	0	0	603	2	\$ 493,453	11.6%	7.0%	1	0	0
37	7	\$ 160,657	1.5%	-9.7%	1	0	0	7914	3	\$ 769,967	11.6%	-29.1%	1	0	0
8192	4	\$ 1,558,713	1.5%	12.8%	1	0	0	1249	4	\$ 5,641,000	11.6%		1	0	0
176	3	\$ 1,179,513	1.5%	-5.1%	1	0	0	1248	4	\$ 5,641,000	11.6%		1	0	0
7920	9	\$ 10,921,000	1.5%	-34.1%	1	0	0	7502	3	\$ 5,094,721	11.7%	3.5%	1	0	0
848	4	\$ 2,580,000	1.5%	-5.7%	1	0	0	1073	5	\$ 3,147,313	11.7%	2.5%	1	0	0
7727	4	\$ 236,783	1.5%	-51.4%	1	0	0	984	2	\$ 1,064,510	11.7%	2.3%	1	0	0
8105	9	\$ 28,618,804	1.5%	-17.0%	1	0	0	956	3	\$ 774,725	11.7%	3.9%	1	0	0
44	4	\$ 177,554	1.6%	-5.4%	1	0	0	7334	3	\$ 61,269	11.7%	-24.3%	1	0	0
768	5	\$ 1,218,410	1.6%	20.5%	1	0	0	1377	2	\$ 1,918,634	11.7%		1	0	0
803	2	\$ 1,746,500	1.6%	12.7%	1	0	0	7636	4	\$ 1,132,499	11.7%	-8.6%	1	0	0
833	2	\$ 2,245,849	1.6%	7.0%	1	0	0	1063	3	\$ 2,582,390	11.7%	-10.0%	1	0	0
7484	4	\$ 28,355,111	1.6%	-9.5%	1	0	0	483	7	\$ 1,398,997	11.7%	-10.5%	1	0	0
284	4	\$ 2,418,191	1.6%	8.9%	1	0	0	8252	5	\$ 696,460	11.8%	-6.0%	1	0	0
7550	9	\$ 16,328,901	1.6%	-14.2%	1	0	0	365	4	\$ 554,264	11.8%	73.1%	0	1	0
7300	2	\$ 9,198,840	1.6%	0.9%	0	0	1	246	3	\$ 272,048	11.8%	-28.4%	1	0	0
700	3	\$ 193,711	1.6%	-1.7%	0	0	1	7857	9	\$ 1,785,325	11.8%	-28.9%	1	0	0
7976	4	\$ 2,383,719	1.6%	-16.7%	1	0	0	7993	3	\$ 39,827	11.8%	12.3%	0	1	0
707	2	\$ 266,886	1.6%	-29.4%	1	0	0	8491	7	\$ 1,693,757	11.8%	-39.1%	1	0	0
7817	3	\$ 2,449,266	1.6%	-2.7%	0	0	1	345	5	\$ 483,372	11.8%	-30.5%	1	0	0
7483	2	\$ 589,180	1.6%	4.4%	0	0	1	525	2	\$ 3,090,466	11.8%	-16.9%	1	0	0
698	2	\$ 173,548	1.6%	-15.8%	1	0	0	8486	4	\$ 336,444	11.9%	-23.2%	1	0	0
230	3	\$ 1,770,319	1.6%	-4.1%	0	0	1	179	5	\$ 154,486	11.9%	-11.8%	1	0	0
584	6	\$ 1,592,826	1.6%	-12.3%	1	0	0	8011	5	\$ 795,836	11.9%	-20.8%	1	0	0
1196	6	\$ 10,802,348	1.6%		0	0	1	7382	5	\$ 391,135	11.9%	-17.6%	1	0	0
1170	8	\$ 2,688,860	1.6%		0	0	1	8654	2	\$ 111,111	11.9%	13.7%	0	1	0
1222	5	\$ 761,267	1.6%		0	0	1	191	3	\$ 175,252	12.0%	7.9%	1	0	0
218	4	\$ 1,587,780	1.6%	-1.6%	0	0	1	815	3	\$ 248,268	12.0%	-43.6%	1	0	0
145	5	\$ 869,391	1.6%	7.7%	1	0	0	8420	2	\$ 149,909	12.0%	-24.1%	1	0	0
331	4	\$ 3,195,259	1.6%	12.2%	1	0	0	7643	4	\$ 403,144	12.0%	-31.4%	1	0	0
8328	5	\$ 3,835,534	1.6%	-0.2%	0	0	1	579	2	\$ 155,348	12.1%	102.7%	0	1	0
136	3	\$ 791,253	1.6%	0.8%	0	0	1	8586	6	\$ 832,126	12.1%	-25.8%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7946	7	\$ 16,392,704	1.6%	-25.9%	1	0	0	8458	3	\$ 889,550	12.1%	-1.6%	1	0	0
159	3	\$ 946,007	1.7%	-9.0%	1	0	0	829	4	\$ 278,678	12.1%	21.7%	0	1	0
586	9	\$ 1,587,478	1.7%	-22.4%	1	0	0	978	3	\$ 982,779	12.1%	15.5%	0	1	0
7866	12	\$ 6,783,945	1.7%	-40.0%	1	0	0	485	5	\$ 1,370,188	12.1%	-16.0%	1	0	0
767	4	\$ 1,123,112	1.7%	-25.6%	1	0	0	111	4	\$ 81,282	12.1%	-3.2%	1	0	0
47	7	\$ 174,283	1.7%	-3.9%	0	0	1	923	2	\$ 554,561	12.1%	-15.6%	1	0	0
757	2	\$ 983,000	1.7%	-7.4%	1	0	0	1314	3	\$ 6,034,832	12.1%		1	0	0
7537	8	\$ 7,350,281	1.7%	-15.4%	1	0	0	423	2	\$ 820,219	12.1%	-0.7%	1	0	0
819	5	\$ 1,780,796	1.7%	-10.1%	1	0	0	7293	2	\$ 2,994,014	12.2%	-11.9%	1	0	0
784	6	\$ 1,328,503	1.7%	-16.2%	1	0	0	629	3	\$ 1,345,271	12.2%	844.3%	0	1	0
7335	4	\$ 58,009	1.7%	16.3%	1	0	0	204	5	\$ 196,240	12.2%	27.1%	0	1	0
59	2	\$ 247,408	1.7%	2.6%	0	0	1	1313	3	\$ 23,735,284	12.3%		1	0	0
116	4	\$ 615,219	1.7%	-5.9%	1	0	0	738	5	\$ 109,992	12.3%	-16.0%	1	0	0
718	3	\$ 454,000	1.7%	-70.5%	1	0	0	7612	3	\$ 372,104	12.3%	-33.6%	1	0	0
7465	5	\$ 61,494,606	1.7%	-10.0%	1	0	0	398	8	\$ 663,746	12.3%	-33.0%	1	0	0
447	4	\$ 6,683,828	1.7%	4.8%	0	0	1	788	3	\$ 193,328	12.3%	13.1%	0	1	0
7978	2	\$ 711,117	1.7%	-24.6%	1	0	0	367	5	\$ 531,745	12.3%	-12.2%	1	0	0
7972	4	\$ 3,042,698	1.8%	-3.6%	0	0	1	826	2	\$ 260,944	12.3%	50.8%	0	1	0
761	4	\$ 989,949	1.8%	19.0%	1	0	0	1312	3	\$ 1,598,171	12.4%		1	0	0
786	4	\$ 1,293,377	1.8%	25.8%	1	0	0	589	5	\$ 249,068	12.4%	-30.5%	1	0	0
156	4	\$ 867,635	1.8%	-23.7%	1	0	0	8387	5	\$ 339,135	12.4%	-25.5%	1	0	0
7522	6	\$ 14,874,970	1.8%	-15.5%	1	0	0	1031	3	\$ 1,598,895	12.4%	-3.3%	1	0	0
723	4	\$ 535,175	1.8%	-20.6%	1	0	0	889	2	\$ 454,787	12.4%	22.9%	0	1	0
8185	6	\$ 1,300,928	1.8%	8.5%	1	0	0	966	2	\$ 842,293	12.4%	34.8%	0	1	0
8029	15	\$ 3,573,162	1.8%	-26.9%	1	0	0	7921	4	\$ 1,079,313	12.4%	-25.4%	1	0	0
8015	5	\$ 6,307,669	1.8%	-5.7%	1	0	0	7758	5	\$ 2,927,575	12.4%	-25.8%	1	0	0
8375	3	\$ 312,823	1.8%	32.8%	1	0	0	8182	7	\$ 298,194	12.4%	-22.8%	1	0	0
8474	5	\$ 507,508	1.8%	-37.4%	1	0	0	8307	4	\$ 297,789	12.4%	-3.3%	1	0	0
172	8	\$ 958,318	1.8%	11.3%	1	0	0	250	3	\$ 259,851	12.5%	4.8%	1	0	0
8608	7	\$ 3,262,709	1.8%	-14.2%	1	0	0	8198	4	\$ 2,969,688	12.5%	-34.1%	1	0	0
7717	16	\$ 969,075	1.8%	-28.0%	1	0	0	7622	4	\$ 5,998,535	12.5%	-16.7%	1	0	0
7935	3	\$ 1,980,480	1.8%	-22.2%	1	0	0	8331	4	\$ 264,869	12.5%	-7.7%	1	0	0
73	3	\$ 314,196	1.8%	-12.8%	1	0	0	536	4	\$ 4,401,996	12.6%	-9.1%	1	0	0
336	2	\$ 2,892,333	1.8%	-5.6%	1	0	0	324	5	\$ 398,652	12.6%	6.0%	1	0	0
7575	4	\$ 17,039,595	1.8%	6.2%	1	0	0	870	5	\$ 369,457	12.6%	-5.0%	1	0	0
8090	6	\$ 2,519,519	1.9%	-17.6%	1	0	0	373	2	\$ 532,322	12.6%	-16.8%	1	0	0
7692	18	\$ 3,298,002	1.9%	-36.3%	1	0	0	532	2	\$ 3,649,516	12.6%	-6.7%	1	0	0
8447	4	\$ 2,087,572	1.9%	4.9%	0	0	1	241	5	\$ 242,847	12.7%	-18.4%	1	0	0
147	5	\$ 766,793	1.9%	-9.4%	1	0	0	194	5	\$ 170,820	12.7%	-21.8%	1	0	0
8246	11	\$ 2,823,532	1.9%	-5.1%	1	0	0	8460	9	\$ 3,237,136	12.7%	1.1%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7670	4	\$ 1,067,440	1.9%	11.4%	1	0	0	8043	9	\$ 30,602	12.7%	-28.7%	1	0	0
973	3	\$ 5,881,296	1.9%	0.2%	0	0	1	8643	2	\$ 344,004	12.8%	17.4%	0	1	0
110	3	\$ 520,514	1.9%	-17.5%	1	0	0	1075	3	\$ 2,896,768	12.8%	-1.8%	1	0	0
1281	4	\$ 2,020,250	1.9%		0	0	1	158	5	\$ 121,699	12.8%	-28.5%	1	0	0
1353	3	\$ 1,052,800	1.9%		0	0	1	958	3	\$ 723,842	12.9%	5.2%	1	0	0
821	6	\$ 1,598,500	1.9%	-7.1%	1	0	0	7584	3	\$ 339,532	12.9%	-2.8%	1	0	0
1280	4	\$ 847,806	1.9%		0	0	1	7646	6	\$ 467,631	12.9%	-32.3%	1	0	0
708	4	\$ 259,131	1.9%	151.6%	1	0	0	238	3	\$ 231,990	13.0%	8.2%	1	0	0
297	2	\$ 2,194,297	1.9%	-1.8%	0	0	1	431	10	\$ 807,755	13.0%	11.0%	0	1	0
8235	6	\$ 1,949,049	1.9%	12.4%	1	0	0	442	2	\$ 872,124	13.0%	16.9%	0	1	0
8329	3	\$ 530,434	2.0%	10.7%	1	0	0	7348	3	\$ 940,916	13.0%	-43.8%	1	0	0
7977	8	\$ 4,333,222	2.0%	-16.4%	1	0	0	841	3	\$ 282,402	13.0%	13.9%	0	1	0
8091	3	\$ 1,883,388	2.0%	-12.2%	1	0	0	7760	2	\$ 2,948,948	13.0%	-2.4%	1	0	0
782	4	\$ 1,087,355	2.0%	-2.1%	0	0	1	277	2	\$ 282,862	13.0%	13.5%	0	1	0
390	6	\$ 3,798,445	2.0%	2.2%	0	0	1	7765	4	\$ 89,006	13.1%	-18.7%	1	0	0
8017	6	\$ 4,723,891	2.0%	-23.1%	1	0	0	813	4	\$ 223,696	13.1%	3.1%	1	0	0
522	5	\$ 15,791,604	2.0%	16.0%	1	0	0	1376	2	\$ 844,774	13.1%		1	0	0
8094	5	\$ 145,894	2.0%	-18.1%	1	0	0	1247	4	\$ 391,346	13.2%		1	0	0
750	3	\$ 761,294	2.0%	11.3%	1	0	0	1246	4	\$ 1,874,832	13.2%		1	0	0
7702	5	\$ 994,966	2.0%	-22.1%	1	0	0	7787	2	\$ 3,242,563	13.2%	-12.0%	1	0	0
8524	3	\$ 129,099	2.0%	33.4%	1	0	0	261	5	\$ 264,549	13.2%	2.3%	1	0	0
142	2	\$ 690,784	2.0%	-8.7%	1	0	0	460	2	\$ 1,014,052	13.2%	28.3%	0	1	0
1352	3	\$ 1,107,250	2.0%		0	0	1	8604	2	\$ 1,771,500	13.2%	-5.2%	1	0	0
8339	4	\$ 521,799	2.0%	16.5%	1	0	0	245	3	\$ 239,250	13.2%	-11.1%	1	0	0
8446	4	\$ 1,880,925	2.0%	-6.2%	1	0	0	8032	4	\$ 4,058,703	13.3%	53.1%	0	1	0
7516	4	\$ 4,356,298	2.0%	1.4%	0	0	1	314	2	\$ 361,155	13.4%	-3.4%	1	0	0
8543	3	\$ 894,042	2.0%	-2.3%	0	0	1	404	3	\$ 649,206	13.4%	-15.6%	1	0	0
7381	5	\$ 1,526,999	2.0%	15.7%	1	0	0	743	3	\$ 104,132	13.4%	-34.9%	1	0	0
7259	7	\$ 28,394,392	2.1%	-12.1%	1	0	0	789	3	\$ 177,548	13.4%	7.0%	1	0	0
772	2	\$ 968,098	2.1%	40.7%	1	0	0	7775	5	\$ 444,988	13.5%	-3.3%	1	0	0
7598	8	\$ 124,080	2.1%	-22.2%	1	0	0	476	4	\$ 1,126,155	13.5%	2.5%	1	0	0
8300	2	\$ 2,805,196	2.1%	22.5%	1	0	0	1311	3	\$ 1,066,443	13.5%		1	0	0
276	3	\$ 1,777,491	2.1%	9.3%	1	0	0	301	3	\$ 316,803	13.6%	-27.8%	1	0	0
7835	8	\$ 20,528,756	2.1%	-33.6%	1	0	0	7283	3	\$ 124,000,000	13.6%	-0.8%	1	0	0
1279	4	\$ 9,590,000	2.1%		0	0	1	8399	2	\$ 2,671,717	13.6%	-12.1%	1	0	0
1278	4	\$ 9,590,000	2.1%		0	0	1	808	5	\$ 206,708	13.6%	-7.3%	1	0	0
