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**CNWRA PROGRAM MANAGER'S PERIODIC REPORT
ON ACTIVITIES OF
THE CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES**

**For The Fiscal Reporting Period
January 18, 1991 - February 14, 1992
PMPR No. 92-05**

February 28, 1992

426.1

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**CNWRA PROGRAM MANAGER'S PERIODIC REPORT
ON ACTIVITIES OF THE
CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES**

TITLE: Center for Nuclear Waste
Regulatory Analyses

FIN: D1035-8

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CONTRACT NO: NRC-02-88-005

ESTIMATED BUDGET: \$42,550,000

SITE: 6220 Culebra Road
San Antonio, Texas

PERIOD OF PERFORMANCE: 10/26/87 - 10/26/92

PERIOD OF THIS REPORT: 01/18/92 - 02/14/92

1. SUMMARY

1.1 Technical Status

NMSS Element 1 - CNWRA Operations

NRC and Center management continued effective coordination meetings and conferences addressing a range of day-to-day and long-term management topics (Section 2). Topics of discussion included the ADP and Center Management Plans, and preparations for contract renewal.

The current status of Center staffing is indicated in the attached tables, which have been revised in accordance with the November 1991 Center Staffing Plan. Intensive recruitment efforts continued for the positions in material science, earth science, numerical analysis, computer science, and systems engineering. Dr. John Walton joined the Center staff this period.

The ADP Plan was revised and transmitted to NRC. Revisions were also made to the Operations Plan for this Element. Attention was also focused on contract renewal activities. A decision was made to delay modifying the FY92-93 Operations and Project Plans at this time, due to the press of other higher priority work.

Quality Assurance activities continued to focus on implementation of the Center QA system (particularly in the area of quality planning), surveillances, review of technical operating procedures and development of quality assurance procedures, and QA indoctrination and training. Review and revision of personnel qualification forms continued.

NMSS Element 2 - Waste Systems Engineering and Integration

Center staff continued to work with the NRC on the refinement of guidance for Compliance Determination Strategies (CDS) type selection and subsequent development of the CDSs in standard 'synopsis' format (Section 3). This activity included working with NRC staff on the development of the CDS procedure, as well as development of CDSs for Mining Regulations, Naturally Occurring Materials, Flooding, and Retrievability Regulatory Requirements, and review of draft CDSs. The Center continued the development of draft procedures and training materials for Compliance Determination Strategies and Methods, and draft interim guidance for development of Technical Review Components (TRCs).

The Center continued to participate in task force follow-up work concerning the relationships between the RR/REOP and Format and Content Regulatory Guide structures. These efforts are focused on resolution of the problems identified in Section 1.2 Major Problems in previous periods. Although this continued to receive considerable staff and management attention, closure remained elusive.

Discussions continued on the Repository Isolation Criteria (RIC) work plan and preparation of the final Repository Functional Analysis (RFA) report.

The Center continued development of Version 2.1 of PASS, which will include an Interactive Input Support Subsystem (IISS). Maintenance software for PASS is also under development.

Development of the prototype Open Item Tracking System (OITS) continued.

Initial activities on an NRC-requested Geotechnology Decision Study commenced.

NMSS Element 3 - External Quality Assurance

Activities this period primarily involved planning, with no audits or surveillances being conducted (Section 4). Center staff assisted in the NRC revision of the Division of High-Level Waste Management (HLWM) Manual.

NMSS Element 4 - Geologic Setting

At the request of J. Trapp and P. Justus, a supplementary review of DOE Study Plan 8.3.1.8.1.1 entitled "Probability of magmatic disruption of the repository" was initiated to specifically address the potential for problems related to using the methods proposed in the study plan for time frames of 10,000 years and beyond (Section 5). Staff interactions with NRC continued on the development of suitable criteria for considering optional alternative requirements for the geologic subsystem.

The Natural Resources Assessment Methodology study continued with primary efforts related to development of the CDS for this Regulatory Requirement (see Sections 3 and 5). Technical background studies continued on the potentially adverse conditions on flooding, natural resources, volcanic hazards, and tectonics. Limited work on Systematic Regulatory Analysis (SRA) also occurred on these subjects. Organizational meetings were held at the Center on January 29-31, 1992, to discuss the application of Systematic Regulatory Analysis (SRA) in tectonics, volcanic/magmatic hazards, natural resources, and seismology. The letter report "Identification of Pertinent Regulatory Requirements for Systematic Regulatory Analyses of Issues Related to Probabilistic Fault Displacement and Seismic Hazard Analyses in 10 CFR Part 60" was completed and forwarded to NRC February 7, 1992.

Work continued on development of methods for review of tectonic models, detailed evaluation of DOE cross sections of Yucca Mt., and integration of data into tectonic models.

The Lawrence Livermore National Laboratory (LLNL) PSHA code was obtained from LLNL and installed on CNWRA's SUN Sparc2 workstation. USGS code which will be used to interpret and plot their seismic event tapes (previously sent to the NRC) has been installed. The sample tape supplied by the NRC has been read and will be plotted using the USGS software. Other codes for calculations and analysis of digital seismic records have been ordered to permit independent analysis of the NRC digital seismic event records as required.

A major organizational meeting was held in mid-February to establish the work plans, schedules, and levels of participation of key participants in the structural geology and tectonics work activities Center, SwRI, consultant, and NRC RES and HLW staffs were involved.

