JP-96-003

# AUDIT REPORT

## PLANNED CONSTRUCTION OF FACILITIES AT THE JET PROPULSION LABORATORY

JUNE 28, 1996

National Aeronautics and Space Administration

OFFICE OF INSPECTOR GENERAL

National Aeronautics and
Space Administration
**Headquarters**
Washington, DC 20546-0001

JUN 28 1996

Reply to Attn of: W

TO: J/Associate Administrator for Management Systems & Facilities

FROM: W/Assistant Inspector General for Auditing

SUBJECT: Final Report, Planned Construction of Facilities
at the Jet Propulsion Laboratory (JPL)
Assignment No. A-JP-95-007
Report No. JP-96-003

The NASA Office of Inspector General (OIG) has completed an audit of Construction of Facilities (CoF) planned projects at the Jet Propulsion Laboratory (JPL) through fiscal year (FY) 1996. Overall, the planned CoF projects were adequately justified and necessary. Saving opportunities existed, however, through the deferment or cancellation of two non-mission essential CoF projects without adversely impacting program or mission requirements. One project costing $750,000, was for a third backup battery bank at the JPL Deep Space Network (DSN) location. The other project was for a $300,000 sewage system modification at the Madrid, Spain DSN site. During the audit, management action was taken to defer both projects and allow for a redirection of funds to more critical requirements. Subsequently, in your office's response to the draft of this report, we were advised that the third backup battery bank project has now been cancelled. Based on the actions taken, no recommendation was made relating to these two projects.

However, the adequacy of project cost proposal data provided to NASA Headquarters by JPL needs improvement. The lack of complete cost data prevents NASA managers from having a sound decision-making basis for the approval or disapproval of projects to fund. We recommended that your office clarify its handbook guidance on the level of detailed cost estimates to be provided when submitting CoF project candidates for review and approval. In addition, your office should require submission of the appropriate CoF project cost estimate and/or basis for the estimate as a part of the review and approval process. The actions your office plans are responsive to the recommendations.

The results of this audit were discussed with JPL on February 1, 1996 and your office on February 7, 1996. This report reflects the results of those discussions and letters from your office dated February 7, 1996 and March 14, 1996. A written response to the draft of this report was received from your office on June 6, 1996. The comments are summarized after the

recommendation and included in their entirety in Appendix A. In accordance with NMI 9910.1A, please include our office in the concurrence cycle for closing the recommendation in this report.

Debra A. Guentzel

Enclosure

cc:
JMC/P. Chait
SPJ/K. Lindstrom
W/R. Flann

# INTRODUCTION

The NASA Office of Inspector General (OIG) has completed an audit of Construction of Facilities (CoF) planned projects at the Jet Propulsion Laboratory (JPL) through fiscal year (FY) 1996. These projects totaled $54 million. The audit was not part of our FY 1995 audit plan, but was added as part of a NASA-wide CoF review.

JPL is a Federally Funded Research and Development Center (FFRDC) operated by the California Institute of Technology (Caltech) under NASA Contract NAS7-1260. The Laboratory, staffed with largely Caltech employees, is a Government-owned installation located in Pasadena, California. JPL also operates other NASA facilities in Southern California, at the Goldstone Tracking Station and Table Mountain. The NASA Management Office (NMO) at JPL provides NASA management oversight of JPL operations.

Completing a CoF project can take up to five years from the initial identification of need to completion of construction. The project phases include requirement studies, planning, budgeting, design, and construction. Because of this lengthy project process, sudden changes in budgetary constraints can result in the need to reprioritize some previously planned CoF projects.

The NASA Budget Administration Manual, NASA Handbook (NHB) 7400.1, requires that all CoF projects have adequate documentation which describes and justifies the projects. For CoF projects in excess of $200,000, the JPL CoF Program Office is required to submit its project documentation to NASA Headquarters for review and approval. The review process exists at each step of the project's development to identify problems, evaluate approaches, recommend options, and provide information that allows appropriate decision-making.

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## OBJECTIVE, SCOPE, AND METHODOLOGY

***OBJECTIVES***

The overall objective of this audit was to determine whether CoF projects were adequately justified and necessary. Specifically, our objectives were to identify feasible cost saving opportunities from canceling or delaying non-mission essential projects.

***SCOPE AND METHODOLOGY***

We examined FYs 1994 through 1996 CoF budget documents to identify non-mission essential projects that were not adequately justified or were not necessary. Because FY 1994 projects had progressed beyond the design stage, it was not practical to defer or cancel any of those projects. However, FYs 1995 and 1996 projects had generally not progressed beyond the design stage. Specifically, we:

- reviewed supporting documents justifying project submissions;
- obtained a description and purpose of each project;
- determined the current status of the projects identified (i.e., progress toward completion and money obligated);
- discussed project importance with CoF representatives at JPL and NASA Headquarters;
- inspected selected CoF project sites; and
- reviewed applicable NASA and JPL CoF guidance and publications.