8269	8	\$ 811,871	2.1%	-39.3%	1	0	0	930	4	\$ 523,884	13.7%	31.0%	0	1	0
728	3	\$ 479,075	2.1%	56.1%	1	0	0	8620	4	\$ 1,209,769	13.7%	-22.4%	1	0	0
8611	3	\$ 2,365,237	2.1%	-3.5%	0	0	1	8297	5	\$ 1,154,878	13.7%	-4.0%	1	0	0
8201	3	\$ 421,868	2.1%	9.0%	1	0	0	328	4	\$ 381,022	13.7%	-30.8%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7871	7	\$ 608,774	2.1%	-24.3%	1	0	0	258	11	\$ 249,674	13.7%	-5.7%	1	0	0
7602	3	\$ 595,555	2.1%	-6.3%	1	0	0	425	2	\$ 726,997	13.7%	-8.2%	1	0	0
8118	2	\$ 1,510,328	2.1%	-6.1%	1	0	0	8431	7	\$ 995,504	13.8%	-31.4%	1	0	0
7506	14	\$ 303,760	2.1%	-28.4%	1	0	0	7769	3	\$ 6,499,399	13.8%	-20.5%	1	0	0
7586	7	\$ 156,663	2.1%	-8.3%	1	0	0	1107	3	\$ 8,323,962	13.8%	11.1%	0	1	0
295	5	\$ 1,922,369	2.1%	7.0%	1	0	0	804	4	\$ 196,805	13.8%	-24.0%	1	0	0
8101	6	\$ 1,107,911	2.1%	-14.0%	1	0	0	409	3	\$ 654,989	13.9%	-11.7%	1	0	0
705	3	\$ 180,096	2.2%	5.3%	1	0	0	270	6	\$ 261,305	13.9%	-0.6%	1	0	0
1195	6	\$ 2,386,434	2.2%		0	0	1	7697	3	\$ 6,330,905	13.9%	2.3%	1	0	0
133	3	\$ 586,807	2.2%	-6.7%	1	0	0	7748	3	\$ 2,833,069	13.9%	-11.6%	1	0	0
7267	6	\$ 10,747,747	2.2%	1.9%	0	0	1	7898	7	\$ 147,245	13.9%	-10.3%	1	0	0
8415	3	\$ 1,043,493	2.2%	-5.8%	1	0	0	8428	4	\$ 442,293	13.9%	-15.8%	1	0	0
7772	7	\$ 500,896	2.2%	-17.9%	1	0	0	621	3	\$ 926,089	14.0%	8.5%	1	0	0
1399	2	\$ 2,774,500	2.2%		0	0	1	7820	4	\$ 1,251,953	14.0%	-13.0%	1	0	0
746	3	\$ 653,866	2.2%	57.6%	1	0	0	906	3	\$ 447,473	14.0%	18.1%	0	1	0
41	4	\$ 114,880	2.2%	-6.0%	1	0	0	7313	2	\$ 2,347,149	14.0%	-4.8%	1	0	0
744	3	\$ 636,351	2.2%	13.6%	1	0	0	631	4	\$ 1,243,285	14.0%	-1.3%	1	0	0
8629	2	\$ 260,000	2.2%	15.5%	1	0	0	7613	4	\$ 471,750	14.0%	-19.0%	1	0	0
143	2	\$ 630,438	2.2%	-2.3%	0	0	1	1077	2	\$ 2,969,000	14.0%	2.7%	1	0	0
8142	4	\$ 1,182,402	2.2%	-11.6%	1	0	0	418	3	\$ 699,019	14.0%	-18.7%	1	0	0
1398	2	\$ 5,636,873	2.2%		0	0	1	8505	2	\$ 1,106,399	14.1%	2.5%	1	0	0
7688	8	\$ 329,023	2.3%	-20.6%	1	0	0	8372	2	\$ 1,522,758	14.1%	-7.0%	1	0	0
7984	10	\$ 1,765,585	2.3%	5.3%	1	0	0	7689	6	\$ 3,851,852	14.1%	-32.2%	1	0	0
8498	8	\$ 187,388	2.3%	-30.5%	1	0	0	546	3	\$ 6,968,718	14.2%	-2.8%	1	0	0
7711	9	\$ 173,404	2.3%	-17.0%	1	0	0	7582	2	\$ 1,123,123	14.2%	-17.4%	1	0	0
7507	4	\$ 187,809	2.3%	-19.2%	1	0	0	8445	3	\$ 1,169,962	14.2%	-19.9%	1	0	0
141	8	\$ 603,593	2.3%	5.2%	1	0	0	518	2	\$ 1,955,413	14.2%	0.2%	1	0	0
1277	4	\$ 9,920,000	2.3%		0	0	1	1310	3	\$ 1,179,533	14.2%		1	0	0
7869	4	\$ 4,579,035	2.3%	-8.0%	1	0	0	1309	3	\$ 1,179,533	14.2%		1	0	0
822	2	\$ 1,323,319	2.3%	-14.1%	1	0	0	8102	3	\$ 3,419,556	14.2%	-18.2%	1	0	0
85	9	\$ 326,988	2.3%	-7.1%	1	0	0	325	3	\$ 355,016	14.2%	-18.9%	1	0	0
95	4	\$ 366,435	2.3%	20.2%	1	0	0	8507	7	\$ 392,052	14.2%	-24.8%	1	0	0
249	5	\$ 1,400,276	2.3%	-5.8%	1	0	0	330	4	\$ 367,614	14.3%	-11.2%	1	0	0
61	3	\$ 197,850	2.3%	0.4%	0	0	1	595	6	\$ 239,579	14.3%	-26.4%	1	0	0
149	10	\$ 624,148	2.3%	-3.7%	0	0	1	420	3	\$ 689,771	14.3%	-16.4%	1	0	0
8293	4	\$ 2,113,355	2.3%	0.3%	0	0	1	7591	2	\$ 6,734,000	14.3%	-20.2%	1	0	0
7896	2	\$ 82,281	2.3%	-36.0%	1	0	0	453	3	\$ 846,867	14.4%	-17.9%	1	0	0
638	3	\$ 10,632,683	2.3%	27.7%	1	0	0	7378	2	\$ 564,270	14.4%	10.3%	0	1	0
1163	10	\$ 4,513,943	2.3%		0	0	1	8624	3	\$ 2,517,039	14.4%	5.1%	1	0	0
63	3	\$ 198,658	2.3%	-2.3%	0	0	1	7806	6	\$ 214,177	14.4%	-39.3%	1	0	0



BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
212	3	\$ 1,062,674	2.3%	-8.4%	1	0	0	7895	4	\$ 33,774,714	14.4%	-7.4%	1	0	0
1162	11	\$ 14,593,986	2.3%		0	0	1	1245	4	\$ 6,373,780	14.4%		1	0	0
1161	11	\$ 14,593,986	2.3%		0	0	1	931	6	\$ 499,000	14.4%	-20.7%	1	0	0
19	2	\$ 45,435	2.4%	8.1%	1	0	0	190	3	\$ 143,976	14.5%	-4.5%	1	0	0
8080	7	\$ 6,157,383	2.4%	-29.3%	1	0	0	8109	2	\$ 1,671,559	14.5%	-15.2%	1	0	0
167	3	\$ 715,634	2.4%	-2.3%	0	0	1	7419	2	\$ 1,359,596	14.5%	-8.8%	1	0	0
7242	8	\$ 15,139,250	2.4%	-6.1%	1	0	0	657	2	\$ 3,988,988	14.5%	1.1%	1	0	0
7777	6	\$ 37,540,556	2.4%	-25.7%	1	0	0	88	4	\$ 53,153	14.5%	1.0%	1	0	0
8315	4	\$ 2,269,665	2.4%	-3.7%	0	0	1	1087	2	\$ 3,989,660	14.5%	-6.6%	1	0	0
92	2	\$ 344,324	2.4%	0.6%	0	0	1	8129	5	\$ 471,405	14.5%	-17.2%	1	0	0
548	4	\$ 47,365,477	2.4%	-16.1%	1	0	0	267	3	\$ 248,932	14.5%	13.2%	0	1	0
8617	9	\$ 4,959,924	2.4%	-35.1%	1	0	0	379	3	\$ 479,614	14.5%	-7.1%	1	0	0
854	2	\$ 1,723,388	2.4%	-12.4%	1	0	0	421	5	\$ 682,287	14.6%	-4.1%	1	0	0
8689	3	\$ 2,381,922	2.4%	-6.0%	1	0	0	341	3	\$ 384,589	14.6%	-4.8%	1	0	0
729	5	\$ 472,976	2.4%	29.2%	1	0	0	1202	5	\$ 1,709,682	14.6%		1	0	0
1194	6	\$ 3,239,922	2.4%		0	0	1	7427	2	\$ 1,124,939	14.6%	13.6%	0	1	0
7882	12	\$ 3,701,707	2.4%	-23.4%	1	0	0	1244	4	\$ 1,395,490	14.6%		1	0	0
91	6	\$ 335,100	2.4%	-10.1%	1	0	0	1308	3	\$ 4,480,000	14.6%		1	0	0
792	2	\$ 999,888	2.4%	24.7%	1	0	0	1307	3	\$ 4,480,000	14.6%		1	0	0
8137	4	\$ 1,820,597	2.4%	0.2%	0	0	1	120	4	\$ 73,941	14.7%	-44.2%	1	0	0
1276	4	\$ 979,797	2.4%		0	0	1	8577	2	\$ 504,206	14.7%	19.7%	0	1	0
7934	4	\$ 500,874	2.4%	-41.0%	1	0	0	7705	3	\$ 2,725,921	14.8%	-30.6%	1	0	0
7861	9	\$ 2,398,718	2.4%	-10.8%	1	0	0	1306	3	\$ 1,008,000	14.8%		1	0	0
8255	4	\$ 816,000	2.5%	-15.0%	1	0	0	1305	3	\$ 1,008,000	14.8%		1	0	0
7668	7	\$ 184,184	2.5%	-26.0%	1	0	0	8106	3	\$ 2,497,252	14.8%	-18.1%	1	0	0
720	4	\$ 342,846	2.5%	-0.3%	0	0	1	8652	3	\$ 758,900	14.8%	-7.9%	1	0	0
7661	14	\$ 3,208,021	2.5%	-42.8%	1	0	0	802	3	\$ 182,872	14.8%	-1.2%	1	0	0
162	6	\$ 659,230	2.5%	-13.7%	1	0	0	8212	5	\$ 304,440	14.8%	-20.6%	1	0	0
7632	4	\$ 337,200	2.5%	-19.0%	1	0	0	7428	2	\$ 1,493,044	14.9%	12.5%	0	1	0
1351	3	\$ 8,432,063	2.5%		0	0	1	880	4	\$ 345,851	14.9%	-13.8%	1	0	0
8687	5	\$ 440,156	2.5%	-28.4%	1	0	0	1304	3	\$ 1,974,315	14.9%		1	0	0
639	6	\$ 10,255,073	2.5%	4.5%	0	0	1	874	4	\$ 315,745	14.9%	-12.5%	1	0	0
173	3	\$ 709,959	2.5%	21.2%	1	0	0	8510	6	\$ 1,436,900	15.0%	0.4%	1	0	0
8381	8	\$ 1,278,347	2.5%	2.4%	0	0	1	523	2	\$ 2,293,894	15.0%	6.8%	1	0	0
7706	2	\$ 1,657,734	2.5%	-13.7%	1	0	0	1243	4	\$ 4,331,236	15.1%		1	0	0
192	3	\$ 841,283	2.5%	34.0%	1	0	0	1242	4	\$ 4,331,236	15.1%		1	0	0
1275	4	\$ 14,963,700	2.5%		0	0	1	1375	2	\$ 19,597,450	15.1%		1	0	0
7225	3	\$ 740,540	2.6%	4.2%	0	0	1	7309	3	\$ 1,457,834	15.1%	-29.0%	1	0	0
7653	4	\$ 2,749,325	2.6%	-21.1%	1	0	0	7839	10	\$ 148,498	15.1%	-28.0%	1	0	0
54	3	\$ 147,217	2.6%	-0.9%	0	0	1	7571	2	\$ 717,320	15.2%	11.8%	0	1	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
248	2	\$ 1,252,701	2.6%	-9.9%	1	0	0	1047	2	\$ 1,640,279	15.2%	-26.5%	1	0	0
7278	5	\$ 10,571,219	2.6%	-34.2%	1	0	0	618	2	\$ 742,742	15.2%	-15.0%	1	0	0
7403	5	\$ 233,687	2.6%	8.6%	1	0	0	893	4	\$ 384,810	15.2%	-6.4%	1	0	0
981	5	\$ 4,673,778	2.6%	-4.0%	0	0	1	478	2	\$ 1,018,414	15.2%	18.4%	0	1	0
168	2	\$ 646,886	2.6%	4.8%	0	0	1	1241	4	\$ 10,214,717	15.3%		1	0	0
407	3	\$ 3,332,062	2.6%	-15.9%	1	0	0	1020	6	\$ 1,133,201	15.3%	-8.9%	1	0	0
340	5	\$ 2,124,856	2.6%	-1.5%	0	0	1	1052	4	\$ 1,664,058	15.5%	0.9%	1	0	0
8211	3	\$ 794,432	2.6%	24.5%	1	0	0	8314	3	\$ 5,004,744	15.5%	3.6%	1	0	0
7287	2	\$ 1,115,969	2.6%	-19.3%	1	0	0	391	4	\$ 489,630	15.5%	-23.3%	1	0	0
8021	4	\$ 314,247	2.7%	-14.3%	1	0	0	435	3	\$ 690,625	15.6%	18.6%	0	1	0
450	5	\$ 4,431,848	2.7%	19.4%	1	0	0	8216	3	\$ 3,346,888	15.7%	-14.6%	1	0	0
7342	3	\$ 3,749,085	2.7%	-12.4%	1	0	0	240	7	\$ 194,414	15.7%	4.6%	1	0	0
7543	3	\$ 498,816	2.7%	-18.2%	1	0	0	315	2	\$ 307,828	15.7%	4.1%	1	0	0
843	4	\$ 1,387,801	2.7%	11.6%	1	0	0	7499	4	\$ 229,229	15.7%	-25.2%	1	0	0
7926	4	\$ 44,127,374	2.7%	4.2%	0	0	1	779	5	\$ 136,263	15.7%	-0.5%	1	0	0
563	5	\$ 155,064	2.7%	-18.8%	1	0	0	989	2	\$ 811,768	15.7%	-8.0%	1	0	0
7462	8	\$ 2,720,720	2.7%	-15.9%	1	0	0	538	4	\$ 3,824,861	15.8%	8.8%	1	0	0
7557	3	\$ 385,287	2.7%	2.1%	0	0	1	388	4	\$ 471,777	15.8%	-14.8%	1	0	0
7742	5	\$ 129,643	2.7%	-2.8%	0	0	1	1024	4	\$ 1,127,582	15.8%	-13.6%	1	0	0
76	3	\$ 238,207	2.7%	-19.1%	1	0	0	7721	13	\$ 398,014	15.8%	-48.2%	1	0	0
7906	2	\$ 1,622,622	2.7%	-2.3%	0	0	1	7645	2	\$ 2,574,637	15.9%	-18.1%	1	0	0
500	6	\$ 7,536,550	2.7%	-17.9%	1	0	0	8233	5	\$ 195,359	15.9%	-12.0%	1	0	0
