

DATE ISSUED: October 23, 2002

REPORT NO. 02-246

ATTENTION: Public Safety and Neighborhood Services Committee
Agenda of October 30, 2002

SUBJECT: California Multi-Agency CIP Benchmarking Study

SUMMARY

Issue - Should the Committee accept the Manager's Report and direct staff to investigate the City utilizing the following in respect to its Capital Improvement Program (CIP): (1) Complete feasibility studies and fully define a project prior to its inclusion in the CIP, (2) Develop a Council approved prioritization process for the City Manager to utilize in developing the CIP, and (3) Use resource based budgeting in developing both the CIP and the Department's budget?

Manager's Recommendation - Accept the Manager's Report and direct staff to investigate the City utilizing feasibility studies, a Council approved prioritization process, and resource based budgeting in developing both the CIP and the Department's budget.

Other Recommendation(s) - None

Fiscal Impact - None for the short term and unidentified for the long term solutions.

BACKGROUND

Over the next three years, the six largest cities in California are expected to expend nearly \$6 billion dollars in public works infrastructure construction contracts. These municipalities are building roads and transportation systems, sewer and water infrastructure, municipal facilities, libraries, parks and recreation facilities, animal shelters, fire stations, bridges, seismic retrofits, bikeways, storm drains, and other facilities. While \$6 billion dollars for public works improvements is a significant amount, it does not represent the entire infrastructure cost. There are additional, significant costs - over and above construction - to deliver these projects. The costs associated with the project delivery process - planning, design, environmental documentation, value engineering, permits, construction management and startup - are influenced by many factors such as project size and complexity, new construction vs. rehabilitation, internal organization, project prioritization, clear guidelines, and more. With all of this construction on tap in California, staff from these cities began to collaborate, pool their knowledge and experience on these cost-influencing factors, then benchmark their project delivery processes so they can learn from each other's successes, while keeping project delivery costs to a minimum.

In October 2001, the City of Los Angeles, Department of Public Works, Bureau of Engineering, initiated a Benchmarking study through the cooperative effort of individuals responsible for the development and implementation of Capital Improvement Projects (CIP) in six of the larger California cities. The objective of this study was to provide a general analysis of the efficiency of capital project delivery systems within various agencies in California, based on the observed performance and the processes implemented over the last five years. The California Multi-Agency CIP Benchmarking Study is the beginning of a planned cooperative and continuous Benchmarking study that may eventually include other agencies throughout the State of California. The following agencies participated in the first phase of the study:

City of Long Beach, Department of Public Works
City of Los Angeles, Department of Public Works/Bureau of Engineering
City of Sacramento, Department of Public Works
City of San Diego, Engineering & Capital Projects Department
City & County of San Francisco, Dept of Public Works/Bureau of Engineering
City of San Jose, Department of Public Works

This Benchmarking Study report is the result of the first year of collaboration among these six member agencies.

DISCUSSION

Performance Benchmarking (Cost data):

The first task of the Study was to collect Capital Improvement Program (CIP) project data from all the agencies for use in evaluating performance and establishing benchmarks for project delivery statewide. After the initial data collection, the CIP projects of all agencies were categorized according to the similarity of the work and only those with a statistically sufficient number of representative projects were selected for further examination. From this, the selected projects were separated into one of three project types each made of up of several project classifications:

Municipal Facilities:

Libraries
Police & Fire Stations
Community Buildings and Recreation/Children's Centers

Streets:

New roads, Road widening, and Grade separations
Bridges
Road Renovations
Pedestrian/Bikeways and Curb Ramps
Traffic Signals

Pipe Systems:

Storm Drains and Sewer main replacements

Water mains and other pressure systems Pump Stations

These projects represent the CIP projects completed by the six agencies over the previous five years. For each of these project types and classifications, additional cost data was then collected for these projects to breakdown the various phases of the project (Design and Construction) as well as the different types of costs throughout the project (Design, Construction Management, Construction, Change Orders, etc.). In order to analyze the trends and establish benchmarks on a project level, the study participants utilized the expertise of Dr. Maged M. Dessoucky, Associate Professor at the Industrial and Systems Engineering Department at the University of Southern California. The project data was graphed by Dr. Dessoucky on a logarithmic curve using a regression (“best fit”) method. These graphs produced an average value as well as an upper bound of the data. The area between these curves was selected as the benchmark values for each selection. The statistical validity for each set of data is measured by the (R^2) value shown on each curve, where an (R^2) of 1.0 being perfect fit and an (R^2) of 0 being an unreliable curve.