***INTERNAL CONTROLS REVIEWED***

Significant management controls were reviewed to determine whether CoF:

- project submission guidance by NASA was being followed; and;
- project justifications were being adequately reviewed by NASA Headquarters.

No significant problems, other than the lack of complete project cost data estimates, came to our attention. This is identified and described in the Observations and Recommendation section of this report.

***AUDIT FIELD WORK***

Audit field work was conducted from April 1995 through August 1995. The audit was performed in accordance with generally accepted government auditing standards.

## OBSERVATIONS AND RECOMMENDATION

***OVERALL EVALUATION***

Overall, the planned Construction of Facilities (CoF) projects were adequately justified and necessary. Saving opportunities existed, however, through the deferment or cancellation of two non-mission essential CoF projects without adversely impacting program or mission requirements. One project costing $750,000, was for a third backup battery bank at the JPL Deep Space Network location. The other project was for a $300,000 sewage system modification at the Madrid, Spain DSN site. During the audit, management action was taken to defer both projects and allow for a redirection of funds to more critical NASA requirements. Based on the actions taken, no recommendation was made relating to these two projects. However, the adequacy of project cost proposal data provided to NASA Headquarters by JPL needs improvement. The lack of complete cost data prevents NASA managers from having a sound decision-making basis for the approval or disapproval of projects to fund.

***THIRD BACKUP BATTERY BANK QUESTIONED***

A JPL project to purchase a third backup battery bank (Project 96PRBZ), costing $750,000, for the Space Flight Operations Facility at JPL does not appear to be mission critical and could be deferred or canceled. According to the Manager of the Facility Maintenance and Operations Section at JPL, present batteries possess a substantial margin of sustainable power for over 30 minutes. Adding the third battery, would provide sustainable power for over 45 minutes. Only 10 to 15 seconds of battery power is needed, however, before the diesel generators take over extended power generation, in the event of an emergency power outage.

In determining the need for the third battery bank, we found no evidence that JPL made any comparison of their backup requirement with that of other NASA Centers with battery backup requirements. The NASA Facility Project Implementation Handbook, NHB 8820.2A, requires ". . . cost comparisons of alternate facility concepts and locations." We found two other NASA Centers, the Johnson Space Center (JSC) and the Goddard Space Flight Center (GSFC) White Sands Complex, with backup battery requirements. Both used only two backup battery banks. The Control Center Complex at JSC

provides real time air-to-ground support for the manned Shuttle flights, while the White Sands Complex operates ground terminals to provide communications and data links to NASA scientific users via the tracking and data relay satellite fleet. In our opinion, JPL's mission does not appear any more critical than the JSC or GSFC mission in support of manned flight or satellite communications.

During the audit, the above information was shared with NASA Headquarters Management Systems and Facilities (Code J) staff for consideration in deferring or canceling the third backup battery bank project. In a letter from the Code J Associate Administrator to our office, dated February 7, 1996, we were advised that Code J ". . . will defer this project (third battery bank) for possible modification to a subsequent fiscal year." Since the appropriate corrective action has already been taken, no recommendation is being made at this time concerning this project.

***SEWAGE SYSTEM MODIFICATION***

Also during the audit, the JPL CoF program manager for DSN identified and deferred until FY 1999 a $300,000 sewage system project. The project, which was considered deferrable, was for a modification to the sewage system at the Madrid, Spain DSN site. Because of the action taken, no recommendation is being made at this time concerning this project.

***COST PROPOSAL DATA***

The adequacy of project cost proposal data provided by JPL to NASA's Facilities Engineering Division (Code JX) for review and approval needs improvement. The NASA Facility Project Implementation Handbook, NHB 8820.2A requires the completion and submission of NASA Form 1510, Facility Project Cost Estimate. However, detailed cost estimates were not always provided by JPL to NASA Headquarters. For example, in our review of the third backup battery bank it was originally proposed at $340,000 in FY 1992, but was subsequently rejected by NASA due to funding constraints. One year later, the same project was submitted to NASA at a cost of $750,000 and approved. Both these submissions lacked detail cost breakdowns for evaluating the basis of JPL's estimates. Another example of a JPL project approved by NASA without detailed cost breakdown was for the refurbishment of corridors in Building 198. This project was estimated to by JPL to cost $650,000 when submitted to NASA in November 1993. The project remained at that

amount, even though JPL had an internal Study Report dated October 1995 that showed detailed costs to be $545,000.