115	3	\$ 382,757	2.7%	-4.2%	0	0	1	7771	3	\$ 5,841,107	15.9%	-19.9%	1	0	0
7413	7	\$ 17,294,960	2.8%	-30.3%	1	0	0	7480	3	\$ 2,827,036	15.9%	-14.3%	1	0	0
857	3	\$ 1,519,211	2.8%	-7.6%	1	0	0	7314	4	\$ 226,917	16.0%	-28.9%	1	0	0
7679	15	\$ 3,148,190	2.8%	-27.1%	1	0	0	7488	2	\$ 964,413	16.0%	-15.3%	1	0	0
128	9	\$ 445,575	2.8%	-11.1%	1	0	0	982	2	\$ 774,303	16.0%	18.6%	0	1	0
1221	5	\$ 2,030,353	2.8%		0	0	1	8085	4	\$ 295,845	16.0%	-28.9%	1	0	0
1220	5	\$ 2,030,353	2.8%		0	0	1	8470	4	\$ 83,534	16.0%	37.2%	0	1	0
8065	13	\$ 2,480,568	2.8%	-23.2%	1	0	0	1111	2	\$ 7,817,940	16.0%	-25.5%	1	0	0
125	2	\$ 417,476	2.8%	-9.2%	1	0	0	660	3	\$ 8,489,064	16.0%	4.9%	1	0	0
300	7	\$ 1,533,089	2.8%	-3.1%	0	0	1	7729	4	\$ 1,109,407	16.0%	-51.3%	1	0	0
7336	2	\$ 170,024	2.8%	-9.4%	1	0	0	516	2	\$ 1,644,072	16.0%	-4.2%	1	0	0
1397	2	\$ 4,448,256	2.8%		0	0	1	8658	3	\$ 633,327	16.0%	5.8%	1	0	0
740	4	\$ 494,799	2.8%	-29.3%	1	0	0	274	3	\$ 228,108	16.1%	12.7%	0	1	0
852	2	\$ 1,458,900	2.8%	3.2%	0	0	1	8110	4	\$ 309,457	16.1%	-1.2%	1	0	0
620	7	\$ 4,209,169	2.8%	14.7%	1	0	0	7685	4	\$ 8,091,334	16.2%	-1.7%	1	0	0
8414	6	\$ 3,950,269	2.8%	12.4%	1	0	0	7961	3	\$ 672,944	16.2%	-13.8%	1	0	0
7317	3	\$ 678,400	2.8%	3.8%	0	0	1	911	4	\$ 392,198	16.2%	44.7%	0	1	0
741	3	\$ 489,902	2.8%	2.9%	0	0	1	7736	3	\$ 608,608	16.2%	-16.8%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
924	5	\$ 2,423,890	2.8%	5.9%	1	0	0	1172	7	\$ 8,456,553	16.3%		1	0	0
7796	12	\$ 15,794,702	2.8%	-26.6%	1	0	0	1171	7	\$ 8,456,553	16.3%		1	0	0
7938	8	\$ 15,514,435	2.9%	-30.5%	1	0	0	8609	7	\$ 2,212,436	16.3%	-6.4%	1	0	0
8144	3	\$ 1,612,149	2.9%	-9.9%	1	0	0	1374	2	\$ 1,968,980	16.3%		1	0	0
7576	3	\$ 198,290	2.9%	5.9%	1	0	0	8257	2	\$ 74,707	16.3%	7.8%	1	0	0
7755	2	\$ 3,012,012	2.9%	-13.7%	1	0	0	1049	3	\$ 1,566,043	16.3%	-6.1%	1	0	0
203	9	\$ 826,450	2.9%	-5.8%	1	0	0	8368	4	\$ 1,273,710	16.3%	-20.8%	1	0	0
1350	3	\$ 1,922,250	2.9%		0	0	1	402	3	\$ 513,414	16.4%	-20.3%	1	0	0
8143	4	\$ 1,304,360	2.9%	-20.9%	1	0	0	770	2	\$ 117,486	16.4%	29.1%	0	1	0
100	8	\$ 303,825	2.9%	-13.8%	1	0	0	497	2	\$ 1,199,325	16.4%	-1.7%	1	0	0
7936	5	\$ 50,778,923	2.9%	-21.3%	1	0	0	592	2	\$ 198,465	16.4%	67.6%	0	1	0
1396	2	\$ 506,252	2.9%		0	0	1	1373	2	\$ 256,753	16.4%		1	0	0
769	6	\$ 649,600	2.9%	9.9%	1	0	0	8133	6	\$ 433,357	16.4%	-21.8%	1	0	0
348	6	\$ 2,058,000	2.9%	-17.5%	1	0	0	7856	6	\$ 2,968,787	16.4%	-23.5%	1	0	0
883	5	\$ 1,844,995	2.9%	17.3%	1	0	0	8184	6	\$ 1,252,400	16.5%	-42.8%	1	0	0
7272	5	\$ 9,987,659	2.9%	-7.9%	1	0	0	8542	5	\$ 1,153,045	16.5%	6.5%	1	0	0
1274	4	\$ 2,578,750	2.9%		0	0	1	306	4	\$ 272,427	16.5%	-23.4%	1	0	0
1273	4	\$ 2,578,750	2.9%		0	0	1	1096	3	\$ 4,244,987	16.5%	2.5%	1	0	0
825	2	\$ 1,068,525	2.9%	7.2%	1	0	0	7450	4	\$ 2,393,095	16.5%	-26.2%	1	0	0
1272	4	\$ 18,418,418	2.9%		0	0	1	8551	3	\$ 610,254	16.5%	-26.8%	1	0	0
7821	6	\$ 379,000	2.9%	-26.1%	1	0	0	7247	3	\$ 373,772	16.5%	-1.8%	1	0	0
8024	3	\$ 367,504	3.0%	15.7%	1	0	0	432	8	\$ 638,055	16.5%	32.4%	0	1	0
161	6	\$ 539,911	3.0%	9.0%	1	0	0	8546	6	\$ 1,655,998	16.6%	-32.8%	1	0	0
1271	4	\$ 3,088,888	3.0%		0	0	1	861	3	\$ 268,000	16.6%	-59.1%	1	0	0
781	3	\$ 729,564	3.0%	-6.6%	1	0	0	1085	5	\$ 3,231,123	16.6%	112.2%	0	1	0
8344	8	\$ 3,253,051	3.0%	-3.4%	0	0	1	433	2	\$ 648,962	16.6%	15.0%	0	1	0
8247	4	\$ 6,176,936	3.0%	-2.1%	0	0	1	384	2	\$ 430,500	16.6%	5.4%	1	0	0
914	3	\$ 2,155,850	3.0%	-6.3%	1	0	0	649	2	\$ 2,193,176	16.6%	-1.9%	1	0	0
849	4	\$ 1,338,808	3.0%	-11.6%	1	0	0	7546	2	\$ 1,249,386	16.7%	-4.8%	1	0	0
731	7	\$ 385,504	3.0%	-42.8%	1	0	0	317	4	\$ 291,916	16.7%	-13.5%	1	0	0
888	3	\$ 1,877,929	3.0%	706.0%	1	0	0	614	5	\$ 555,555	16.7%	-22.5%	1	0	0
7724	3	\$ 6,235,235	3.0%	-22.2%	1	0	0	7819	4	\$ 3,664,569	16.7%	-28.4%	1	0	0
8582	8	\$ 5,877,202	3.0%	-28.6%	1	0	0	329	2	\$ 312,228	16.7%	-5.8%	1	0	0
7324	6	\$ 33,750,315	3.0%	-1.5%	0	0	1	1201	5	\$ 2,182,248	16.7%		1	0	0
90	4	\$ 263,416	3.0%	-6.3%	1	0	0	1200	5	\$ 2,182,248	16.7%		1	0	0
739	4	\$ 457,950	3.0%	-6.2%	1	0	0	869	4	\$ 277,434	16.8%	-13.6%	1	0	0
99	5	\$ 286,607	3.0%	-15.9%	1	0	0	8435	7	\$ 4,993,369	16.8%	-13.7%	1	0	0
7751	3	\$ 1,675,706	3.0%	-17.7%	1	0	0	8477	3	\$ 1,274,905	16.8%	1.5%	1	0	0
7410	4	\$ 542,739	3.0%	21.8%	1	0	0	1060	3	\$ 1,709,812	16.8%	-3.4%	1	0	0
444	4	\$ 3,737,778	3.0%	1.5%	0	0	1	892	5	\$ 341,918	16.8%	-17.0%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
182	5	\$ 632,207	3.1%	-0.5%	0	0	1	400	3	\$ 488,234	16.9%	2.6%	1	0	0
8489	3	\$ 408,303	3.1%	-1.3%	0	0	1	7695	6	\$ 198,991	16.9%	-46.0%	1	0	0
165	4	\$ 547,349	3.1%	3.2%	0	0	1	7316	2	\$ 61,353	16.9%	-39.3%	1	0	0
7479	6	\$ 18,877,586	3.1%	-25.3%	1	0	0	609	5	\$ 467,578	17.0%	-25.7%	1	0	0
7389	3	\$ 258,000	3.1%	28.2%	1	0	0	451	7	\$ 698,118	17.0%	-29.1%	1	0	0
489	4	\$ 5,669,654	3.1%	-16.3%	1	0	0	8168	5	\$ 424,707	17.0%	-6.4%	1	0	0
1045	2	\$ 7,787,990	3.1%	12.4%	1	0	0	1303	3	\$ 15,615,615	17.0%		1	0	0
623	3	\$ 4,410,156	3.1%	23.9%	1	0	0	961	3	\$ 579,156	17.1%	-43.3%	1	0	0
8392	4	\$ 227,055	3.1%	-21.5%	1	0	0	778	3	\$ 125,144	17.1%	10.7%	0	1	0
8548	3	\$ 1,875,189	3.1%	-8.1%	1	0	0	1003	2	\$ 865,253	17.1%	-14.3%	1	0	0
713	3	\$ 210,221	3.1%	17.4%	1	0	0	7770	4	\$ 844,531	17.1%	0.8%	1	0	0
7285	2	\$ 3,775,439	3.2%	4.9%	0	0	1	7996	4	\$ 212,182	17.2%	-21.4%	1	0	0
7671	4	\$ 4,718,502	3.2%	-30.8%	1	0	0	7310	3	\$ 18,599	17.2%	18.5%	0	1	0
134	2	\$ 403,973	3.2%	-19.1%	1	0	0	502	3	\$ 1,203,110	17.2%	-7.2%	1	0	0
8557	4	\$ 1,600,000	3.2%	-17.8%	1	0	0	7388	2	\$ 321,094	17.2%	-17.1%	1	0	0
288	3	\$ 1,235,484	3.2%	-11.0%	1	0	0	7411	3	\$ 1,373,240	17.2%	-17.2%	1	0	0
7447	5	\$ 481,111	3.2%	-25.8%	1	0	0	8366	4	\$ 916,323	17.2%	-4.2%	1	0	0
1270	4	\$ 16,378,378	3.2%		0	0	1	8261	8	\$ 1,375,770	17.2%	-41.8%	1	0	0
725	4	\$ 300,191	3.2%	1.1%	0	0	1	587	5	\$ 168,504	17.2%	62.1%	0	1	0
951	4	\$ 2,694,068	3.2%	-5.9%	1	0	0	8165	4	\$ 1,223,879	17.3%	-7.9%	1	0	0
607	4	\$ 2,245,555	3.2%	12.3%	1	0	0	484	2	\$ 953,970	17.3%	-6.9%	1	0	0
39	3	\$ 75,617	3.3%	-28.5%	1	0	0	934	7	\$ 431,570	17.3%	-2.8%	1	0	0
831	2	\$ 1,053,363	3.3%	-9.7%	1	0	0	7985	2	\$ 767,641	17.3%	3.8%	1	0	0
171	2	\$ 536,352	3.3%	-8.8%	1	0	0	8622	2	\$ 2,068,740	17.3%	-5.6%	1	0	0
1349	3	\$ 3,578,000	3.3%		0	0	1	8494	3	\$ 1,422,477	17.4%	-14.0%	1	0	0
1348	3	\$ 3,578,000	3.3%		0	0	1	633	3	\$ 1,018,358	17.4%	17.1%	0	1	0
417	6	\$ 2,964,748	3.3%	25.7%	1	0	0	449	6	\$ 672,048	17.4%	-21.9%	1	0	0
7579	2	\$ 5,695,043	3.3%	5.4%	1	0	0	8666	2	\$ 194,400	17.6%	2.0%	1	0	0
1219	5	\$ 4,130,000	3.3%		0	0	1	7254	4	\$ 892,499	17.6%	5.3%	1	0	0
8638	3	\$ 461,109	3.3%	8.9%	1	0	0	7989	5	\$ 964,901	17.6%	-21.4%	1	0	0
146	8	\$ 430,000	3.3%	2.2%	0	0	1	543	3	\$ 4,669,967	17.7%	-20.5%	1	0	0
8600	3	\$ 2,539,002	3.3%	-8.6%	1	0	0	337	3	\$ 303,969	17.7%	7.4%	1	0	0
519	4	\$ 8,915,952	3.3%	21.6%	1	0	0	8639	2	\$ 322,506	17.8%	12.0%	0	1	0
7786	15	\$ 1,971,677	3.3%	-18.6%	1	0	0	470	4	\$ 808,582	17.8%	-6.9%	1	0	0
8612	4	\$ 722,122	3.3%	-2.8%	0	0	1	7740	6	\$ 1,584,730	17.8%	-39.7%	1	0	0
8444	7	\$ 1,125,102	3.4%	12.6%	1	0	0	7773	3	\$ 47,731	17.8%	-13.7%	1	0	0
1218	5	\$ 6,728,231	3.4%		0	0	1	150	2	\$ 83,971	17.8%	40.4%	0	1	0
8409	7	\$ 829,108	3.4%	-13.4%	1	0	0	1000	3	\$ 799,000	17.8%	9.6%	1	0	0
127	3	\$ 353,669	3.4%	29.2%	1	0	0	1240	4	\$ 775,492	17.8%		1	0	0
1072	5	\$ 10,795,199	3.4%	-13.8%	1	0	0	952	3	\$ 488,814	17.9%	-11.0%	1	0	0

## BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7616	3	\$ 445,346	3.4%	2.5%	0	0	1	493	4	\$ 1,013,508	17.9%	-2.7%	1	0	0
886	4	\$ 1,627,991	3.4%	5.0%	1	0	0	7568	3	\$ 504,628	17.9%	-3.0%	1	0	0
7931	2	\$ 832,204	3.4%	-4.2%	0	0	1	1054	2	\$ 1,468,079	18.0%	1.7%	1	0	0
8197	3	\$ 796,621	3.4%	30.1%	1	0	0	122	4	\$ 63,039	18.0%	-3.4%	1	0	0
820	2	\$ 884,651	3.4%	35.5%	1	0	0	501	3	\$ 1,147,020	18.0%	-4.0%	1	0	0
597	3	\$ 1,014,989	3.4%	19.9%	1	0	0	1186	6	\$ 769,636	18.0%		1	0	0
7423	2	\$ 2,857,857	3.4%	4.9%	0	0	1	963	3	\$ 549,952	18.1%	-0.9%	1	0	0
283	2	\$ 1,097,558	3.4%	35.6%	1	0	0	413	3	\$ 521,245	18.1%	-1.7%	1	0	0
109	3	\$ 282,939	3.4%	6.8%	1	0	0	8124	4	\$ 965,364	18.1%	-15.4%	1	0	0