The graphs of the total project delivery (“soft”) costs versus total construction costs (including City forces work) for each of the project types are attached to this report as Attachment 1 - Figures A1 thru A3, which also include a curve representing the data for the City of San Diego projects. As can be seen from these charts, a project with a smaller construction cost has a larger percentage of project delivery (“soft”) costs, while the larger projects have a smaller percentage of project delivery costs. This is primarily due to the number of project costs that are relatively fixed (contract processing, permit fees, etc.), which have a greater impact on the smaller projects. For this reason, projects less than \$100,000 are typically so affected by the fixed costs and changes in scope that they are not adequately predicted by these curves. However, since this data is specific to a particular type of project and a good comparison to similar agencies, staff will be using these statewide curves as the benchmark values for acceptable project delivery costs for the City CIP projects greater than \$100,000, with the upper bound being the limit for the more complex projects. For example, a Street Project with an construction cost of \$3,000,000 would be considered to be within the anticipated benchmark range for project delivery if the total of the design, construction management, and all other “soft” costs were between 20 percent (\$600,000) and 36 percent (\$1,080,000). The variation within this range would depend on the complexity of the project and other factors such as the amount of community meetings required. As can be seen from these charts, the City of San Diego projects are consistently within and often better than the statewide acceptable range for CIP project delivery costs.

In addition to the project delivery costs, a graph showing the change order costs versus total amount of construction is shown in Attachment 2 - Figure A4. As can be seen from this graph, the state average for change orders varies between about 8% to 12.5%, with the City of San Diego’s value being generally better at 6% to 9% for projects above \$0.5 million. These values include the costs for scope changes requested by the client departments, City Council, and community groups. However, since the (R^2) value for both the statewide and the City of San Diego data is low, additional data collection will have to be conducted before a recommendation is made. In addition, it was noted during the initial study that an evaluation of change order source (owner initiated scope change, unforeseen conditions, design errors, etc.) should be conducted in order to accurately evaluate the performance of any agency relating to change

orders, since these factors can severely affect outcome.

In addition to the project specific curves described above, a summary of the overall data for all projects was conducted. Because of the great variance and effect of fixed costs described previously, all projects less than \$100,000 were omitted from this investigation. This study found that the overall costs (“soft”) of project delivery throughout the six agencies for projects over \$100,000 were as follows:

Design Phase	18 percent
Construction Management	<u>14 percent</u>
Total Project Delivery	32 percent

It should be noted that these costs are not appropriate for estimating the costs of individual projects, due to the variance in the size of each project that was described previously. They may be appropriate, however, for a programmatic level of predicting project delivery costs, provided that a uniform variance of project size is anticipated. The City’s Total Project Delivery costs averaged approximately 34%; however, it should be noted that this value is somewhat skewed due to the inclusion of several smaller projects (construction costs below \$1 million) which typically have a higher “soft” cost percentage, as demonstrated in Attachment 2 - Figures A1 thru A3.

Process Benchmarking (Best Management Practices):

The gathering of executive level technical staff from six (6) major agencies to share information about costs and openly discuss effectiveness of their capital project delivery methods is unprecedented. Ninety-eight (98) processes associated with the effective delivery of capital projects were identified, discussed, and evaluated by the agency representatives in an effort to develop the ability to benchmark capital improvement projects in the industry.

The “process” benchmarking exercise resulted in the identification of fifteen (15) best management practices (see Attachment 3 - Table A) currently being employed by most agencies. These practices included processes such as: standard consultant contracts and processing, training programs for construction inspectors, and project schedules are developed and tracked throughout the project. The participating agencies also agreed on an additional twenty-four (24) best management practices (see Attachment 3 - Table B) that are recommended to improve project delivery.

During these discussions staff contributed/co-contributed several recommended best management practices that the City is already doing. These processes are identified below:

Municipal Facilities projects undergo a review for “Green Building Standards” (LEED)

This contributes to a lower life-cycle costs as a result of lower building maintenance and replacement frequency.

Construction Management Teams are involved before completion of design

CIP construction contracts and plans are provided a constructability review by the Engineering and Capital Projects Department's Field Engineering Division prior to completion of the design. This review improves the quality of the plans by allowing those that are most familiar with construction problems to recommend changes.

A formal Dispute Resolution Procedure is included in all contract agreements

All CIP contracts have a mandatory dispute resolution clause. This process must be followed before any dispute can be taken to court.

A consultant rating system is used that identifies quality of consultant performance

The City has had a consultant rating system in place for several years. This system provides consultant interview panels with a description of past performance.

A Contractor pre-qualification has been used for larger projects and is being implemented on a larger scale now

The City is developing a pilot project where all Contractors that meet a certain set of requirements are added to a list certifying their eligibility to perform City work. This will allow for an expeditious contract bid and award process, because contractors bonding capacity, licensing, EOCP requirements, insurance, etc., are already verified.