NMSS Element 5 - Engineered Barrier Systems

Revisions continued on both the work plan for the Substantially Complete Containment (SCC) example problem and the EBSPAC Plan update (Section 6). The former will include a review of experience with buried structures and a review of the calculational algorithm for the example problem.

Documentation of the initiation model for occluded cell crevice corrosion and its modification for use in the Iterative Performance Assessment (IPA) was completed.

Leaching of borosilicate glass samples obtained from the Savannah River Laboratory were initiated, following development of appropriate procedures.

NMSS Element 6 - Repository Design, Construction, and Operations

Center staff conducted and reported on its preliminary review of the DOE Site Characterization Plan Progress Report (Section 7). Recommendations were made regarding documents which may need more indepth review. Selected staff attended the NWTRB Panel on Structural Geology and Geoengineering in Irvine, California, which addressed seismic vulnerabilities of geologic repositories.

S. Hsiung was part of a staff exchange to the NRC offices where he was engaged in intensive efforts resolving comments on the NRC technical position on thermal loads. The working group included NRC, Center, and subcontractor staffs.

The Design Basis Accident (DBA) rulemaking effort continued, with the remaining SRA activities continuing in parallel to ensure that the complete package of supporting information is complete prior to issuance of the proposed rulemaking. The Acceptance Criteria Report for the development of the Repository Operational Criteria (ROC) Activity 3 was completed and transmitted to NRC January 24, 1992.

A literature review continued on the examination of the state-of-the-art in fully and partially coupled modeling of thermal-mechanical-hydrological-chemical processes relevant to repositories. The source code for the two-dimensional distinct element code UDEC was procured, so that necessary modifications can be made to support staff technical assistance, technical review, and research activities.

NMSS Element 7 - Performance Assessment

Center management staff participated in an evaluation of training needs in the area of performance assessment (Section 8). The needs of both management and technical staffs were considered.

A kick-off meeting was held January 24, 1992, to initiate a study of the elicitation and use of expert judgement in performance assessments. Center, consultant, and NRC staff were involved.

Information presented by the various participants at the IPA coordinators indicated that development of the source term code and consequence modules for disruptive scenarios are behind schedule. The waste-package failure module is complete and the waste dissolution and near-field transport module is under development.

Additional test cases were selected and are being set up to augment the results of the recent report on preliminary regional-scale hydrogeology modeling of the saturated zone in the vicinity of Yucca Mt. This report considered a variety of scenarios which could hypothetically lead to changes in the groundwater level in the vicinity of the proposed repository site. Work continued in each of these areas, as well as on preparation of Part 2 of the report on sensitivity and uncertainty analysis. A report titled "Effects of Layering, Dipping Angle, and Faulting on Two-Dimensional Variably Saturated Flow" was completed as part of the auxiliary analyses and was transmitted to NRC.

Research Project 1 - Overall Research

Laboratory experimentation continued in Building 57 and in other SwRI facilities on six Center research projects (Section 9). Modification commenced to install an additional fume hood.

Work continued in each of the Projects on the 1991 Research Annual Report. With the exceptions of the Overall, Seismic Rock Mechanics, and Integrated Waste Package Experiments Projects, all revised Project Plans and Task 1 of the new Plan on Volcanism have been approved. Efforts continue to obtain NRC comments and resolution of same on the remaining Plans, so that work can progress unimpeded.

Task 2 activities included (i) coordination regarding preparation and review of papers for the proceedings of the 1991 Workshop on the Role of Natural Analogs in the Geologic Disposal of Nuclear Waste and (ii) preparation for a two-day workshop on the Use of Geochemical Modeling Software EQ3/6, which will be conducted February 25-26, 1992.

Internal Quality Assurance activities continued in accordance with the requirements of the Center Quality Assurance Manual and related implementing procedures. Surveillance of experimental activities and oversight of the technical review process are continuing focuses of attention, as is configuration management and control of scientific and engineering codes used in the conduct of research work.

Research Project 2 - Geochemistry

Reverse experiments at 25°C to study the precipitation of analcime from supersaturated solutions continued. In addition, aqueous samples for chemical analysis were taken from mixtures designed to determine equilibrium between analcime+clinoptilolite+aqueous-solutions.

Ion exchange experiments to evaluate the effects of anionic composition on exchange equilibria between aqueous solutions and clinoptilolite continued using mixed cations and mixed anions. Reverse experiments for the mixtures involving NaCl/KCl and NaCl/CaCl₂ were completed.

A paper titled "Dissolution rate and solubility of analcime at 25°C" was prepared for submission to the International Water-Rock Interaction conference.

Research Project 3 - Thermohydrology

The first thermohydrologic experiment under Task 3 continued. Early examination of the movement of the dye tracer, which is being injected into the medium to help track the movement of liquid water, continues to indicate three-dimensional flow in the vicinity of the heater element in this two-dimensional geometry experiment. Analysis of data from Tests 5 and 6 also continued in support of several reports that are in preparation.

Laboratory determination of the moisture retention characteristics of the alumina beads used in these studies continued, with an aim of developing an adequate representation of the suction-pressure/saturation relationship for use in numerical and analytical models.

Planning for a project peer review, including development of a comprehensive report on results to date, continued. The due date for this report is February 17, 1992, although an extension may be necessary to accommodate internal Center review and revision of the document.