8040	13	\$ 384,193	3.5%	-31.5%	1	0	0	8616	2	\$ 624,749	18.2%	1.1%	1	0	0
1347	3	\$ 693,400	3.5%		0	0	1	7889	4	\$ 109,806	18.2%	-30.4%	1	0	0
8007	2	\$ 151,215	3.5%	-17.9%	1	0	0	7258	3	\$ 2,419,088	18.2%	-8.2%	1	0	0
1181	7	\$ 1,470,800	3.5%		0	0	1	7816	2	\$ 913,269	18.2%	-38.1%	1	0	0
121	4	\$ 314,955	3.5%	-8.3%	1	0	0	606	4	\$ 397,460	18.2%	-3.3%	1	0	0
217	4	\$ 743,517	3.5%	2.8%	0	0	1	456	3	\$ 696,075	18.3%	-22.9%	1	0	0
7565	3	\$ 1,602,440	3.5%	-17.7%	1	0	0	954	3	\$ 480,868	18.3%	5.9%	1	0	0
7743	6	\$ 6,547,278	3.5%	-9.8%	1	0	0	8019	3	\$ 826,480	18.3%	-13.7%	1	0	0
1217	5	\$ 16,661,661	3.5%		0	0	1	8069	3	\$ 645,811	18.3%	-15.4%	1	0	0
975	3	\$ 3,271,000	3.5%	14.8%	1	0	0	364	3	\$ 354,309	18.3%	12.2%	0	1	0
8575	4	\$ 1,254,587	3.5%	8.1%	1	0	0	8027	6	\$ 150,000	18.4%	-36.9%	1	0	0
163	4	\$ 476,237	3.5%	-9.2%	1	0	0	8346	4	\$ 299,193	18.4%	-13.8%	1	0	0
1346	3	\$ 1,049,812	3.5%		0	0	1	382	2	\$ 385,155	18.4%	-17.2%	1	0	0
1345	3	\$ 1,049,812	3.5%		0	0	1	7718	2	\$ 3,546,628	18.4%	-31.5%	1	0	0
8462	4	\$ 2,240,474	3.5%	-2.1%	0	0	1	8111	5	\$ 185,194	18.4%	-43.6%	1	0	0
294	2	\$ 1,159,067	3.5%	4.8%	0	0	1	1027	4	\$ 990,366	18.4%	-1.0%	1	0	0
251	3	\$ 934,782	3.5%	-0.7%	0	0	1	7704	3	\$ 107,777	18.4%	-29.5%	1	0	0
8512	3	\$ 204,931	3.6%	16.9%	1	0	0	7405	5	\$ 1,870,887	18.5%	-22.0%	1	0	0
7725	3	\$ 613,330	3.6%	-14.1%	1	0	0	830	4	\$ 184,105	18.5%	-20.3%	1	0	0
7872	7	\$ 7,874,534	3.6%	-29.5%	1	0	0	1239	4	\$ 2,006,250	18.5%		1	0	0
8053	10	\$ 10,693,961	3.6%	-20.2%	1	0	0	8377	4	\$ 204,776	18.5%	-10.3%	1	0	0
763	7	\$ 512,175	3.6%	-18.6%	1	0	0	965	2	\$ 540,000	18.6%	7.1%	1	0	0
201	9	\$ 658,106	3.6%	-12.7%	1	0	0	1064	2	\$ 1,650,744	18.7%	-8.4%	1	0	0
927	6	\$ 1,971,150	3.6%	11.2%	1	0	0	552	2	\$ 10,284,408	18.7%	-15.7%	1	0	0
216	2	\$ 713,955	3.6%	9.5%	1	0	0	8263	4	\$ 1,008,539	18.7%	-13.8%	1	0	0
129	5	\$ 343,238	3.6%	21.1%	1	0	0	805	4	\$ 147,380	18.7%	-4.3%	1	0	0
947	5	\$ 2,305,953	3.6%	-5.5%	1	0	0	457	3	\$ 680,966	18.7%	17.7%	0	1	0
7849	6	\$ 7,591,034	3.6%	-5.0%	1	0	0	397	2	\$ 434,275	18.7%	-9.6%	1	0	0
7881	3	\$ 557,777	3.6%	-31.6%	1	0	0	8455	3	\$ 2,779,290	18.7%	-7.6%	1	0	0
1180	7	\$ 1,069,639	3.7%		0	0	1	8258	5	\$ 459,482	18.7%	-9.9%	1	0	0
8397	12	\$ 351,486	3.7%	-32.5%	1	0	0	7887	7	\$ 47,751	18.8%	-17.1%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
247	2	\$ 877,039	3.7%	-6.2%	1	0	0	915	2	\$ 343,145	18.8%	30.5%	0	1	0
473	4	\$ 4,054,082	3.7%	17.0%	1	0	0	817	10	\$ 159,861	18.8%	3.8%	1	0	0
858	2	\$ 1,148,403	3.7%	3.2%	0	0	1	7932	4	\$ 117,154	18.9%	-40.1%	1	0	0
7315	3	\$ 1,373,000	3.7%	-21.3%	1	0	0	7789	3	\$ 586,473	19.0%	4.3%	1	0	0
7998	15	\$ 15,517,832	3.7%	-30.6%	1	0	0	807	5	\$ 147,998	19.0%	-12.9%	1	0	0
1179	7	\$ 4,377,771	3.7%		0	0	1	816	5	\$ 157,374	19.1%	43.1%	0	1	0
7455	5	\$ 2,774,794	3.7%	-29.8%	1	0	0	1068	2	\$ 1,704,350	19.2%	2.4%	1	0	0
123	5	\$ 309,335	3.7%	-5.0%	0	0	1	811	4	\$ 151,361	19.2%	-5.4%	1	0	0
7297	3	\$ 191,858	3.7%	15.7%	1	0	0	7840	3	\$ 163,704	19.2%	-37.9%	1	0	0
7273	4	\$ 31,466,232	3.7%	10.0%	1	0	0	1238	4	\$ 4,101,178	19.2%		1	0	0
1166	9	\$ 742,029	3.7%		0	0	1	1019	4	\$ 896,200	19.3%	28.2%	0	1	0
7338	3	\$ 3,909,943	3.7%	-11.1%	1	0	0	824	4	\$ 161,914	19.4%	-1.3%	1	0	0
7439	5	\$ 1,733,624	3.7%	-3.6%	0	0	1	1185	6	\$ 674,000	19.4%		1	0	0
7240	4	\$ 1,111,714	3.7%	7.0%	1	0	0	1184	6	\$ 674,000	19.4%		1	0	0
7492	12	\$ 3,449,705	3.8%	-30.9%	1	0	0	1015	3	\$ 848,812	19.6%	-16.8%	1	0	0
1178	7	\$ 4,118,690	3.8%		0	0	1	498	4	\$ 1,019,488	19.6%	11.9%	0	1	0
8202	9	\$ 843,262	3.8%	-8.8%	1	0	0	1372	2	\$ 1,995,690	19.6%		1	0	0
307	5	\$ 1,201,780	3.8%	8.2%	1	0	0	8457	4	\$ 1,813,430	19.7%	-6.5%	1	0	0
7907	4	\$ 1,122,335	3.8%	-16.7%	1	0	0	916	4	\$ 327,850	19.7%	-35.2%	1	0	0
271	3	\$ 955,906	3.8%	18.6%	1	0	0	1199	5	\$ 3,945,378	19.8%		1	0	0
7911	12	\$ 2,707,707	3.8%	-33.5%	1	0	0	941	7	\$ 399,534	19.8%	-11.4%	1	0	0
474	3	\$ 3,948,855	3.8%	-9.4%	1	0	0	764	4	\$ 93,350	19.8%	-5.7%	1	0	0
8267	8	\$ 545,208	3.8%	-22.0%	1	0	0	950	3	\$ 439,350	19.8%	-27.7%	1	0	0
8671	6	\$ 1,396,691	3.8%	-10.6%	1	0	0	8660	3	\$ 661,654	19.9%	-30.5%	1	0	0
1177	7	\$ 1,454,116	3.8%		0	0	1	1371	2	\$ 619,133	19.9%		1	0	0
242	3	\$ 811,127	3.8%	-4.3%	0	0	1	909	2	\$ 316,916	19.9%	-11.0%	1	0	0
7915	3	\$ 6,683,574	3.8%	2.9%	0	0	1	1029	5	\$ 952,718	19.9%	-2.4%	1	0	0
327	3	\$ 1,355,630	3.8%	-15.6%	1	0	0	7766	2	\$ 34,450,000	19.9%	-9.2%	1	0	0
108	5	\$ 247,453	3.8%	11.7%	1	0	0	8579	4	\$ 639,867	20.0%	-17.3%	1	0	0
8472	8	\$ 2,630,699	3.8%	-9.0%	1	0	0	8647	2	\$ 250,000	20.0%	42.0%	0	1	0
8544	7	\$ 2,322,690	3.8%	0.7%	0	0	1	1102	4	\$ 4,411,194	20.1%	28.9%	0	1	0
184	6	\$ 509,637	3.8%	4.5%	0	0	1	910	3	\$ 312,097	20.2%	51.5%	0	1	0
8674	4	\$ 813,880	3.8%	-5.6%	1	0	0	517	2	\$ 1,306,864	20.3%	-2.3%	1	0	0
1344	3	\$ 3,074,750	3.8%		0	0	1	8570	2	\$ 188,226	20.3%	0.1%	1	0	0
1269	4	\$ 3,074,750	3.8%		0	0	1	393	2	\$ 380,275	20.3%	-9.0%	1	0	0
461	4	\$ 3,475,938	3.9%	43.0%	1	0	0	8155	3	\$ 896,851	20.3%	16.2%	0	1	0
419	6	\$ 2,542,756	3.9%	9.8%	1	0	0	505	7	\$ 1,052,859	20.4%	-22.3%	1	0	0
104	4	\$ 233,952	3.9%	4.4%	0	0	1	1370	2	\$ 1,924,703	20.4%		1	0	0
1216	5	\$ 2,945,200	3.9%		0	0	1	7623	4	\$ 9,874,897	20.4%	-37.0%	1	0	0
8463	3	\$ 2,037,908	3.9%	2.2%	0	0	1	7231	10	\$ 1,195,146	20.5%	-14.7%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
1268	4	\$ 885,890	3.9%		0	0	1	864	2	\$ 222,098	20.5%	-23.1%	1	0	0
8164	3	\$ 1,051,664	3.9%	-23.9%	1	0	0	475	2	\$ 740,516	20.5%	-20.3%	1	0	0
715	4	\$ 179,957	3.9%	16.1%	1	0	0	1083	2	\$ 2,244,724	20.5%	-8.7%	1	0	0
1042	3	\$ 6,156,940	3.9%	-0.8%	0	0	1	871	2	\$ 227,089	20.6%	13.5%	0	1	0
138	4	\$ 339,163	3.9%	60.4%	1	0	0	333	2	\$ 255,708	20.6%	-6.5%	1	0	0
369	4	\$ 1,688,118	3.9%	6.0%	1	0	0	8456	3	\$ 267,920	20.7%	-29.3%	1	0	0
87	6	\$ 195,675	3.9%	-15.7%	1	0	0	510	5	\$ 1,142,099	20.7%	9.0%	1	0	0
8384	7	\$ 354,904	3.9%	-6.1%	1	0	0	902	4	\$ 289,736	20.8%	13.2%	0	1	0
851	4	\$ 1,027,617	3.9%	1.9%	0	0	1	907	4	\$ 301,922	20.8%	-20.5%	1	0	0
223	5	\$ 695,747	3.9%	9.6%	1	0	0	7950	2	\$ 990,546	21.0%	-22.9%	1	0	0
8361	3	\$ 158,851	3.9%	3.6%	0	0	1	7559	2	\$ 164,998	21.0%	6.2%	1	0	0
1395	2	\$ 105,738	4.0%		0	0	1	1038	4	\$ 1,097,502	21.0%	-4.0%	1	0	0
928	7	\$ 1,777,000	4.0%	-30.9%	1	0	0	1110	2	\$ 5,938,220	21.0%	-7.7%	1	0	0
990	4	\$ 3,230,127	4.0%	-32.8%	1	0	0	627	2	\$ 687,346	21.0%	7.7%	1	0	0
366	5	\$ 1,642,077	4.0%	3.5%	0	0	1	174	5	\$ 85,959	21.0%	8.4%	1	0	0
1040	2	\$ 5,977,525	4.0%	7.5%	1	0	0	8645	4	\$ 472,500	21.3%	-4.5%	1	0	0
8150	3	\$ 4,250,250	4.0%	-17.6%	1	0	0	8642	3	\$ 164,346	21.3%	-1.9%	1	0	0
1343	3	\$ 931,434	4.0%		1	0	0	471	2	\$ 680,219	21.4%	6.8%	1	0	0
1342	3	\$ 931,434	4.0%		1	0	0	8276	4	\$ 1,335,692	21.4%	-12.2%	1	0	0
313	5	\$ 1,175,138	4.0%	0.0%	1	0	0	8264	5	\$ 225,999	21.5%	-19.2%	1	0	0
8485	2	\$ 625,384	4.0%	-3.0%	1	0	0	7642	4	\$ 470,666	21.5%	-17.2%	1	0	0
8576	5	\$ 697,344	4.0%	-11.5%	1	0	0	1302	3	\$ 655,640	21.6%		1	0	0
8320	8	\$ 1,165,284	4.0%	-26.3%	1	0	0	7566	2	\$ 1,300,498	21.6%	-15.8%	1	0	0
900	3	\$ 1,476,000	4.1%	-15.8%	1	0	0	8125	3	\$ 79,328	21.6%	6.3%	1	0	0
7638	3	\$ 583,978	4.1%	10.9%	1	0	0	7277	5	\$ 953,119	21.7%	-7.3%	1	0	0
459	3	\$ 3,261,176	4.1%	26.4%	1	0	0	7463	3	\$ 604,009	21.9%	-23.6%	1	0	0
7556	8	\$ 613,731	4.1%	-11.6%	1	0	0	7593	6	\$ 214,961	21.9%	-9.3%	1	0	0
626	3	\$ 3,486,783	4.1%	10.1%	1	0	0	553	2	\$ 8,897,502	21.9%	6.4%	1	0	0
7897	4	\$ 2,014,005	4.1%	-26.3%	1	0	0	1237	4	\$ 1,286,056	22.0%		1	0	0
7669	5	\$ 4,929,000	4.1%	-20.0%	1	0	0	7288	2	\$ 1,552,377	22.0%	-6.3%	1	0	0
717	2	\$ 189,875	4.1%	111.0%	1	0	0	793	7	\$ 110,626	22.0%	104.9%	0	1	0
7885	5	\$ 4,798,497	4.1%	-19.3%	1	0	0	430	3	\$ 472,284	22.1%	-18.1%	1	0	0
7710	5	\$ 236,970	4.1%	-17.5%	1	0	0	919	4	\$ 292,993	22.2%	-12.8%	1	0	0
873	8	\$ 1,137,486	4.1%	1.7%	1	0	0	7539	2	\$ 1,239,239	22.3%	-21.4%	1	0	0
8614	3	\$ 5,140,335	4.2%	6.8%	1	0	0	467	2	\$ 620,457	22.4%	52.5%	0	1	0
1267	4	\$ 2,618,000	4.2%		1	0	0	1236	4	\$ 907,974	22.5%		1	0	0
7735	3	\$ 185,169	4.2%	0.0%	1	0	0	445	3	\$ 509,903	22.5%	-17.2%	1	0	0