Formal training for Project Managers is provided on a regular basis

It was clear that the City is in the forefront when it comes to training and has developed several classes and academies to train staff. The Project Management Academy (PMA), Construction Management Academy (CMA), and Academy 2000 are examples of some training opportunities that have helped to train City staff in project management, construction management, and supervisory skills. Other public entities have participated in these City of San Diego sponsored classes.

A Quality Assurance/Quality Control (QA/QC) process is utilized to ensure consistency in plans and specifications

In addition to the Citywide plan check process, several departments have staff that exclusively perform a QA/QC review of all projects. This has contributed in keeping the construction claims and change order costs down significantly.

In addition to these recommended best management practices where the City is excelling, a few process differences that the City utilizes were identified that are worth noting:

A bid Item for Field Orders is included in public works contracts to help facilitate construction and expedite payments to contractors

This unique idea consists of having a bid item for minor unforeseen conditions encountered during construction and was developed in conjunction with the local contracting community to help expedite the payment for such work. This idea was received with great interest by other participating agencies and some are beginning to explore this option for their use.

Low change order percentage of project cost

The City of San Diego has adopted an allowance for change orders that is held to 5% for projects over \$1 million and 10% for projects under \$1 million, unless unusual circumstances are identified. Most other agencies begin construction with a 10% to 25% allowance for change orders.

Recommended Process Improvements:

Several processes that other agencies have implemented could be applied in San Diego. These improvements to the City's process would enhance the delivery of capital projects. The first three processes the Engineering & Capital Projects would recommend implementing are focused on the planning/budgeting process for the CIP. The first would bring consistency to the development of proposed project budgets and the level of effort used to develop the scope of work. The second and third would work together to identify projects that have both the necessary funding and the staff needed to effectively manage these projects. These recommended improvements and enhancements are:

A. Complete project feasibility studies prior to defining budget and scope

The City uses various levels of effort to establish budgets and schedules for capital projects being submitted in the Proposed Capital Improvement Program Budget. Further definition of the scope of work early on would provide insight into the feasibility of the proposed project and budget. Consequently, if we were to fully define and develop the scope of work and then complete feasibility studies on that scope prior to a project being placed in the City's Capital Improvement Program, we would more successfully be able to keep projects on schedule and on budget. A design contingency that is related to the unknown components of the scope of work could be used in the development of the preliminary cost estimate that would provide greater assurance of project completion within the budget assigned.

B. Council Prioritization of Capital Improvement Program by type of work

Currently staff undertakes substantial effort in prioritizing projects for sewer, water, traffic signals, bridge, and storm drain funding. Additionally, the recently approved programs for library and fire facilities incorporated a prioritization process and the Police Department is initiating a strategic plan to identify its capital needs. However, a formal prioritization method generally does not exist for park and recreation facilities or transportation facilities. In respect to park and recreation facilities, the needs that are funded are often on a project-by-project basis. Staff would recommend that a Citywide approach be taken which would establish criteria, approved by the City Council, which would guide the City Manager in his funding recommendations. With regard to transportation facilities, lack of funding has not created a need for a comprehensive prioritization process. However, we would recommend that one be developed, with the Council's input and for your approval, in order to prepare for what we hope will be a re-authorization of Transnet.

C. Resource Loading for Projects

The first step would be to collect historical information on the number of staff necessary to

deliver projects according to the schedule mandated by the City Council. Analyzing this database would help determine the optimum staffing required to deliver projects. This information could then be used to develop the City's CIP and Department's budget. As this is a significant change in budget approach and would require the development of systems that do not exist at this time, implementing this Best Management Practice would be accomplished for inclusion in the Fiscal Year 2005 Capital Improvement Program Budget.

This study, which is the first phase, builds the foundation of a continuous Benchmarking study. Future phases are expected to refine and improve the conclusions and recommendations as additional project data is provided. These future phases will enhance the study and address new topics (consultant fees, time benchmarks, etc.) to share information about new processes being employed. An annual update of this report is planned.

Additional information on the performance and process Benchmarking data conducted as part of this endeavor is outlined in the full state-wide study, which is available for reference on the City's Engineering & Capital Projects Department's website at:

<http://www.sandiego.gov/engineering-cip/>

ALTERNATIVE(S)

3. Implement selected portions of the recommendations.
4. Implement none of the recommendations. Continue without benchmarks for CIP processes.

Respectfully submitted,

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Frank Belock, Jr.	George I. Loveland
Director	Senior Deputy City Manager
Engineering and Capital Projects		

Note: The attachments are not available in electronic format. A copy is available for review in the Office of the City Clerk.

Attachments:

1. Project Delivery Graphs (Figures A1 thru A3)
2. Change Order Graph (Figure A4)
3. Common and Recommended Best Management Practices (Tables A and B)