Research Project 4 - Seismic Rock Mechanics

Data collection continued from the 50 extensometers, two triaxial velocity gauges, eight closure point stations, four piezometers, and a hydrophone which were installed at the field experimental site at the Lucky Friday Mine. Most of the field data continues to be acquired remotely using a computer located in the Center offices in San Antonio. Significant rock displacements and hydrologic responses have been observed to date.

Laboratory direct shear testing of single joint rock specimens continued. Pseudostatic and step-velocity tests are being conducted. Data are being analyzed in the context of Coulomb, Barton-Bandis, and continuously yielding rock joint models.

The second benchmark analysis continued this period with the discrete element code DECICE. Work on the DECOVALEX task commenced following NRC verbal approval.

Results of the field studies to date were presented in a comprehensive three-hour briefing to the U.S. National Committee for Rock Mechanics and in a shorter presentation to the Nuclear Waste Technical Review Board (NWTRB), in two separate meetings January 21 and 22, 1992.

Research Project 5 - Integrated Waste Package Experiments

Pitting repassivation potential tests continued using specimens of alloy 825 and 316L. Early results suggest no effect of initial pit depth in cases where the pits were relatively deep. The equipment was assembled for conducting tests under alternating wet and dry conditions.

A series of slow strain-rate tests was conducted on CDA 102 (oxygen-free copper) at room temperature. Two specimen geometries were evaluated in a single aqueous solution composition. Only ductile failures were observed in these tests.

Short-term tests of intergranular corrosion susceptibility of specimens of alloy 825 were completed in accordance with ASTM A-262, Procedure C. Analysis of results is in progress.

Research Project 6 - Stochastic Analysis of Large-Scale Flow and Transport in Unsaturated Fractured Rock

Task 2 work included continued work to consider introduction of auxiliary hydrodynamic models suitable for large-scale simulations of partially saturated flow in heterogeneous fractured rocks. Results from previously conducted simulations using BIGFLO were assembled. Activities focused on input to the Research Annual Report.

Research Project 7 - Geochemical Analogs

Planning and preparation for additional field research at the Peña Blanca March 1 through 6, 1992, continued. Activities during this trip are expected to include detailed sampling of ore and related rocks at the Nopal I deposit; quality assurance checks of maps completed under contract with I. Reyes of the University of Chihuahua; and meetings with representatives from the *Comision Nacional de Seguridad Nuclear y Salvaguardias*, the *Consejo Recursos Minerales*, and the *Fideicomiso de Fomento Minero*.

Characterization of high-grade uranium ore and associated host rocks from Peña Blanca continued with additional scanning electron microscopy, x-ray diffractometry, energy-dispersive spectrometry, and optical petrography. Evaluation and interpretation of electron microprobe data continued. Preparation of chemical reagents for U and Th isotopic analysis of fluid samples by alpha spectrometry continued. Measurement of the radioisotope content of Peña Blanca rock samples by gamma spectrometry and sample preparation of Peña Blanca rock samples for isotope dilution alpha spectroscopy continued.

Research Project 9 - Sorption Modeling

Experiments to study sorption of uranium on the zeolite mineral clinoptilolite under carbonate-free conditions were initiated using a controlled-atmosphere (nitrogen purged) glove box. Experiments initiated in the previous reporting period and under conditions in equilibrium with atmospheric CO₂ continued, with aqueous samples being taken for uranium concentration analysis using polarography and for pH measurement.

A detailed workplan of the Sr adsorption experiments was submitted to the radiation safety office at SWRI for approval. Preparation for the start of the Cs and Sr sorption experiments began by obtaining the appropriate shielding and supplies. Initiation of these experiments will begin as soon as approval of the workplans from the SWRI radiation safety committee is obtained.

Thermodynamic data from the EQ3/EQ6 database were adapted for use in the MINTQA2 database for Am, Pu, Tc, and Np. Reformatting of data for other key constituents continues.

A preliminary version of the MINEQL/PSI radionuclide database was obtained from researchers in Switzerland and is being evaluated for use.

Research Project 10 - Performance Assessment

G. Wittmeyer attended the INTRAVAL conference in Sidney, Australia, where he presented the results of research on model validation and presented the invitation to the next INTRAVAL meeting, which will be hosted by the Center in San Antonio.

The User's Manual for the code PORFLOW was completed and is undergoing internal technical review and editing in preparation for publication.

Work continued on evaluation of the application of massively parallel computers to the solution of groundwater flow problems. A code for partially saturated flow is being tested at this time. Results will be presented in the next Research Quarterly Report.

The literature review on colloid transport continued

Simulations of the Las Cruces trench site continued, and consideration is being given to using a data set developed by the USGS for the Yucca Mountain site.

Research Project 11 - Volcanic Systems

Staff continued surveying, compiling, and reading literature pertinent to conduct of the Volcanism Research Project.

On February 13, an intensive workshop was held in San Antonio which brought together the Center consultants in volcanism, tectonics, and Yucca Mountain area geology for discussions on integration of Center activities in the areas of volcanism and tectonism. The meeting successfully focused the consultants and Center staff on timely completion of the Task 1 literature review for the research project, and set the stage for undertaking the remaining tasks of the project as well. Consultants present included W. Leeman, J. Luhr, and B. Marsh in volcanism/magmatism; A. Morris and B. Wernicke in tectonics/structural geology; and L. McKague in Yucca Mountain area geology/stratigraphy.