The NASA Director of the Facilities Engineering Division stated in a letter to our office on March 14, 1996 that ". . . we will clarify para 4.5 of the handbook to state that estimates shown on page two of NASA Form 1510 should be submitted and commensurate with the level of information known at that time." We believe this change in the guidance and adherence to the guidance by JPL will provide NASA Headquarters with a better basis for the approval or disapproval of CoF projects.

***RECOMMENDATION***

The NASA Associate Administrator for Management Systems and Facilities should:

a. clarify the NASA Facility Project Implementation Handbook, NHB 8820.21, on the level of detailed cost estimates to be provided with the NASA Form 1510 when submitting CoF project candidates for review and approval, and

b. require submission of the appropriate CoF project cost estimate and/or basis for the estimate as part of their review and approval process.

***Management's Response***

"We concur with your two recommendations. We will issue guidance to the Centers that Page 2 of Facility Project Cost Estimate, (NASA Form 1510) must always accompany Page 1 when projects are submitted to Headquarters at appropriate times during the CoF process (Enclosure 1). Also, the letter will state that the estimate should be commensurate with the level of design. However, there are points in the draft report that require clarification. Otherwise, misinterpretations may be inferred by a reader of the report."

The following is a paraphrase of the remaining Code JX management response. The full text of the response is enclosed as Appendix A.

(1) The report states that there is a need for improved cost proposal data and the lack of complete data prevents sound decision-making. Normally, Centers submit estimates that are appropriate to the stage

of design development. These estimates should be submitted on Page 2 of NASA Form 1510 and be commensurate with the level of information known at that time.

(2) The report discusses the sewage treatment project. This project " . . . was not an element of the FY 1996 NASA budget submission to Congress on February 6, 1995, 2 months prior to commencement of the audit."

(3) The report deals with the topic Cost Proposal Data and discusses the canceled battery project. The project's increased cost between the two battery bank proposals related to an increase in scope that was questioned by Code JX personnel.

(4) " . . . the report uses the change in estimates for Building 198 from the preliminary stage to the completion of design stage as an example of project approval without detailed cost estimate."
We do not expect estimates of the same refinement for the preliminary stage of a project as we do for the completion of the design stage, but we do expect NASA Form 1510, Page 2, to be submitted and reflect the appropriate detail commensurate with the stage of development. "In consonance with this thought, the fact that the estimate changed in October 1995 from the estimate of November 1993 on this FY 1996 project is inconsequential."

***Evaluation of Management's Responses***

The actions planned by NASA Headquarters are considered responsive to the recommendation. Contained below is our assessment of management's response in the same order as presented above.

(1) We recognize that the cost estimates normally become better defined as a project matures. However, we found that the methodology and detail for the derived estimate of projects were often missing from the cost proposal packages submitted to Code JX. Without such detail, a sound basis to judge the reasonableness of the costs submitted for approval is lacking. Your agreement to now require this sort of detail included with the cost proposal submissions to your office should rectify this problem.

(2) During the audit, the DSN CoF Program Manager and his staff identified, in writing, the sewage treatment project as a non-mission essential project that could be deferred. At that time, project construction was scheduled to be awarded March 1, 1996 and be completed on March 1, 1997. This project was within the scope of our audit.

(3) Nothing came to our attention regarding Code JX personnel questioning the increased cost between the two proposals submitted for a third battery bank. More importantly, the Code JX personnel should have questioned the need for the third battery bank as part of their proposal evaluation. It was only after our audit questioned the need for the project that action was taken to have it canceled.

(4) Similar to point (1) above, Building 198 cost details were not made available to Code JX between the 1993 and 1995 JPL cost estimates. The November 1993 estimate from which Code JX was managing this project was $105,000 or 19 percent higher than a detailed cost study JPL had developed in October 1995. We believe cost estimates as they become refined should be provided to Code JX for use in decision-making and ensuring excess funds are identified for potential use on other priority projects.

***GENERAL COMMENTS***

We appreciate the courtesy, assistance, and cooperation extended by JPL and the NASA Associate Administrator for Management Systems and Facilities personnel contacted during the audit. We also thank the NASA Management Office for their assistance.