308	6	\$ 1,097,595	4.2%	18.8%	1	0	0	665	4	\$ 15,869,269	22.5%	0.6%	1	0	0
7424	6	\$ 1,362,148	4.2%	-28.5%	1	0	0	296	5	\$ 184,628	22.5%	-6.4%	1	0	0
608	10	\$ 1,772,452	4.2%	-27.4%	1	0	0	7937	2	\$ 330,454	22.6%	-20.8%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7933	3	\$ 2,098,098	4.2%	-5.6%	1	0	0	8064	10	\$ 631,207	22.6%	-28.0%	1	0	0
7535	3	\$ 299,801	4.2%	-8.5%	1	0	0	611	2	\$ 377,956	22.8%	-8.3%	1	0	0
440	2	\$ 2,700,701	4.2%	3.7%	1	0	0	979	5	\$ 529,143	22.9%	-29.8%	1	0	0
780	3	\$ 513,497	4.2%	-47.9%	1	0	0	1056	3	\$ 1,178,759	22.9%	-27.1%	1	0	0
534	6	\$ 12,194,670	4.2%	12.8%	1	0	0	202	2	\$ 103,805	22.9%	7.5%	1	0	0
7398	3	\$ 518,939	4.2%	-37.1%	1	0	0	422	7	\$ 434,618	22.9%	3.0%	1	0	0
8550	4	\$ 1,940,274	4.2%	-7.0%	1	0	0	1198	5	\$ 2,457,000	23.0%		1	0	0
8606	2	\$ 1,628,157	4.2%	29.3%	1	0	0	293	5	\$ 177,660	23.0%	-33.6%	1	0	0
942	4	\$ 1,889,913	4.3%	9.6%	1	0	0	7540	5	\$ 432,404	23.0%	-31.7%	1	0	0
1341	3	\$ 1,297,617	4.3%		1	0	0	7299	3	\$ 2,238,230	23.1%	-6.3%	1	0	0
599	2	\$ 1,020,275	4.3%	-35.8%	1	0	0	749	2	\$ 66,295	23.1%	54.2%	0	1	0
8222	13	\$ 4,995,958	4.3%	-11.4%	1	0	0	860	5	\$ 189,578	23.2%	-26.8%	1	0	0
360	3	\$ 1,491,143	4.3%	-4.3%	1	0	0	455	5	\$ 528,965	23.2%	-19.2%	1	0	0
8280	3	\$ 2,233,510	4.3%	33.4%	1	0	0	1369	2	\$ 579,163	23.2%		1	0	0
354	4	\$ 1,455,734	4.3%	1.1%	1	0	0	7260	3	\$ 175,769	23.3%	9.9%	1	0	0
221	4	\$ 617,197	4.3%	-8.2%	1	0	0	401	2	\$ 355,363	23.4%	-5.2%	1	0	0
7477	4	\$ 1,880,690	4.3%	-9.0%	1	0	0	7955	8	\$ 821,644	23.4%	-47.3%	1	0	0
8097	3	\$ 306,604	4.3%	-20.9%	1	0	0	976	4	\$ 489,077	23.4%	12.7%	0	1	0
213	2	\$ 586,512	4.3%	18.6%	1	0	0	7674	2	\$ 1,633,364	23.5%	-24.5%	1	0	0
569	14	\$ 156,381	4.3%	-35.7%	1	0	0	464	3	\$ 580,414	23.6%	12.1%	0	1	0
154	3	\$ 354,536	4.3%	-12.5%	1	0	0	838	4	\$ 153,735	23.7%	-18.2%	1	0	0
1266	4	\$ 17,823,145	4.3%		1	0	0	1235	4	\$ 237,334	23.7%		1	0	0
7691	2	\$ 2,422,680	4.3%	-5.2%	1	0	0	1234	4	\$ 237,334	23.7%		1	0	0
814	6	\$ 686,372	4.3%	-54.1%	1	0	0	654	3	\$ 2,175,475	23.8%	0.1%	1	0	0
7788	5	\$ 114,593	4.4%	-44.9%	1	0	0	7606	4	\$ 235,647	24.0%	17.6%	0	1	0
8680	5	\$ 170,403	4.4%	-12.8%	1	0	0	7306	2	\$ 489,262	24.1%	51.1%	0	1	0
8390	4	\$ 286,733	4.4%	-28.6%	1	0	0	8478	10	\$ 908,067	24.1%	-52.9%	1	0	0
1193	6	\$ 20,554,583	4.4%		1	0	0	7805	5	\$ 1,425,687	24.1%	-20.4%	1	0	0
8139	9	\$ 8,485,707	4.4%	-4.0%	1	0	0	465	2	\$ 570,993	24.2%	-20.1%	1	0	0
765	2	\$ 427,193	4.4%	10.4%	1	0	0	1115	3	\$ 7,214,500	24.2%	2.2%	1	0	0
1265	4	\$ 2,303,335	4.4%		1	0	0	642	3	\$ 1,117,540	24.4%	13.3%	0	1	0
578	4	\$ 408,273	4.4%	-2.2%	1	0	0	481	3	\$ 661,982	24.4%	111.7%	0	1	0
8483	2	\$ 2,427,630	4.4%	18.0%	1	0	0	374	2	\$ 276,771	24.4%	-19.6%	1	0	0
290	5	\$ 908,213	4.4%	13.2%	1	0	0	414	4	\$ 388,448	24.5%	-25.3%	1	0	0
233	4	\$ 652,705	4.4%	12.1%	1	0	0	469	2	\$ 576,755	24.6%	-12.8%	1	0	0
342	3	\$ 1,264,553	4.4%	3.5%	1	0	0	8217	6	\$ 232,819	24.6%	-2.6%	1	0	0
7337	3	\$ 858,429	4.4%	4.6%	1	0	0	1233	4	\$ 2,296,473	24.8%		1	0	0
945	2	\$ 1,844,165	4.4%	12.9%	1	0	0	1112	4	\$ 5,105,089	24.8%	-2.1%	1	0	0
302	2	\$ 972,141	4.5%	-30.1%	1	0	0	8271	2	\$ 1,038,293	24.9%	-2.9%	1	0	0
7460	3	\$ 3,199,938	4.5%	-11.7%	1	0	0	264	5	\$ 143,759	24.9%	-22.9%	1	0	0



BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7731	3	\$ 325,197	4.5%	1.2%	1	0	0	8581	3	\$ 1,327,620	24.9%	-19.0%	1	0	0
8033	15	\$ 11,478,643	4.5%	-26.5%	1	0	0	7390	3	\$ 731,186	24.9%	-16.6%	1	0	0
231	5	\$ 644,627	4.5%	-2.9%	1	0	0	1008	3	\$ 616,950	25.0%	-4.1%	1	0	0
8350	3	\$ 180,714	4.5%	20.7%	1	0	0	8488	3	\$ 188,451	25.1%	-11.1%	1	0	0
585	6	\$ 587,070	4.5%	-9.6%	1	0	0	7655	9	\$ 133,542	25.2%	-41.2%	1	0	0
8205	2	\$ 142,529	4.5%	25.8%	1	0	0	8071	2	\$ 453,604	25.3%	-27.7%	1	0	0
664	6	\$ 72,777,532	4.5%	6.1%	1	0	0	1165	9	\$ 9,882,440	25.3%		1	0	0
1264	4	\$ 13,936,692	4.5%		1	0	0	8434	4	\$ 40,834	25.4%	-7.4%	1	0	0
759	6	\$ 375,635	4.5%	7.0%	1	0	0	868	4	\$ 182,860	25.4%	-12.5%	1	0	0
7605	3	\$ 47,195	4.5%	-33.4%	1	0	0	8044	10	\$ 55,498	25.4%	-45.2%	1	0	0
8310	6	\$ 9,787,326	4.5%	-3.9%	1	0	0	1368	2	\$ 2,797,864	25.4%		1	0	0
922	3	\$ 1,479,932	4.5%	1.9%	1	0	0	1367	2	\$ 2,797,864	25.4%		1	0	0
381	6	\$ 1,550,973	4.5%	9.7%	1	0	0	7367	2	\$ 4,734,004	25.5%	13.8%	0	1	0
7508	5	\$ 2,569,811	4.5%	-14.5%	1	0	0	8667	3	\$ 295,139	25.5%	20.7%	0	1	0
243	4	\$ 688,172	4.6%	39.4%	1	0	0	7614	7	\$ 10,829,674	25.5%	-21.1%	1	0	0
7968	4	\$ 495,880	4.6%	-37.0%	1	0	0	650	3	\$ 1,589,615	25.7%	-11.8%	1	0	0
986	2	\$ 2,747,074	4.6%	4.3%	1	0	0	7578	3	\$ 779,268	25.8%	13.0%	0	1	0
8248	6	\$ 34,786	4.6%	-32.5%	1	0	0	8580	4	\$ 431,860	25.9%	-13.6%	1	0	0
394	2	\$ 1,714,775	4.6%	-71.3%	1	0	0	521	2	\$ 1,209,864	25.9%	-8.4%	1	0	0
8115	4	\$ 81,944	4.6%	25.0%	1	0	0	1121	3	\$ 20,937,000	26.0%	12.9%	0	1	0
7903	8	\$ 19,730,515	4.6%	-29.6%	1	0	0	1366	2	\$ 2,297,652	26.0%		1	0	0
193	8	\$ 467,122	4.6%	-6.9%	1	0	0	439	4	\$ 429,217	26.1%	-4.0%	1	0	0
263	5	\$ 770,040	4.6%	-8.6%	1	0	0	1301	3	\$ 364,248	26.1%		1	0	0
7262	3	\$ 4,543,589	4.6%	15.3%	1	0	0	509	2	\$ 893,040	26.1%	0.6%	1	0	0
7733	2	\$ 2,983,566	4.6%	-9.5%	1	0	0	375	6	\$ 260,466	26.2%	-21.2%	1	0	0
577	6	\$ 371,233	4.6%	-19.5%	1	0	0	311	2	\$ 177,463	26.2%	12.8%	0	1	0
7328	7	\$ 1,317,664	4.6%	-10.0%	1	0	0	7719	2	\$ 139,859	26.4%	-18.0%	1	0	0
8479	2	\$ 95,749	4.7%	22.1%	1	0	0	8448	3	\$ 195,017	26.5%	-25.1%	1	0	0
7609	4	\$ 1,301,378	4.7%	-8.6%	1	0	0	719	3	\$ 32,072	26.6%	-1.3%	1	0	0
77	2	\$ 139,493	4.7%	-2.2%	1	0	0	839	4	\$ 136,932	26.7%	-10.5%	1	0	0
7844	4	\$ 2,482,582	4.7%	-15.5%	1	0	0	878	2	\$ 188,200	26.8%	1.7%	1	0	0
1340	3	\$ 392,145	4.7%		1	0	0	1017	3	\$ 617,481	27.1%	-9.3%	1	0	0
8078	3	\$ 811,204	4.7%	-8.5%	1	0	0	200	5	\$ 85,797	27.1%	-44.3%	1	0	0
195	2	\$ 467,928	4.7%	-4.5%	1	0	0	913	2	\$ 235,610	27.1%	1.1%	1	0	0
837	4	\$ 769,970	4.7%	10.8%	1	0	0	1118	4	\$ 9,188,811	27.1%	-10.8%	1	0	0
1192	6	\$ 5,869,947	4.7%		1	0	0	619	8	\$ 429,113	27.1%	-11.5%	1	0	0
1191	6	\$ 5,869,947	4.7%		1	0	0	721	4	\$ 34,600	27.2%	-42.3%	1	0	0
8138	5	\$ 424,910	4.7%	-21.1%	1	0	0	912	3	\$ 234,382	27.2%	-29.2%	1	0	0
368	8	\$ 1,399,746	4.7%	5.6%	1	0	0	1365	2	\$ 3,659,169	27.3%		1	0	0
72	5	\$ 121,030	4.7%	-4.0%	1	0	0	482	2	\$ 592,421	27.3%	-20.2%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
1190	6	\$ 634,526	4.7%		1	0	0	7311	2	\$ 4,538,000	27.6%	28.3%	0	1	0
7814	4	\$ 185,680	4.7%	-29.0%	1	0	0	1079	2	\$ 1,600,987	27.7%	-6.0%	1	0	0
1263	4	\$ 7,093,270	4.7%		1	0	0	1364	2	\$ 3,127,229	27.8%		1	0	0
1262	4	\$ 1,236,765	4.7%		1	0	0	479	3	\$ 559,274	27.9%	-16.1%	1	0	0
7811	4	\$ 766,504	4.7%	-8.1%	1	0	0	7960	4	\$ 342,584	27.9%	-25.7%	1	0	0
7468	2	\$ 1,254,093	4.8%	-20.4%	1	0	0	1363	2	\$ 3,406,916	28.4%		1	0	0
742	7	\$ 291,783	4.8%	-4.3%	1	0	0	8214	4	\$ 46,093	28.5%	-24.0%	1	0	0
1261	4	\$ 2,478,012	4.8%		1	0	0	545	2	\$ 3,404,324	28.6%	-7.0%	1	0	0
1260	4	\$ 2,478,012	4.8%		1	0	0	7809	4	\$ 2,948,206	28.7%	0.4%	1	0	0
531	2	\$ 9,131,787	4.8%	-17.3%	1	0	0	8303	6	\$ 1,711,104	28.8%	-41.0%	1	0	0
735	4	\$ 249,797	4.8%	-4.3%	1	0	0	1006	2	\$ 528,719	28.9%	15.2%	0	1	0
181	5	\$ 398,193	4.8%	6.1%	1	0	0	1106	2	\$ 3,694,460	28.9%	-35.5%	1	0	0
8538	6	\$ 4,815,096	4.8%	-24.8%	1	0	0	8515	3	\$ 335,251	28.9%	12.7%	0	1	0
262	8	\$ 736,134	4.8%	15.5%	1	0	0	1120	7	\$ 13,392,143	29.0%	-28.0%	1	0	0
1339	3	\$ 10,624,081	4.8%		1	0	0	8517	2	\$ 102,985	29.1%	15.9%	0	1	0
7945	10	\$ 18,727,000	4.8%	-40.3%	1	0	0	855	3	\$ 142,800	29.3%	-27.1%	1	0	0
7774	2	\$ 2,853,000	4.9%	-14.7%	1	0	0	895	2	\$ 199,994	29.4%	29.0%	0	1	0
8338	6	\$ 395,404	4.9%	-19.2%	1	0	0	7975	4	\$ 285,499	29.6%	-17.6%	1	0	0
939	2	\$ 1,584,424	4.9%	-8.8%	1	0	0	1025	5	\$ 608,877	29.6%	-21.3%	1	0	0
355	4	\$ 1,287,998	4.9%	40.0%	1	0	0	7658	3	\$ 95,609	29.7%	-23.1%	1	0	0
299	4	\$ 874,645	4.9%	-9.0%	1	0	0	796	2	\$ 83,249	29.7%	-44.9%	1	0	0
8424	5	\$ 979,500	4.9%	-11.4%	1	0	0	795	3	\$ 82,855	29.9%	-31.0%	1	0	0
363	3	\$ 1,317,596	4.9%	23.6%	1	0	0	8323	2	\$ 300,223	30.0%	4.4%	1	0	0
544	2	\$ 18,203,998	4.9%	4.4%	1	0	0	648	2	\$ 1,117,117	30.1%	-18.0%	1	0	0
8244	13	\$ 8,830,732	4.9%	0.5%	1	0	0	647	2	\$ 1,117,117	30.1%	-18.0%	1	0	0