LSSA Support - Development of Access Protocols for Technical Data

LSSA staff continued their evaluation of the overall outline for the access protocols plan. Current thoughts, which continue to be developed and discussed, call for development of a succession of draft reports and associated meetings which would lead to a final product.

Discussions continued regarding the "Preliminary Report on the Feasibility of Priority Loading of the Licensing Support System (LSS)," which was transmitted to NRC December 18, 1991. The Center examined revising its approach to surveying the LSS participants. Revisions to the Operations Plan continued, to incorporate requested changes to these tasks.

Waste Solidification Systems

There were no significant activities this period (Section 11).

A staff member attended and prepared a trip report on the International Symposium on Above Ground Storage Tanks which was held in Houston, Texas, January 14-16, 1992.

1.2 Major Problems

Although NRC and CNWRA staff and management continued to aggressively address problems related to SRA which are impacting the planned conduct of work in support of the NRC, efforts have not yet met with success. Analyses appear to be complete, including crafting of alternative language for pertinent sections of the rule. Effective review, resolution, and closure of the issue continue to be elusive. Joint NRC/CNWRA task forces continued to address these problems and a management-level meeting is planned for next period to attempt resolution and closure.

Approval of all or part of three Research Project Plans submitted in September 1991 continues to be awaited, due to unresolved issues.

1.3 Forecast for Next Period

Work will continue in accordance with the revised FY92-93 Operations Plans and Project Plans. Contract renewal activities will also be a focus of management staff efforts. Staffing will continue to be a high priority activity, within the constraints of funding. Work will commence on Task 6 of the Center Operations Element. Implementation of Change 3 of Revision 2 of the Center Quality Assurance Manual will continue.

The conduct of Systematic Regulatory Analyses will continue with an emphasis on completion and issuance of guidance on the selection of Compliance Determination Strategy types and development of Compliance Determination Strategies and Methods, participation in task force follow-up activities addressing the relationships of Sections 112 and 122 of 10 CFR Part 60, and restructuring and updating of the governing procedures for SRA. Work will continue on preparation of the RFA final report, and a date will be established for its completion.

Demonstration and training on Version 2.0 of PASS will continue for Center and NRC staff, as appropriate. Prototyping of Version 2.1, Interactive Input Support Subsystem will continue. The Configuration Management and Control Manual for CNWRA computer systems will continue to be implemented as well as ongoing maintenance, optimization, and extensions to PASS Version 2.0. Work will continue on the Open Item Tracking System (OITS).

Center and QA staff professionals will continue to plan and coordinate upcoming audit observations. A Quality Assurance Observation Audit will be conducted at Oak Ridge National Laboratory February 24-27, 1992.

The Geologic Setting Element activities will continue to focus on technical assistance in the potential regulatory guidance on Natural Resources Assessment Methodology, GWTT, and seismic hazard analysis, including assistance in the review and evaluation of key draft reports submitted in these areas. Staff will support joint NRC and CNWRA work on the SRA. A staff exchange with J. Bradbury is planned for next period.

The SCC example problem and EBSPAC Plans will be completed in the EBS Element, and work will continue on the related studies. Testing of borosilicate waste form will continue.

Activities within the RDCO Element will include response to comments on the technical position on thermal loads, work under ROC Activity 3, the DBA rulemaking, the literature review on coupled modeling, and prelicensing reviews (as requested by NRC).

Work on the various Phase 2 Iterative Performance Assessment activities will continue within the Performance Assessment Element, in accordance with the Operations Plan. SRA of the total system performance objective will also continue with a focus on preparation of a Compliance Determination Strategy and evaluation of 40 CFR Part 191.

Work will continue on all research projects, in accordance with the approved FY92-93 Project Plans. Work will continue on the 1991 Research Annual Report.

Within the LSSA Element, the Center will submit its report on attributes for non-text-searchable materials and the table of contents for packages. The proposal for work under Task 2 will be completed, and a revised Operations Plan for this work will be submitted to NRC.

Tasks 1 and 5 will be initiated and Tasks 3 and 4 will resume in WSS.

1.4 Summary Financial Status

Table 1 below indicates the financial status of the Center in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Total commitments of the Center are \$306,652. The attached figures following each table display the estimated cumulative spending plan and the actual cumulative costs to date.

In addition, cumulative spending plans and actual cumulative costs to date are included for both the Division of High-Level Waste Management (HLW) (Table 3) and Office of Nuclear Regulatory Research Division of Engineering (RES) (Table 4) components of the Center program. These allow easy comparison of planned versus actual expenditures at the FIN level. (Note that since the LSSA project and WSS project are the only projects within their respective FINs, they are not repeated here.)