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## MAJOR CONTRIBUTORS TO THIS AUDIT

| | |
|---|---|
| Jet Propulsion Laboratory | Mr. Roger Flann, Audit Field Office Manager |
| | Mr. Stan Graves, Auditor-in-Charge |

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**APPENDIX A**

## Management's Response

National Aeronautics and
Space Administration
**Headquarters**
Washington, DC 20546-0001


Reply to Attn of JX

JUN 6 1996

TO: W/Assistant Inspector General for Auditing

FROM: JX/Director, Facilities Engineering Division

SUBJECT: Draft Report, Planned Construction of Facilities at the Jet Propulsion Laboratory (JPL), Assignment No. A-JP-95-0007

This responds to your letter of May 7, 1996, subject as above. We concur with your two recommendations. We will issue guidance to the Centers that Page 2 of Facility Project Cost Estimate, (NASA Form 1510) must always accompany Page 1 when projects are submitted to Headquarters at appropriate times during the CoF Process (Enclosure 1). Also, the letter will state that the estimate should be commensurate with the level of design. However, there are points in the draft report that require clarification. Otherwise, misinterpretations may be inferred by a reader of the report.

On page 6, the report states "... the adequacy of project cost proposal data provided to NASA Headquarters by JPL needs improvement. The lack of complete cost data prevents NASA managers from having a sound decision-making basis for the approval or disapproval of projects to fund." Please refer to my letter of March 14, 1996, (Enclosure 2), which dealt with the previous draft report. That letter explains the expectations associated with cost estimates. For example, in the early stages of project development, before the design is started, we do not expect detailed cost estimates. The preliminary estimates are normally based on similar projects and developed from methodologies such as "Parametric Estimating," or "Means Building Construction Cost Data." Detailed estimates are developed later in the design process. That is why our March letter stated "...estimates shown on Page two of NASA Form 1510 should be submitted and be commensurate with the level of information known at that time." Normally, Centers submit estimates that are appropriate to the level of design.

Also on page 6, the report refers to the third backup battery bank at the JPL Deep Space Network location and the modification of a sewage treatment system at Madrid, Spain. The third battery bank project has been canceled. A much smaller project to replace batteries in one of the two existing banks has been approved. However, the sewage treatment project, which is also

discussed on Page 8, was not an element of the FY 1996 NASA budget submission to Congress on February 6, 1995, 2 months prior to commencement of the audit.

On page 9, the report deals with the topic of Cost Proposal Data. It uses the canceled battery bank project and a project in Building 198. Initial submission of the third battery bank project occurred in November of 1992 and again in November of 1993 for consideration and incorporation into the FY 1995 or FY 1996 budget, respectively. Although the titles were the same, the scope of the project had increased. Hence, the increase in estimated cost. Code JX personnel questioned the increase in scope and cost during the review process for the FY 1996 budget. Also, the project was not "approved" during 1992 or 1993. However, JPL was allowed to continue the study/design process so that sufficient design cost information could be completed prior to determining its inclusion into the FY 1996 CoF budget.

Finally, the report uses the change in estimates for Building 198 from the preliminary stage to the completion of design stage as an example of project approval without detailed cost estimate. We do not expect estimates of the same refinement for the preliminary stage of a project as we do for the completion of the design stage. We do expect that page 2 of NASA Form 1510 be submitted and understand that the level of detail on this page will vary with the extent that the design has matured. In consonance with this thought, the fact that the estimate changed in October 1995 from the estimate of November 1993 on this FY 1996 project is inconsequential. Savings are realized during the remainder of the CoF process; bid opening, award of a contract, settlement of subsequent changes and claims determine the amount of savings. Intermediate estimates of savings are used in managing the Congressionally approved CoF Budget, but the official Budget Amount for a project is not altered.

Thank you for allowing me the opportunity to comment on the draft report.

W.W. Brubaker

2 Enclosures:
1. Draft Guidance letter
2. JX letter, March 14, 1996

cc:
JM/Mr. Robbins

**Enclosure 1**

## Management's Response

JX

TO: See Distribution

FROM: JX/Director, Facilities Engineering Division

SUBJECT: Clarification on the Use of Page 2, Facility Project Cost Estimate, NASA Form 1510

A recent Inspector General draft report highlighted that page 2 , Facility Project Cost Estimate, NASA Form 1510, was either not submitted or insufficient detail existed to justify a Center's Construction of Facilities project. As clarification, page 2 must always accompany page 1 when submitted to this headquarters.

The above guidance applies to three specific points in time during the current CoF process. This entails: initial submission for requesting facilities planning and design funds, the submission of projects being considered for inclusion in the Office of Management and Budget submission, and your request for construction funding in the budget year.

The level of detail on page 2 must reflect the stage of design at that time. Obviously, only a preliminary estimate exists when requesting initial FP&D funds. The OMB submit requires a cost estimate based upon design progress to 35 percent where possible. Requests for construction funding requires a cost estimate based upon at least nearly completed plans and specifications.