226	4	\$ 565,813	5.0%	2.4%	1	0	0	7919	4	\$ 155,778	30.1%	-44.8%	1	0	0
8388	3	\$ 179,962	5.0%	-7.8%	1	0	0	1048	4	\$ 829,069	30.2%	10.0%	1	0	0
940	6	\$ 1,576,714	5.0%	-2.1%	1	0	0	8585	4	\$ 954,447	30.2%	-28.4%	1	0	0
8440	3	\$ 751,804	5.0%	-13.3%	1	0	0	7865	4	\$ 852,344	30.3%	-17.0%	1	0	0
7456	2	\$ 398,698	5.0%	17.2%	1	0	0	527	2	\$ 1,255,916	30.5%	17.9%	0	1	0
1215	5	\$ 1,605,000	5.0%		1	0	0	8508	5	\$ 2,160,424	30.6%	-24.6%	1	0	0
8220	11	\$ 580,582	5.0%	-23.8%	1	0	0	1043	4	\$ 787,198	30.7%	6.1%	1	0	0
305	7	\$ 883,473	5.0%	-7.2%	1	0	0	7301	2	\$ 596,164	30.8%	-8.7%	1	0	0
612	4	\$ 1,778,387	5.0%	-14.9%	1	0	0	1078	2	\$ 1,370,406	30.9%	-9.7%	1	0	0
8634	4	\$ 1,964,964	5.0%	-6.8%	1	0	0	7327	2	\$ 567,010	31.0%	-1.5%	1	0	0
747	3	\$ 290,998	5.0%	3.2%	1	0	0	1069	2	\$ 1,067,185	31.0%	2.3%	1	0	0
215	10	\$ 509,436	5.1%	-16.1%	1	0	0	7354	2	\$ 669,000	31.3%	-6.1%	1	0	0
8108	4	\$ 1,731,000	5.1%	-17.0%	1	0	0	7953	2	\$ 2,279,712	31.3%	-25.8%	1	0	0
153	3	\$ 300,227	5.1%	-13.4%	1	0	0	8034	4	\$ 334,754	31.3%	-37.1%	1	0	0
8603	4	\$ 76,924	5.1%	23.8%	1	0	0	7471	2	\$ 3,468,239	31.4%	4.6%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
8441	2	\$ 1,066,000	5.1%	-20.2%	1	0	0	7783	3	\$ 1,301,463	31.4%	-27.5%	1	0	0
1338	3	\$ 2,685,440	5.1%		1	0	0	1026	2	\$ 575,000	31.5%	28.1%	0	1	0
762	4	\$ 351,413	5.1%	9.8%	1	0	0	526	2	\$ 1,187,201	31.6%	-7.5%	1	0	0
8232	3	\$ 3,110,681	5.1%	3.8%	1	0	0	1232	4	\$ 28,574,596	31.6%		1	0	0
349	2	\$ 1,182,991	5.1%	-12.3%	1	0	0	8004	4	\$ 470,795	31.7%	-21.9%	1	0	0
1071	2	\$ 6,782,522	5.2%	2.0%	1	0	0	856	3	\$ 130,400	32.1%	-62.7%	1	0	0
370	4	\$ 1,278,634	5.2%	-3.1%	1	0	0	7892	4	\$ 630,418	32.1%	-26.7%	1	0	0
8119	2	\$ 2,144,144	5.2%	-5.6%	1	0	0	8656	3	\$ 168,717	32.1%	-19.7%	1	0	0
1337	3	\$ 4,167,952	5.2%		1	0	0	7407	2	\$ 111,434	32.4%	-7.5%	1	0	0
1336	3	\$ 4,167,952	5.2%		1	0	0	8023	2	\$ 145,284	32.4%	-7.2%	1	0	0
8605	2	\$ 4,045,000	5.2%	10.9%	1	0	0	8412	3	\$ 257,365	32.4%	-9.0%	1	0	0
7474	8	\$ 33,732,740	5.2%	-22.4%	1	0	0	7360	2	\$ 286,719	32.4%	1.1%	1	0	0
254	14	\$ 641,805	5.3%	-6.1%	1	0	0	7429	2	\$ 429,388	32.4%	-17.5%	1	0	0
260	3	\$ 661,400	5.3%	1.5%	1	0	0	7987	4	\$ 452,646	32.5%	-29.1%	1	0	0
358	3	\$ 1,205,507	5.3%	-23.7%	1	0	0	659	2	\$ 3,700,980	32.5%	2.0%	1	0	0
280	2	\$ 712,097	5.3%	12.7%	1	0	0	905	2	\$ 191,226	32.6%	10.5%	0	1	0
8236	5	\$ 330,540	5.3%	-21.3%	1	0	0	7497	2	\$ 965,779	32.7%	-2.0%	1	0	0
1214	5	\$ 1,270,319	5.3%		1	0	0	1013	2	\$ 497,000	32.8%	-9.0%	1	0	0
8325	5	\$ 478,359	5.3%	-14.2%	1	0	0	334	2	\$ 161,664	32.8%	8.1%	1	0	0
1394	2	\$ 957,461	5.3%		1	0	0	480	2	\$ 489,688	32.9%	-17.2%	1	0	0
1393	2	\$ 957,461	5.3%		1	0	0	1300	3	\$ 20,311,893	32.9%		1	0	0
8433	3	\$ 2,214,307	5.3%	-5.9%	1	0	0	1299	3	\$ 20,311,893	32.9%		1	0	0
566	2	\$ 87,571	5.3%	-3.6%	1	0	0	1362	2	\$ 4,131,000	33.1%		1	0	0
1392	2	\$ 2,239,803	5.3%		1	0	0	935	2	\$ 224,900	33.3%	14.3%	0	1	0
1391	2	\$ 2,239,803	5.3%		1	0	0	8619	2	\$ 445,760	33.3%	14.3%	0	1	0
7890	5	\$ 333,079	5.4%	-35.7%	1	0	0	7747	2	\$ 369,369	33.6%	1.2%	1	0	0
8228	4	\$ 99,880	5.4%	77.1%	1	0	0	1098	2	\$ 2,111,650	33.8%	-19.6%	1	0	0
745	2	\$ 267,930	5.4%	97.0%	1	0	0	1298	3	\$ 5,433,176	33.8%		1	0	0
229	2	\$ 531,386	5.4%	12.7%	1	0	0	1041	3	\$ 705,619	33.9%	-16.9%	1	0	0
1390	2	\$ 11,858,426	5.4%		1	0	0	7708	2	\$ 1,888,133	34.0%	-1.3%	1	0	0
8380	5	\$ 434,604	5.4%	14.1%	1	0	0	1117	8	\$ 6,932,917	34.1%	20.3%	0	1	0
281	6	\$ 694,961	5.4%	-6.8%	1	0	0	1113	2	\$ 4,214,850	34.2%	-22.6%	1	0	0
8120	3	\$ 297,317	5.4%	-14.3%	1	0	0	7420	3	\$ 111,499	34.5%	-47.3%	1	0	0
8048	4	\$ 597,597	5.5%	-4.3%	1	0	0	1183	6	\$ 7,499,878	34.6%		1	0	0
8135	4	\$ 3,132,964	5.5%	-20.5%	1	0	0	1051	5	\$ 739,965	34.7%	-23.7%	1	0	0
7900	2	\$ 2,821,499	5.5%	0.8%	1	0	0	8283	2	\$ 276,777	34.7%	-1.7%	1	0	0
319	7	\$ 896,173	5.5%	-11.6%	1	0	0	8156	4	\$ 246,644	34.7%	-22.4%	1	0	0
583	3	\$ 440,999	5.5%	-0.4%	1	0	0	1095	3	\$ 1,990,000	34.9%	-32.3%	1	0	0
78	2	\$ 122,934	5.5%	3.2%	1	0	0	7433	2	\$ 393,528	34.9%	45.9%	0	1	0
7453	6	\$ 358,825	5.5%	-13.8%	1	0	0	1361	2	\$ 491,498	35.1%		1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
7454	7	\$ 621,896	5.6%	-8.0%	1	0	0	1297	3	\$ 675,693	35.2%		1	0	0
1176	7	\$ 464,000	5.6%		1	0	0	1296	3	\$ 675,693	35.2%		1	0	0
581	8	\$ 354,114	5.6%	-12.4%	1	0	0	7964	3	\$ 1,993,750	35.3%	-15.3%	1	0	0
8100	4	\$ 665,994	5.6%	-10.8%	1	0	0	8417	3	\$ 169,178	35.4%	-3.4%	1	0	0
602	2	\$ 1,021,582	5.6%	-0.6%	1	0	0	1101	3	\$ 2,387,000	35.4%	3.1%	1	0	0
8089	14	\$ 672,412	5.6%	-35.0%	1	0	0	7833	5	\$ 369,013	35.4%	-45.8%	1	0	0
7493	2	\$ 695,653	5.6%	-5.0%	1	0	0	598	5	\$ 100,392	35.4%	14.7%	0	1	0
429	2	\$ 1,838,662	5.6%	18.8%	1	0	0	1002	3	\$ 413,260	35.7%	-34.6%	1	0	0
573	2	\$ 243,603	5.6%	61.5%	1	0	0	850	3	\$ 112,395	35.7%	-5.6%	1	0	0
625	7	\$ 2,517,477	5.6%	-5.9%	1	0	0	7739	3	\$ 77,261	35.7%	-50.1%	1	0	0
8275	4	\$ 5,510,055	5.6%	6.2%	1	0	0	929	5	\$ 197,400	36.0%	-0.3%	1	0	0
641	6	\$ 4,728,673	5.6%	-7.3%	1	0	0	622	3	\$ 379,497	36.1%	-29.5%	1	0	0
7402	5	\$ 3,023,364	5.6%	-14.0%	1	0	0	1030	3	\$ 531,955	36.2%	-21.3%	1	0	0
8499	8	\$ 11,981,648	5.6%	-10.6%	1	0	0	663	2	\$ 5,829,031	36.3%	50.4%	0	1	0
1259	4	\$ 2,244,377	5.6%		1	0	0	801	4	\$ 73,750	36.5%	-17.6%	1	0	0
237	5	\$ 532,542	5.7%	2.7%	1	0	0	617	2	\$ 264,077	36.6%	13.2%	0	1	0
1258	4	\$ 3,366,328	5.7%		1	0	0	7490	2	\$ 1,463,337	36.6%	-21.1%	1	0	0
8254	4	\$ 2,027,079	5.7%	23.6%	1	0	0	921	3	\$ 179,235	36.8%	-12.1%	1	0	0
835	5	\$ 632,591	5.7%	-11.8%	1	0	0	372	5	\$ 180,393	36.9%	-33.4%	1	0	0
7910	3	\$ 1,785,726	5.7%	-26.0%	1	0	0	1076	2	\$ 1,086,277	37.0%	13.5%	0	1	0
8086	7	\$ 2,740,818	5.7%	-33.0%	1	0	0	7822	4	\$ 8,404,077	37.0%	-2.5%	1	0	0
8661	2	\$ 80,170	5.7%	25.6%	1	0	0	970	2	\$ 289,000	37.1%	46.9%	0	1	0
214	2	\$ 450,492	5.7%	-6.8%	1	0	0	1099	3	\$ 2,067,472	37.2%	-6.0%	1	0	0
7217	5	\$ 22,459,943	5.7%	22.6%	1	0	0	1295	3	\$ 928,904	37.2%		1	0	0
812	2	\$ 511,188	5.7%	92.2%	1	0	0	7544	4	\$ 992,023	37.2%	-20.7%	1	0	0
1012	5	\$ 2,836,800	5.7%	4.3%	1	0	0	8408	2	\$ 399,949	37.2%	-11.3%	1	0	0
7845	6	\$ 82,255	5.7%	4.8%	1	0	0	1070	3	\$ 889,055	37.5%	-9.3%	1	0	0
8250	5	\$ 376,213	5.7%	-6.4%	1	0	0	1116	2	\$ 5,028,245	37.6%	-19.4%	1	0	0
1011	2	\$ 2,785,210	5.7%	11.4%	1	0	0	410	2	\$ 246,815	37.7%	7.7%	1	0	0
105	4	\$ 157,988	5.7%	-0.3%	1	0	0	591	2	\$ 84,564	37.8%	3.6%	1	0	0
7794	3	\$ 1,227,777	5.8%	-33.4%	1	0	0	8332	3	\$ 1,298,193	37.8%	8.1%	1	0	0
309	12	\$ 800,055	5.8%	-16.4%	1	0	0	7776	3	\$ 1,245,147	37.9%	-41.6%	1	0	0
7716	2	\$ 1,683,782	5.8%	-22.8%	1	0	0	7332	2	\$ 3,187,543	37.9%	10.1%	0	1	0
7331	2	\$ 4,149,158	5.8%	-0.8%	1	0	0	377	3	\$ 182,104	38.0%	-9.4%	1	0	0
1097	6	\$ 12,155,678	5.8%	-4.1%	1	0	0	1034	3	\$ 542,357	38.1%	34.9%	0	1	0
1335	3	\$ 10,579,894	5.8%		1	0	0	537	2	\$ 1,584,999	38.1%	-11.8%	1	0	0
777	2	\$ 367,212	5.8%	-5.8%	1	0	0	996	3	\$ 354,558	38.4%	-23.3%	1	0	0
736	4	\$ 207,590	5.8%	6.5%	1	0	0	853	2	\$ 106,949	38.8%	-6.2%	1	0	0
7521	3	\$ 3,545,321	5.8%	1.4%	1	0	0	938	3	\$ 196,711	38.9%	2.5%	1	0	0
7997	7	\$ 69,815	5.8%	-31.3%	1	0	0	436	5	\$ 281,051	39.3%	7.4%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
872	4	\$ 807,126	5.8%	0.9%	1	0	0	7436	3	\$ 135,446	39.4%	-6.6%	1	0	0
7478	3	\$ 352,711	5.8%	-23.5%	1	0	0	1018	2	\$ 430,000	39.5%	9.1%	1	0	0
8568	3	\$ 2,872,537	5.8%	-12.9%	1	0	0	755	3	\$ 40,304	40.2%	-8.4%	1	0	0
75	3	\$ 107,424	5.8%	-2.4%	1	0	0	1010	2	\$ 386,200	40.3%	19.2%	0	1	0
7387	4	\$ 12,228,837	5.8%	18.1%	1	0	0	8169	2	\$ 106,498	40.4%	-5.1%	1	0	0
347	4	\$ 998,889	5.8%	-9.4%	1	0	0	8020	2	\$ 698,999	40.8%	-12.8%	1	0	0
881	2	\$ 896,637	5.8%	-7.0%	1	0	0	8176	3	\$ 4,457,702	41.0%	-39.3%	1	0	0
287	2	\$ 675,839	5.8%	13.2%	1	0	0	8149	2	\$ 139,641	41.2%	-25.3%	1	0	0
8199	4	\$ 11,927,624	5.8%	-13.6%	1	0	0	1231	4	\$ 1,692,982	41.4%		1	0	0
8406	9	\$ 1,104,454	5.8%	-17.5%	1	0	0	8000	2	\$ 62,699	41.5%	-8.3%	1	0	0
8553	4	\$ 5,785,947	5.8%	-6.7%	1	0	0	8147	2	\$ 810,018	41.6%	-10.5%	1	0	0
8031	6	\$ 1,257,232	5.9%	-1.3%	1	0	0	1044	2	\$ 582,824	41.7%	-14.7%	1	0	0