Total costs of the Center and for the HLW, RES, and WSS FINs are significantly under plan. Costs are somewhat over plan in one research project. Detailed analyses of the cost variances of the individual Elements and Projects are presented in the corresponding Financial Status sections of this report. To summarize, the variances are due primarily to

four factors: (i) assignments/approvals of work have not yet been received (particularly in Task 1 of HLW Elements), (ii) commensurate under-utilization of subcontractor and consultant staff in these activities, (iii) unresolved issues related to Systematic Regulatory Analysis have delayed certain activities in WSE&I and Task 2 of the technical Elements, and (iv) incomplete staffing in certain areas (note that although associated table shows the Center as fully staffed with respect to Plan, two staff members have not yet reported for work).

| Table 1. Financial Status | |
|---|--------------|
| FY92 Funds Authorized (a) | \$ 7,771,309 |
| FY92 Funds Costed to Date (b) | \$ 3,651,320 |
| FY92 Funds Uncosted (c) | \$ 4,119,989 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:** (a) Authorized funds remaining after FY91 actual expenditures with fee.
 (b) Actual expenditures FY92 YTD without fee.
 (c) Difference between (a) and (b).

CENTER CORE STAFF - CURRENT PROFILE (02/14/92)

| EXPERTISE/EXPERIENCE | |
|--|--|
| ADMINISTRATION | J. Latz, R. Adler, H. Garcia, P. Mackin, W. Patrick |
| CODE ANALYST | R. Martin, R. Janetzke (02/17/92) |
| DATA BASE MANAGEMENT AND DATA PROCESS. | S. McFaddin |
| ELECTROCHEMISTRY | G. Cragolino |
| ENGINEERING GEOLOGY/GEOLOGICAL ENGN | |
| ENVIRONMENTAL SCIENCES | P. LaPlante |
| GEOCHEMISTRY | W. Murphy, R. Pabalan, E. Percy, J. Prikryl, D. Turner |
| GEOHYDROLOGY/HYDROGEOLOGY | R. Ababou, A. Bagtzoglou, R. Green, G. Wittmeyer |
| GEOLOGY | J. Russell, M. Maldas |
| HEALTH PHYSICS | J. Hageman |
| INFORMATION MANAGEMENT SYSTEMS | R. Johnson, R. Marshall |
| MATERIAL SCIENCES | P. Nair, H. Manaktala, N. Sridhar |
| MECHANICAL, INCLUDING DESIGN & FABRICATION | C. Tschoepe |
| MINING ENGINEERING | S-M. Hsiung |
| NUCLEAR ENGINEERING | H. Karimi |
| NUMERICAL MODELING/ANALYSIS | J. Walton |
| PERFORMANCE ASSESSMENT | B. Sagar, R. Baca, B. Gureghian, R. Manteufel |
| QUALITY ASSURANCE | B. Mabrito, R. Brient |
| RADIOISOTOPE GEOCHEMISTRY | B. Leslie |
| REGULATORY ANALYSIS | S. Spector (Law) |
| ROCK MECHANICS | A. Chowdhury, M. Ahola |
| SEISMOLOGY | R. Hofmann |
| SPENT FUEL DEGRAD./SOURCE-TERM | |
| STRUCTURAL GEOLOGY/SEISMO-TECTONICS | G. Stirewalt, S. Young |
| SYSTEMS ENGINEERING | D.T. Romine |
| VOLCANOLOGY/IGNEOUS PROCESSES | |

CENTER CORE STAFF - HIRING PROFILE AND STATUS (02/14/92)

| EXPERTISE/EXPERIENCE | FISCAL YEAR | | | | | | | | | TOTAL REQ'D | OPEN THIS QTR |
|--|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|---------------------|
| | FY92 | | | | FY93 | FY94 | FY95 | FY96 | FY97 | | |
| | 1Q | 2Q | 3Q | 4Q | | | | | | | |
| ADMINISTRATION | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 |
| CODE ANALYST (e) (g) | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | -1 |
| DATA BASE MANAGEMENT AND DATA PROCESS. (f) (b) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| ELECTROCHEMISTRY | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| ENGINEERING GEOLOGY/GEOLOGICAL ENGN (b) | | | | | | 1 | 1 | 1 | 1 | 1 | 0 |
| ENVIRONMENTAL SCIENCES | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| GEOCHEMISTRY | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 |
| GEOHYDROLOGY/HYDROGEOLOGY (b) | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 0 |
| GEOLOGY | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 |
| HEALTH PHYSICS | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| INFORMATION MANAGEMENT SYSTEMS | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 |
| MATERIAL SCIENCES (b) (a) (d) | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 1 |
| MECHANICAL, INCLUDING DESIGN & FABRICATION | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| MINING ENGINEERING | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| NUCLEAR ENGINEERING | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| NUMERICAL MODELING/ANALYSIS | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| PERFORMANCE ASSESSMENT (g) | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | -1 |
| QUALITY ASSURANCE | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 |
| RADIOISOTOPE GEOCHEMISTRY | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| REGULATORY ANALYSIS | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| ROCK MECHANICS (b) (d) (a) | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 0 |
| SEISMOLOGY | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| SPENT FUEL DEGRAD./SOURCE-TERM | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| STRUCTURAL GEOLOGY/SEISMO-TECTONICS (b) | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 0 |
| SYSTEMS ENGINEERING (f) (b) (d) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| VOLCANOLOGY/IGNEOUS PROCESSES (b) (a) | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| TOTAL REQUIRED | 44 | 46 | 47 | 47 | 51 | 54 | 54 | 54 | 54 | 54 | 1 |

- (a) Interview scheduled next period.
- (b) Resumes being solicited.
- (c) Offer made.
- (d) Offer pending.
- (e) Offer accepted.
- (f) Position re-opened.
- (g) Negative number indicates early hire.