W. W. Brubaker

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Enclosure 1 of 2

**Enclosure 2**

## Management's Response

MAR 14 1996

JX

TO: W/OIG Audit Field Office Manager, Jet Propulsion Laboratory

FROM: JX/Director, Facilities Engineering Division

SUbJECT: Discussion Draft Audit Report, Planned Construction of Facilities at the Jet Propulsion Laboratory (JPL) Assignment No. A-JP-95-007

This is response to your letter of February 23, 1996 subject as above. The following are your recommendations from that letter and our response.

**Recommendation No. 2** recommends the NASA Associate Administrator for Management Systems and Facilities should require that the project submission process, contained in the NASA Facility Project Implementation Handbook, NHB 8820.2a, be followed before approving Construction of Facilities (CoF) projects.

**Code JX Response:**

In order to make "...full disclosure of the scope and cost of the facility requirements at the specific locations..." the design of the project should be in progress. The initial submission of Forms 1509 and 1510 (which occurs in November two years prior to the budget year) provides planning stage information and estimates. The Centers use this to request Facilities Planning and Design (FP&D) funds to continue the study and initiate the design process. Normally, a detailed cost estimate cannot be provided until the design is well along the way. However, we will clarify para 4.5 of the handbook to state that estimates shown on page two of NASA Form 1510 should be submitted and be commensurate with the level of information known at that time.

Concerning the battery bank project, we also questioned the rise in the estimated cost of the project from the proposed FY 1995 version and the proposed FY 1996 version. JPL advised that the scope of the project had changed and increased from its previous submission. Please note that the project was not "granted approval" for inclusion into the FY 1996 CoF program based on the November 1993 submission. However, JPL was allowed to continue the study/design process so that sufficient design cost information could be completed prior to determining its inclusion in the FY 1996 CoF budget.

Enclosure 2 of 2

## Management's Response

Project 96PMCZ to refurbish corridors in Building 198, illustrates that estimates are refined as design progresses. In this case, the November 1993 Current Cost Estimate (CCE) represents the initial submission (Planning Stage) of the project for the FY 1996 CoF program. The purpose of the initial submission is to provide Headquarters information to issue FP&D funds and start the decision process for developing a CoF program for the budget year two years hence. It is not an "approval" of a project for inclusion in any one fiscal year CoF Program, but allows for the development of additional engineering information upon which to make a budget decision. The October 1995 CCE was the final estimate based upon completed plans and specifications prior to initiating the construction solicitation process. Please remember that these are estimates. The actual construction costs of a project start with the award of a construction contract and continues through construction and ends when all modifications, change orders and claims are settled. The $105,000 difference you point out may or may not be realized.

**Recommendation No. 3** recommends the NASA Associate Administrator for Management Systems and Facilities should reevaluate the need and prioritization for about $1.5 million of CoF projects identified at Exhibit 1 to the draft report.

**Code JX Response:**

**Project 95 PMBZ, Project 96 PMHZ, and Project 96 PADZ.** We appreciate your decision to delete these projects from your report.

**Project PAAZ Minor Construction Remote Sensing Instruments Laboratory [M/C Project Number 3699].** Enclosed is documentation from Codes S and Y which supports the project need. In addition, we recently received concurrence from Codes S and Y to advertise and solicit bids for this project. Award is contingent upon the availability of resources. The project is scheduled for construction in the near future in order to accommodate the short construction season at Table Mountain.

**Project QAAZ96 Modify Sewage Network, Madrid Spain** This project was proposed (November 1, 1993) for inclusion in to the FY 1996 CoF program but was not included in the September 1994 OMB submission for the FY 1996 CoF Budget. The project currently appears in Code O FY 1999 program.

**Project QRDZ96 Design and Construction to Water Distribution System, Goldstone, Ca.** Enclosed is a copy of Letter from Code QS to Code OT, dated February 5, 1996, Subject: Fire Protection projects at Goldstone Deep Space Network Facility. This letter states the project should be constructed for the indicated safety matters.

**Enclosure 2**

## Management's Response

We appreciate your effort in the resolution of outstanding issues regarding the subject report and are hopeful that the above additional information will be helpful to you.

Original Signed by
W. W. Brubaker
W.W. Brubaker

Enclosures: 3

JX/KASS 3/11/96 JX/ELDRED 3/12/96 JX/VITAGLIANO 3/14/96

JX/Kass:hk:IG ltr 2/23, 1996 repns-2(Howard's Computer):
358-1128:3/7/96: Revised: JV/HK/WWB: 3/11/96