809	3	\$ 489,000	5.9%	20.1%	1	0	0	897	2	\$ 140,948	41.9%	-23.0%	1	0	0
917	3	\$ 1,104,867	5.9%	-4.3%	1	0	0	879	4	\$ 118,884	42.5%	-15.7%	1	0	0
960	2	\$ 1,634,667	5.9%	12.0%	1	0	0	7785	2	\$ 1,770,190	42.7%	-14.8%	1	0	0
7762	4	\$ 544,445	5.9%	-16.5%	1	0	0	8682	4	\$ 439,700	42.8%	-20.0%	1	0	0
774	2	\$ 340,858	5.9%	-36.8%	1	0	0	8018	5	\$ 7,849,448	43.2%	-37.8%	1	0	0
7292	3	\$ 953,626	5.9%	4.9%	1	0	0	8298	2	\$ 417,466	43.5%	-29.5%	1	0	0
152	3	\$ 257,780	5.9%	-6.4%	1	0	0	791	3	\$ 55,358	43.6%	-33.3%	1	0	0
630	6	\$ 2,943,214	5.9%	-8.0%	1	0	0	322	2	\$ 114,014	44.0%	-2.5%	1	0	0
7838	9	\$ 398,712	5.9%	-25.8%	1	0	0	454	2	\$ 274,731	44.5%	1.4%	1	0	0
1169	8	\$ 1,530,163	5.9%		1	0	0	994	2	\$ 302,445	44.6%	-1.5%	1	0	0
7853	3	\$ 6,191,302	5.9%	-11.5%	1	0	0	662	7	\$ 4,615,068	45.4%	-20.8%	1	0	0
8301	3	\$ 1,264,595	5.9%	-19.4%	1	0	0	891	2	\$ 126,303	45.6%	27.6%	0	1	0
266	8	\$ 606,457	5.9%	16.1%	1	0	0	8161	2	\$ 50,499	45.7%	-32.5%	1	0	0
1081	4	\$ 7,615,874	5.9%	-5.2%	1	0	0	1080	3	\$ 984,460	45.8%	-8.1%	1	0	0
752	4	\$ 262,255	6.0%	0.1%	1	0	0	7510	3	\$ 2,861,013	46.0%	-36.5%	1	0	0
8465	3	\$ 1,201,485	6.0%	-2.8%	1	0	0	7414	3	\$ 156,779	46.1%	-11.3%	1	0	0
8289	2	\$ 1,961,182	6.0%	-14.9%	1	0	0	1050	2	\$ 552,323	46.4%	30.0%	0	1	0
7848	3	\$ 4,149,149	6.0%	-10.7%	1	0	0	1061	2	\$ 621,000	46.7%	-17.9%	1	0	0
8432	4	\$ 22,129,243	6.0%	7.2%	1	0	0	884	3	\$ 116,489	47.2%	40.3%	0	1	0
1257	4	\$ 4,075,234	6.0%		1	0	0	7802	3	\$ 2,925,184	47.3%	-58.8%	1	0	0
8394	4	\$ 790,104	6.0%	4.2%	1	0	0	8503	4	\$ 201,147	47.6%	-37.2%	1	0	0
885	9	\$ 914,914	6.0%	-5.3%	1	0	0	948	2	\$ 175,311	48.2%	-22.8%	1	0	0
7470	5	\$ 646,040	6.0%	-12.3%	1	0	0	1033	4	\$ 427,006	48.2%	123.6%	0	1	0
547	7	\$ 17,589,674	6.0%	7.0%	1	0	0	529	4	\$ 820,621	48.3%	-10.0%	1	0	0
7619	7	\$ 11,519,676	6.0%	-8.1%	1	0	0	1103	2	\$ 1,853,915	48.7%	14.7%	0	1	0
112	3	\$ 164,979	6.0%	10.2%	1	0	0	1039	5	\$ 475,155	49.1%	-20.0%	1	0	0
98	2	\$ 143,087	6.0%	24.7%	1	0	0	472	3	\$ 298,882	49.3%	-26.5%	1	0	0
206	4	\$ 401,661	6.0%	22.7%	1	0	0	1294	3	\$ 717,850	49.4%		1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
236	7	\$ 492,120	6.1%	-5.4%	1	0	0	8190	4	\$ 230,404	49.5%	-11.4%	1	0	0
8157	3	\$ 1,226,135	6.1%	-24.3%	1	0	0	8545	4	\$ 117,719	49.7%	-13.8%	1	0	0
580	4	\$ 312,346	6.1%	-37.3%	1	0	0	7828	3	\$ 595,709	49.8%	-25.8%	1	0	0
1175	7	\$ 2,524,750	6.1%		1	0	0	389	2	\$ 148,343	51.0%	6.2%	1	0	0
477	6	\$ 2,518,470	6.1%	-9.3%	1	0	0	1046	2	\$ 483,647	51.1%	15.4%	0	1	0
285	5	\$ 625,492	6.1%	2.3%	1	0	0	1105	3	\$ 2,037,681	52.1%	-20.8%	1	0	0
7901	5	\$ 1,347,777	6.1%	-17.5%	1	0	0	7291	2	\$ 1,792,097	53.3%	3.8%	1	0	0
1334	3	\$ 7,229,249	6.1%		1	0	0	7700	6	\$ 794,963	53.4%	-40.0%	1	0	0
1333	3	\$ 790,054	6.1%		1	0	0	7330	3	\$ 99,473	53.8%	8.7%	1	0	0
1332	3	\$ 790,054	6.1%		1	0	0	8584	6	\$ 138,990	54.3%	-37.3%	1	0	0
427	10	\$ 1,663,091	6.1%	-11.0%	1	0	0	964	3	\$ 182,396	54.9%	-24.9%	1	0	0
1331	3	\$ 22,385,329	6.2%		1	0	0	613	3	\$ 167,998	55.1%	-34.8%	1	0	0
1330	3	\$ 22,385,329	6.2%		1	0	0	787	5	\$ 42,336	55.6%	-18.6%	1	0	0
823	4	\$ 494,644	6.2%	23.7%	1	0	0	799	2	\$ 47,629	55.9%	28.7%	0	1	0
7534	3	\$ 417,798	6.2%	-13.5%	1	0	0	605	2	\$ 110,015	56.1%	5.3%	1	0	0
8245	4	\$ 546,990	6.2%	-19.3%	1	0	0	386	3	\$ 129,759	57.2%	21.1%	0	1	0
512	6	\$ 3,977,361	6.2%	2.0%	1	0	0	8146	2	\$ 467,360	58.4%	-35.3%	1	0	0
7759	3	\$ 9,889,889	6.2%	-14.7%	1	0	0	1293	3	\$ 2,112,374	58.5%		1	0	0
211	2	\$ 398,309	6.2%	-0.5%	1	0	0	8343	3	\$ 164,323	58.8%	0.4%	1	0	0
810	3	\$ 463,524	6.2%	-50.2%	1	0	0	1055	4	\$ 443,400	60.3%	-42.4%	1	0	0
949	2	\$ 1,371,039	6.2%	7.1%	1	0	0	7356	2	\$ 806,234	60.4%	-18.3%	1	0	0
7523	3	\$ 1,787,770	6.2%	4.7%	1	0	0	8497	2	\$ 97,299	60.8%	22.7%	0	1	0
1009	2	\$ 2,489,052	6.3%	-24.6%	1	0	0	1109	3	\$ 1,979,324	60.8%	-18.6%	1	0	0
7457	2	\$ 4,257,230	6.3%	-12.7%	1	0	0	1360	2	\$ 851,937	60.9%		1	0	0
8126	5	\$ 79,899	6.3%	-26.1%	1	0	0	8627	2	\$ 242,025	60.9%	16.1%	0	1	0
443	5	\$ 1,812,475	6.3%	-0.1%	1	0	0	959	2	\$ 148,856	63.8%	-5.8%	1	0	0
932	3	\$ 1,149,570	6.3%	12.9%	1	0	0	8151	2	\$ 185,543	63.8%	-21.5%	1	0	0
8402	9	\$ 1,930,000	6.3%	2.4%	1	0	0	7542	2	\$ 592,582	64.9%	5.7%	1	0	0
160	5	\$ 252,412	6.3%	21.9%	1	0	0	616	2	\$ 147,224	65.1%	42.2%	0	1	0
7722	2	\$ 759,558	6.3%	-19.7%	1	0	0	1058	2	\$ 411,844	66.4%	32.4%	0	1	0
7654	2	\$ 5,732,953	6.3%	-6.2%	1	0	0	7303	2	\$ 431,724	68.8%	32.7%	0	1	0
399	2	\$ 1,304,526	6.3%	-16.3%	1	0	0	894	3	\$ 82,200	71.2%	0.2%	1	0	0
1090	2	\$ 9,582,000	6.3%	9.2%	1	0	0	539	2	\$ 870,232	71.6%	16.8%	0	1	0
7249	5	\$ 222,602	6.3%	-25.7%	1	0	0	452	2	\$ 158,250	74.9%	-12.7%	1	0	0
252	3	\$ 529,799	6.3%	-18.0%	1	0	0	7600	2	\$ 129,513	75.4%	-7.7%	1	0	0
1329	3	\$ 2,417,537	6.3%		1	0	0	643	2	\$ 351,593	77.7%	0.9%	1	0	0
1328	3	\$ 2,417,537	6.3%		1	0	0	634	2	\$ 242,492	78.1%	21.1%	0	1	0
8223	17	\$ 1,451,882	6.3%	-5.9%	1	0	0	658	2	\$ 881,634	79.7%	-14.2%	1	0	0
933	4	\$ 1,174,237	6.3%	-2.1%	1	0	0	1093	2	\$ 821,800	81.1%	-16.1%	1	0	0
320	5	\$ 785,864	6.3%	10.8%	1	0	0	1074	3	\$ 452,774	81.4%	-50.0%	1	0	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
604	2	\$ 937,770	6.3%	20.5%	1	0	0	974	2	\$ 132,211	86.0%	11.1%	0	1	0
155	6	\$ 243,072	6.4%	19.5%	1	0	0	962	2	\$ 114,999	86.1%	-22.3%	1	0	0
1327	3	\$ 10,068,116	6.4%		1	0	0	7768	2	\$ 314,413	86.5%	-6.7%	1	0	0
316	2	\$ 758,806	6.4%	19.6%	1	0	0	8158	2	\$ 581,581	86.6%	-26.4%	1	0	0
836	4	\$ 563,667	6.4%	1.2%	1	0	0	551	2	\$ 1,520,355	87.6%	8.7%	1	0	0
756	4	\$ 257,460	6.4%	21.4%	1	0	0	845	2	\$ 43,911	89.6%	-26.8%	1	0	0
1067	2	\$ 5,063,404	6.4%	-5.0%	1	0	0	8291	2	\$ 337,985	93.4%	33.2%	0	1	0
7784	4	\$ 728,349	6.4%	-16.1%	1	0	0	8525	2	\$ 158,344	95.4%	22.2%	0	1	0
321	2	\$ 777,485	6.4%	-11.7%	1	0	0	1092	3	\$ 652,312	100.5%	-34.1%	1	0	0
8028	5	\$ 10,118,866	6.4%	-25.5%	1	0	0	415	2	\$ 94,370	101.0%	-26.1%	1	0	0
783	3	\$ 350,117	6.4%	-12.0%	1	0	0	7756	2	\$ 821,958	105.2%	-24.0%	1	0	0
7837	4	\$ 2,408,538	6.4%	-21.9%	1	0	0	8588	2	\$ 47,515	105.6%	-32.9%	1	0	0
8598	5	\$ 898,827	6.4%	-12.6%	1	0	0	1091	2	\$ 363,000	171.2%	-16.6%	1	0	0
8292	8	\$ 5,715,393	6.5%	-9.5%	1	0	0	1100	2	\$ 443,658	178.3%	-25.8%	1	0	0
8349	3	\$ 135,198	6.5%	-22.9%	1	0	0	1359	2	\$ 114,411	301.9%		1	0	0
1053	4	\$ 4,038,000	6.5%	-2.7%	1	0	0	8649	1	\$ 75,602		31.8%	0	1	0
7815	2	\$ 546,389	6.5%	-17.5%	1	0	0	8520	1	\$ 308,837		-0.4%	1	0	0
8481	5	\$ 1,338,018	6.5%	-1.7%	1	0	0	8519	1	\$ 64,473		-23.3%	0	1	0
8054	2	\$ 903,445	6.5%	-26.8%	1	0	0	8518	1	\$ 2,739,075		-6.7%	1	0	0
468	7	\$ 2,168,216	6.5%	-8.6%	1	0	0	8509	1	\$ 148,950		15.2%	0	1	0
8461	3	\$ 981,511	6.5%	-16.5%	1	0	0	8500	1	\$ 6,875,800		26.4%	0	1	0
7813	4	\$ 1,232,499	6.5%	-10.8%	1	0	0	8362	1	\$ 1,874,250		-21.5%	0	1	0
8268	4	\$ 2,508,376	6.5%	-6.0%	1	0	0	8317	1	\$ 1,042,202		0.0%	1	0	0
332	2	\$ 802,121	6.5%	12.0%	1	0	0	8277	1	\$ 1,199,343		11.3%	0	1	0
371	7	\$ 1,017,102	6.5%	9.9%	1	0	0	8227	1	\$ 156,114		34.8%	0	1	0
983	4	\$ 1,892,829	6.5%	2.1%	1	0	0	8187	1	\$ 659,599		16.4%	0	1	0
1326	3	\$ 4,165,498	6.5%		1	0	0	8170	1	\$ 391,314		32.8%	0	1	0
1325	3	\$ 4,165,498	6.5%		1	0	0	8134	1	\$ 32,898		-17.0%	0	1	0
640	2	\$ 3,965,745	6.6%	-3.6%	1	0	0	8123	1	\$ 575,060		9.0%	1	0	0
8186	2	\$ 745,832	6.6%	10.8%	1	0	0	8117	1	\$ 997,998		10.7%	0	1	0
991	5	\$ 1,965,293	6.6%	-14.7%	1	0	0	8103	1	\$ 3,179,639		16.4%	0	1	0
600	3	\$ 663,665	6.6%	-5.9%	1	0	0	8001	1	\$ 1,300,005		0.0%	1	0	0
139	2	\$ 204,440	6.6%	4.8%	1	0	0	7836	1	\$ 256,669		40.9%	0	1	0
903	3	\$ 932,495	6.6%	-7.1%	1	0	0	7827	1	\$ 500,000		0.0%	1	0	0
8521	4	\$ 485,598	6.6%	-11.1%	1	0	0	7793	1	\$ 727,299		21.1%	0	1	0
416	8	\$ 1,472,195	6.6%	1.2%	1	0	0	7790	1	\$ 515,516		-16.8%	0	1	0
69	5	\$ 84,174	6.6%	-16.9%	1	0	0	7781	1	\$ 979,504		27.3%	0	1	0
7504	6	\$ 2,372,594	6.6%	-9.8%	1	0	0	7778	1	\$ 289,764		-0.1%	1	0	0
7304	2	\$ 7,371,000	6.6%	16.9%	1	0	0	7749	1	\$ 82,483		-17.3%	0	1	0
7594	6	\$ 119,924,730	6.6%	-14.2%	1	0	0	7737	1	\$ 196,350		19.9%	0	1	0

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
1119	4	\$ 37,813,772	6.6%	0.6%	1	0	0	7714	1	\$ 1,445,256		2.0%	1	0	0