Staffing Summary

| | Professional | Support | Total |
|---------------------|--------------|---------|-------|
| Current | 44 | 15 | 59 |
| Planned This Date | 45 | 15 | 60 |
| Planned End of FY92 | 47 | 16 | 63 |

3700-000

CENTER COMPOSITE

Element Status Cost Report

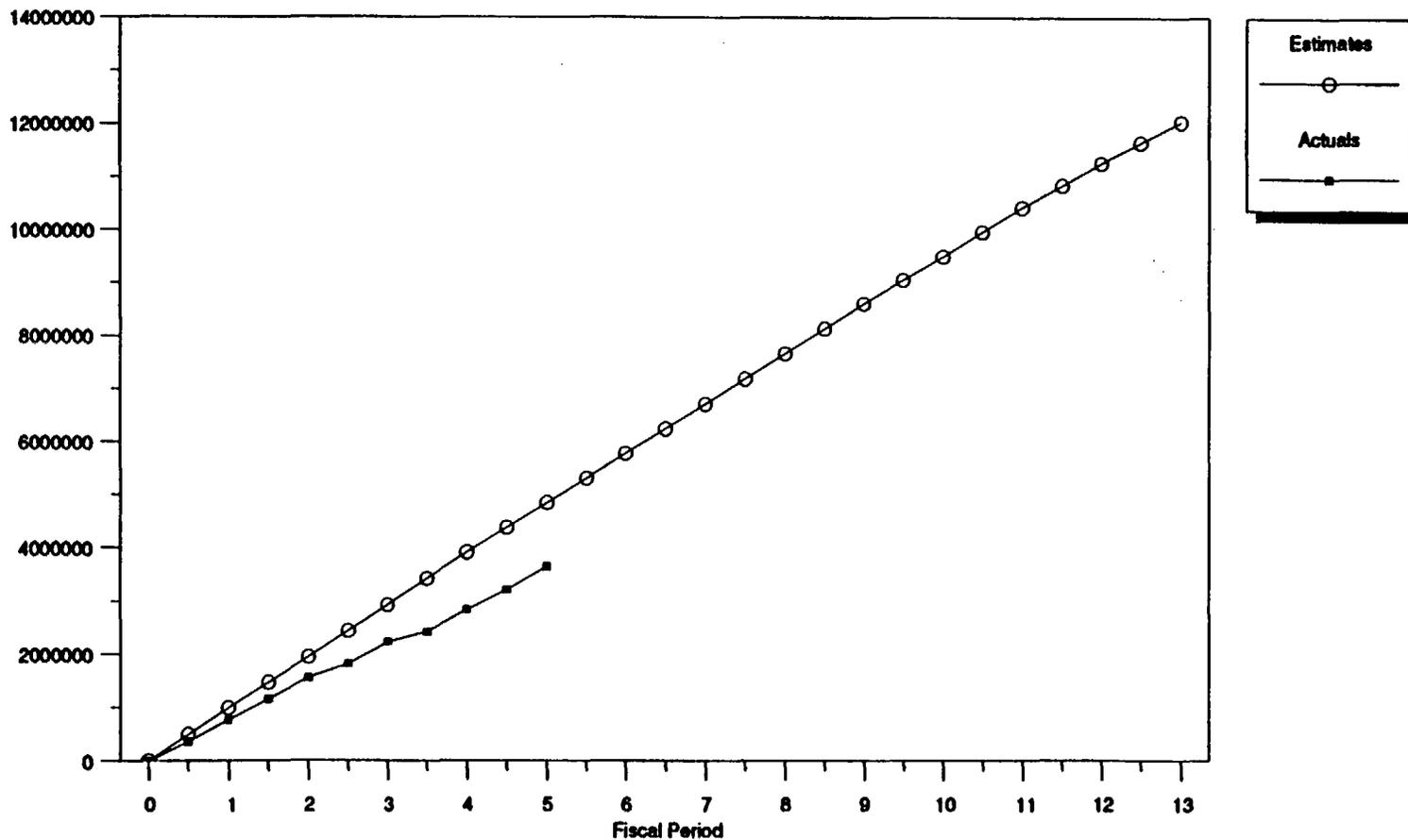
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|---------|
| EST PERIOD COST | 997202 | 948548 | 972653 | 994454 | 940242 | 925714 | 927065 | 956542 | 944143 | 887204 | 926782 | 835225 | 783419 | 4853099 |
| ACT. PERIOD COST | 771847 | 780672 | 674713 | 608807 | 815281 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3651321 |
| VARIANCE, \$ | 225354 | 167875 | 297940 | 385648 | 124960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1201778 |
| VARIANCE, % | 22.6 | 17.7 | 30.6 | 38.8 | 13.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 24.8 |
| EST. FY CUMUL | 997202 | 1945749 | 2918403 | 3912857 | 4853099 | 5778813 | 6705878 | 7662419 | 8606563 | 9493767 | 10420549 | 11255774 | 12039193 | |
| ACTUAL FY CUMUL | 771847 | 1552520 | 2227233 | 2836039 | 3651321 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.064 | 0.129 | 0.185 | 0.236 | 0.303 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 225354 | 393230 | 691170 | 1076818 | 1201778 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 22.6 | 20.2 | 23.7 | 27.5 | 24.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

1-13

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3700-000 Center Composite



3702

HLW

Element Status Cost Report

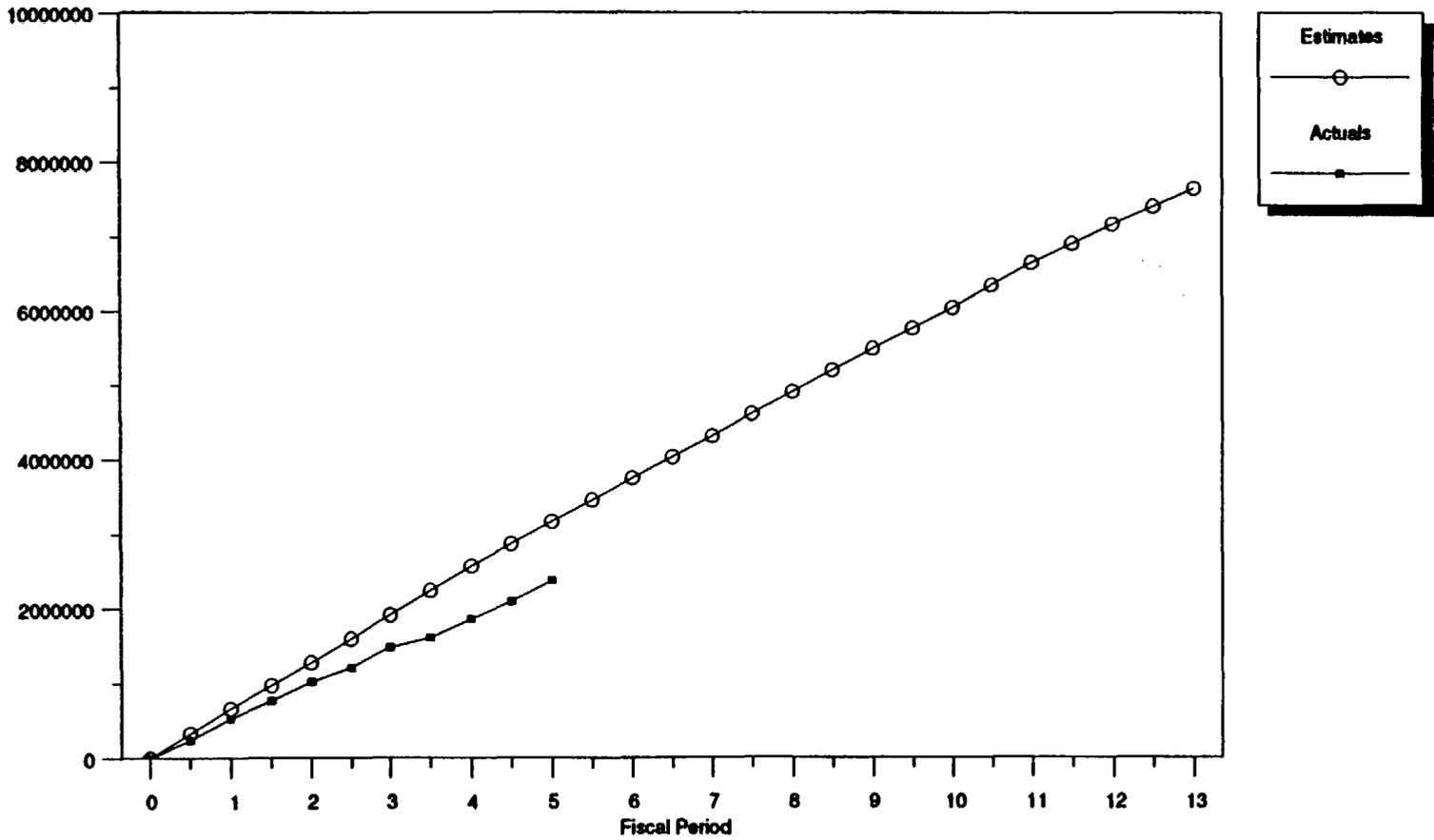
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| EST PERIOD COST | 661121 | 612903 | 636530 | 658829 | 600518 | 580489 | 563517 | 593898 | 578710 | 549985 | 606810 | 520734 | 479678 | 3169901 |
| ACT. PERIOD COST | 528997 | 487028 | 459473 | 486036 | 522450 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2383985 |
| VARIANCE, \$ | 132124 | 125875 | 177057 | 272793 | 78068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 785916 |
| VARIANCE, % | 20.0 | 20.5 | 27.8 | 41.4 | 13.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 24.8 |
| EST. FY CUMUL | 661121 | 1274024 | 1910554 | 2569383 | 3169901 | 3750390 | 4313908 | 4907806 | 5486515 | 6038501 | 6643311 | 7164045 | 7643723 | |
| ACTUAL FY CUMUL | 528997 | 1016025 | 1475498 | 1861534 | 2383985 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.069 | 0.133 | 0.193 | 0.244 | 0.312 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 132124 | 257999 | 435056 | 707849 | 785916 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 20.0 | 20.3 | 22.8 | 27.5 | 24.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