278	4	\$ 560,313	6.6%	6.7%	1	0	0	7712	1	\$ 547,723		20.2%	0	1	0
7495	7	\$ 3,315,000	6.6%	-39.9%	1	0	0	7709	1	\$ 1,243,562		9.8%	1	0	0
462	4	\$ 2,015,197	6.7%	-11.6%	1	0	0	7678	1	\$ 14,602		-39.7%	0	1	0
957	2	\$ 1,384,108	6.7%	9.7%	1	0	0	7648	1	\$ 3,566,333		-6.8%	1	0	0
7275	3	\$ 596,097	6.7%	10.0%	1	0	0	7608	1	\$ 183,687		35.4%	0	1	0
466	4	\$ 2,069,795	6.7%	7.3%	1	0	0	7596	1	\$ 144,558		43.4%	0	1	0
7639	19	\$ 1,687,701	6.7%	-25.4%	1	0	0	7567	1	\$ 741,349		11.0%	0	1	0
490	3	\$ 2,691,445	6.7%	31.5%	1	0	0	7538	1	\$ 5,375,508		7.7%	1	0	0
7435	2	\$ 718,974	6.7%	8.0%	1	0	0	7509	1	\$ 21,734		-39.2%	0	1	0
344	6	\$ 837,407	6.7%	-6.3%	1	0	0	7489	1	\$ 638,157		-10.3%	0	1	0
7832	12	\$ 734,927	6.8%	-25.0%	1	0	0	7448	1	\$ 972,123		26.6%	0	1	0
987	3	\$ 1,866,948	6.8%	-6.0%	1	0	0	7408	1	\$ 102,888		5.9%	1	0	0
8653	2	\$ 280,819	6.8%	72.8%	1	0	0	7391	1	\$ 528,954		-6.0%	1	0	0
863	6	\$ 661,802	6.8%	1.3%	1	0	0	7364	1	\$ 311,607		99.2%	0	1	0
7883	5	\$ 381,381	6.8%	-34.5%	1	0	0	7353	1	\$ 2,492,000		29.4%	0	1	0
753	3	\$ 231,231	6.8%	10.6%	1	0	0	7351	1	\$ 1,998,128		25.2%	0	1	0
8308	5	\$ 1,748,421	6.8%	-10.3%	1	0	0	7347	1	\$ 1,495,700		7.3%	1	0	0
1213	5	\$ 1,229,487	6.8%		1	0	0	7329	1	\$ 438,806		19.0%	0	1	0
148	3	\$ 209,394	6.9%	0.0%	1	0	0	7325	1	\$ 822,271		4.9%	1	0	0
8056	6	\$ 1,377,777	6.9%	-15.0%	1	0	0	7322	1	\$ 11,917,777		14.7%	0	1	0
210	2	\$ 360,433	6.9%	-20.8%	1	0	0	7312	1	\$ 7,423,040		8.1%	1	0	0
1212	5	\$ 10,375,353	6.9%		1	0	0	7307	1	\$ 4,923,673		9.3%	1	0	0
8327	3	\$ 1,175,846	6.9%	-10.6%	1	0	0	7281	1	\$ 19,490,000		3.2%	1	0	0
695	4	\$ 37,849	6.9%	-39.9%	1	0	0	7245	1	\$ 823,946		16.8%	0	1	0
7925	6	\$ 3,728,682	6.9%	-22.1%	1	0	0	1417	1	\$ 1,240,555			0	1	0
1211	5	\$ 3,891,473	6.9%		1	0	0	1416	1	\$ 361,582			0	1	0
228	3	\$ 415,312	6.9%	-13.2%	1	0	0	1415	1	\$ 915,819			0	1	0
7860	2	\$ 468,993	6.9%	-2.3%	1	0	0	1414	1	\$ 627,588			0	1	0
1324	3	\$ 575,128	6.9%		1	0	0	1413	1	\$ 1,312,188			0	1	0
1389	2	\$ 2,382,041	6.9%		1	0	0	1412	1	\$ 226,892			0	1	0
8681	5	\$ 489,250	6.9%	7.3%	1	0	0	1411	1	\$ 1,199,653			0	1	0
219	3	\$ 376,729	6.9%	-21.4%	1	0	0	1410	1	\$ 629,025			0	1	0
8352	4	\$ 2,400,400	6.9%	-6.3%	1	0	0	1409	1	\$ 961,100			0	1	0
8407	2	\$ 157,534	6.9%	-7.1%	1	0	0	1408	1	\$ 2,660,000			0	1	0
8013	3	\$ 1,594,632	6.9%	-13.8%	1	0	0	1407	1	\$ 961,100			0	1	0
343	9	\$ 811,082	6.9%	0.0%	1	0	0	1406	1	\$ 2,660,000			0	1	0
1388	2	\$ 2,382,041	7.0%		1	0	0	1405	1	\$ 1,549,205			0	1	0
846	3	\$ 563,551	7.0%	-18.0%	1	0	0	1404	1	\$ 1,999,358			0	1	0
748	4	\$ 217,502	7.0%	-9.0%	1	0	0	1159	1	\$ 53,258		-40.8%	0	1	0



BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
610	3	\$ 1,222,822	7.0%	44.8%	1	0	0	1158	1	\$ 103,820		48.3%	0	1	0
408	4	\$ 1,272,889	7.0%	-4.8%	1	0	0	1157	1	\$ 108,628		4.5%	1	0	0
1035	2	\$ 3,064,249	7.0%	8.7%	1	0	0	1156	1	\$ 111,704		5.4%	1	0	0
8569	8	\$ 7,399,235	7.0%	-3.2%	1	0	0	1155	1	\$ 121,500		26.6%	0	1	0
635	4	\$ 2,934,142	7.1%	-9.4%	1	0	0	1154	1	\$ 144,459		104.8%	0	1	0
7339	2	\$ 431,668	7.1%	-4.2%	1	0	0	1153	1	\$ 197,297		-36.4%	0	1	0
926	7	\$ 980,800	7.1%	-1.0%	1	0	0	1152	1	\$ 206,728		-2.9%	1	0	0
7601	8	\$ 2,115,081	7.1%	-16.2%	1	0	0	1151	1	\$ 218,500		-35.4%	0	1	0
119	5	\$ 153,033	7.1%	-20.3%	1	0	0	1150	1	\$ 236,675		136.7%	0	1	0
8626	2	\$ 724,217	7.1%	-10.5%	1	0	0	1149	1	\$ 254,893		-9.6%	1	0	0
7296	3	\$ 924,792	7.1%	11.3%	1	0	0	1148	1	\$ 272,798		-14.8%	0	1	0
93	3	\$ 117,507	7.1%	-43.1%	1	0	0	1147	1	\$ 298,005		-10.5%	0	1	0
1323	3	\$ 4,543,405	7.1%		1	0	0	1146	1	\$ 307,832		-2.6%	1	0	0
7879	15	\$ 4,146,936	7.1%	-53.1%	1	0	0	1145	1	\$ 329,951		-14.7%	0	1	0
7656	17	\$ 179,973	7.1%	-35.1%	1	0	0	1144	1	\$ 415,981		-12.6%	0	1	0
7899	3	\$ 541,792	7.1%	-14.8%	1	0	0	1143	1	\$ 440,324		13.5%	0	1	0
227	4	\$ 393,028	7.2%	13.3%	1	0	0	1142	1	\$ 448,687		16.8%	0	1	0
615	10	\$ 1,322,012	7.2%	-7.3%	1	0	0	1141	1	\$ 479,624		219.7%	0	1	0
955	3	\$ 1,225,628	7.2%	11.8%	1	0	0	1140	1	\$ 544,530		28.7%	0	1	0
256	4	\$ 469,887	7.2%	-3.2%	1	0	0	1139	1	\$ 674,422		38.8%	0	1	0
7452	18	\$ 890,042	7.2%	-28.2%	1	0	0	1138	1	\$ 728,905		39.6%	0	1	0
166	2	\$ 233,153	7.2%	-9.6%	1	0	0	1137	1	\$ 756,043		9.4%	1	0	0
8203	8	\$ 112,142	7.2%	-39.2%	1	0	0	1136	1	\$ 770,588		-5.0%	1	0	0
7846	6	\$ 40,400	7.2%	22.7%	1	0	0	1135	1	\$ 911,292		10.6%	0	1	0
312	2	\$ 654,700	7.2%	1.7%	1	0	0	1134	1	\$ 930,575		-11.4%	0	1	0
7927	3	\$ 156,512	7.2%	-28.2%	1	0	0	1133	1	\$ 932,323		-7.7%	1	0	0
7986	3	\$ 201,819	7.2%	-1.6%	1	0	0	1132	1	\$ 954,256		9.7%	1	0	0
232	3	\$ 399,322	7.2%	6.0%	1	0	0	1131	1	\$ 1,073,594		7.7%	1	0	0
8385	9	\$ 644,193	7.2%	-30.7%	1	0	0	1130	1	\$ 1,116,705		2.8%	1	0	0
7280	2	\$ 3,432,395	7.3%	-19.3%	1	0	0	1129	1	\$ 1,138,017		0.7%	1	0	0
239	5	\$ 414,570	7.3%	4.9%	1	0	0	1128	1	\$ 1,181,650		7.7%	1	0	0
291	8	\$ 554,360	7.3%	-6.8%	1	0	0	1127	1	\$ 1,264,064		7.8%	1	0	0
7730	10	\$ 557,084	7.3%	-39.0%	1	0	0	1126	1	\$ 1,345,354		-9.4%	1	0	0
1387	2	\$ 2,767,371	7.3%		1	0	0	1125	1	\$ 1,662,868		-6.1%	1	0	0
1124	1	\$ 1,688,984		-3.3%	1	0	0								
1123	1	\$ 1,930,356		-1.5%	1	0	0								
1122	1	\$ 2,068,631		4.5%	1	0	0								
1036	2	\$ 1,499,950		0.3%	1	0	0								
1028	3	\$ 1,246,000		-0.9%	1	0	0								
998	3	\$ 2,270,670		-18.1%	1	0	0								

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
995	5	\$ 3,854,000		-22.3%	1	0	0								
887	3	\$ 112,954		54.7%	1	0	0								
876	2	\$ 218,450		21.4%	1	0	0								
866	7	\$ 2,037,189		4.4%	1	0	0								
847	2	\$ 187,306		-4.8%	1	0	0								
806	3	\$ 552,273		2.7%	1	0	0								
711	3	\$ 444,444		-15.3%	1	0	0								
703	3	\$ 575,184		0.0%	1	0	0								
675	1	\$ 184,276		8.7%	1	0	0								
674	1	\$ 52,252		-91.8%	0	1	0								
673	1	\$ 936,613		20.2%	0	1	0								
672	1	\$ 4,187,187		27.7%	0	1	0								
671	1	\$ 164,629		7.6%	1	0	0								
670	1	\$ 406,338		22.0%	0	1	0								
669	1	\$ 3,084,409		18.6%	0	1	0								
668	1	\$ 2,502,023		0.2%	1	0	0								
667	1	\$ 492,251		107.6%	0	1	0								
666	1	\$ 517,558		14.0%	0	1	0								
653	2	\$ 1,746,516		-19.2%	1	0	0								
644	4	\$ 3,699,355		-33.7%	1	0	0								
594	4	\$ 517,392		-19.9%	1	0	0								
561	1	\$ 2,729,476		25.8%	0	1	0								
560	1	\$ 316,786		-11.3%	0	1	0								
559	1	\$ 367,175		2.9%	1	0	0								
558	1	\$ 256,382		29.3%	0	1	0								
557	1	\$ 235,860		10.7%	0	1	0								
556	1	\$ 107,761		4.6%	1	0	0								
555	1	\$ 149,402		3.1%	1	0	0								
554	1	\$ 442,984		-18.4%	0	1	0								
549	5	\$ 6,926,558		3.5%	1	0	0								
542	2	\$ 5,743,004		0.7%	1	0	0								
541	4	\$ 9,911,333		-8.8%	1	0	0								
535	4	\$ 2,878,138		-0.7%	1	0	0								
533	2	\$ 1,039,579		-1.0%	1	0	0								
530	2	\$ 2,260,624		-7.7%	1	0	0								
520	3	\$ 1,146,125		-9.2%	1	0	0								
515	2	\$ 861,302		25.2%	1	0	0								
514	8	\$ 5,139,060		-16.6%	1	0	0								
513	3	\$ 1,069,279		-8.5%	1	0	0								
508	2	\$ 1,384,476		-26.4%	1	0	0								

BID QUALITY DATABASE

BID INFORMATION			BID METRICS		BID QUALITY			BID INFORMATION			BID METRICS		BID QUALITY		
ID	Bidders	Amount	s	e	A	U	I	ID	Bidders	Amount	s	e	A	U	I
507	2	\$ 962,900		12.7%	1	0	0								
504	4	\$ 858,491		-1.2%	1	0	0								
503	8	\$ 2,770,350		2.5%	1	0	0								
496	2	\$ 2,137,035		-0.2%	1	0	0								
396	5	\$ 2,818,624		12.9%	1	0	0								
385	5	\$ 809,917		5.3%	1	0	0								
383	2	\$ 837,011		-4.9%	1	0	0								
376	6	\$ 6,316,040		18.4%	1	0	0								
352	5	\$ 354,676		16.8%	1	0	0								
310	5	\$ 2,239,412		8.0%	1	0	0								
304	7	\$ 783,491		-1.3%	1	0	0								
303	2	\$ 534,152		19.6%	1	0	0								
282	3	\$ 273,777		-4.5%	1	0	0								
235	2	\$ 52,125		-3.4%	1	0	0								
199	5	\$ 395,670		-9.6%	1	0	0								
198	3	\$ 209,433		11.1%	1	0	0								
196	2	\$ 308,423		0.0%	1	0	0								
164	3	\$ 1,918,021		17.8%	1	0	0								
67	12	\$ 1,420,680		11.7%	1	0	0								
42	3	\$ 1,728,731		24.3%	1	0	0								
40	9	\$ 133,875		3.8%	1	0	0								
7	6	\$ 629,114		6.5%	1	0	0								
4	3	\$ 27,543		-16.8%	1	0	0								