I-15

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702 HLW



3704

RES

Element Status Cost Report

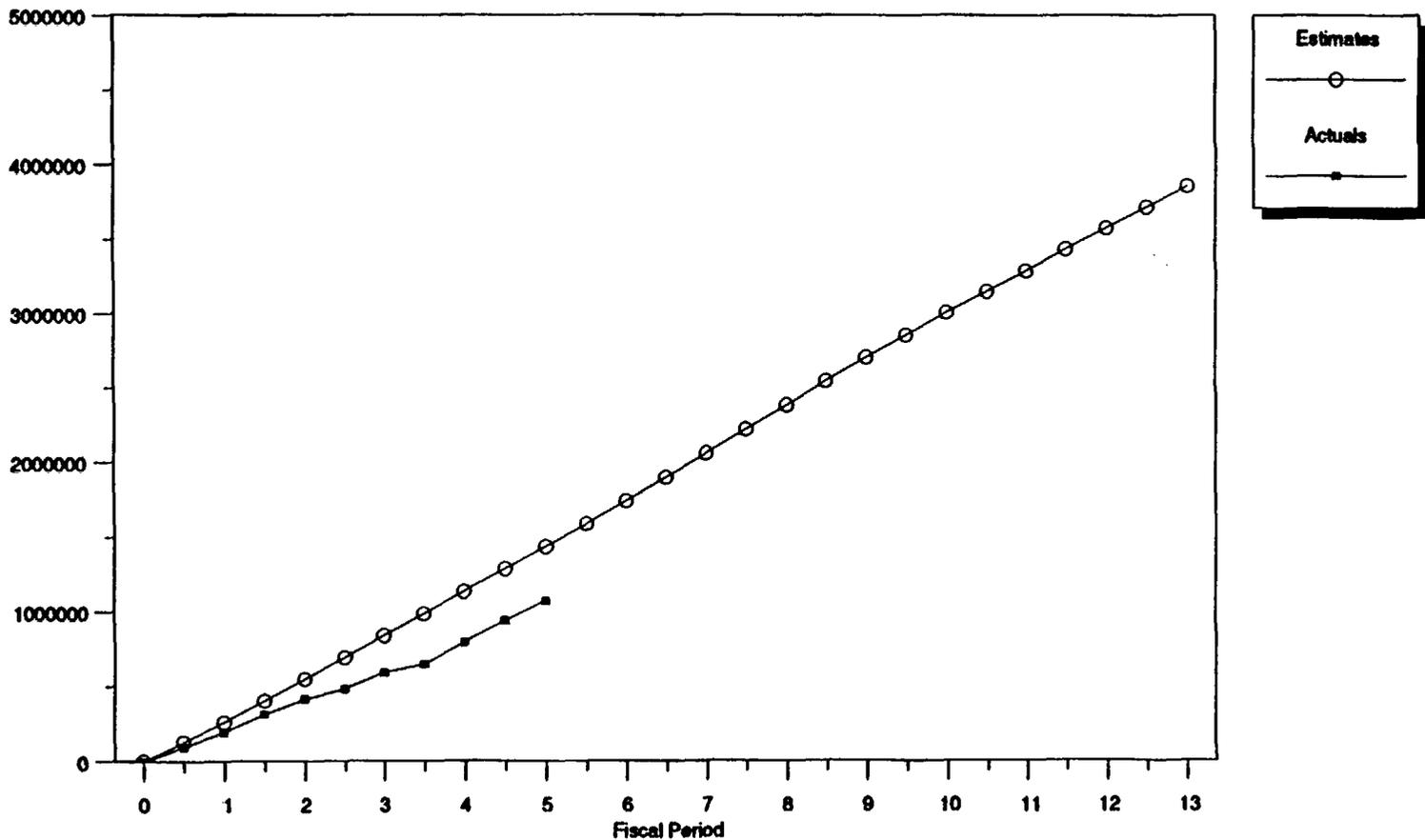
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|----------------------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|] EST PERIOD COST] | 258166 | 289925 | 288722 | 296369 | 301264 | 305602 | 318794 | 324006 | 321204 | 298957 | 281299 | 289654 | 280777 | 1434447 |
|] ACT. PERIOD COST] | 193002 | 221970 | 176051 | 203444 | 277591 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1072058 |
|] VARIANCE, \$] | 65164 | 67956 | 112671 | 92925 | 23673 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 362389 |
|] VARIANCE, %] | 25.2 | 23.4 | 39.0 | 31.4 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 25.3 |
|] EST. FY CUMUL] | 258166 | 548092 | 836814 | 1133183 | 1434447 | 1740049 | 2058843 | 2382849 | 2704053 | 3003010 | 3284309 | 3573963 | 3854740 | |
|] ACTUAL FY CUMUL] | 193002 | 414972 | 591023 | 794467 | 1072058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|] PERCENT COMPLETE] | 0.050 | 0.108 | 0.153 | 0.206 | 0.278 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
|] VARIANCE, \$] | 65164 | 133119 | 245791 | 338716 | 362389 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|] VARIANCE, %] | 25.2 | 24.3 | 29.4 | 29.9 | 25.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

1-17

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704 RES



2. CNWRA OPERATIONS

NRC Program Element Manager: Shirley L. Fortuna

NRC Project Officer: John T. Buckley (Task 5)

CNWRA Element Manager: Henry F. Garcia

Key Personnel: J. Latz, H. Garcia, R. Johnson, W. Patrick, R. Adler, B. Mabrito

Subcontractors/Consultants: Advisory Board Members: F. P. Cotter, A. P. Rollins, Jr.,
G. T. McBride, Jr., and P. T. Flawn

2.1 Technical Status

The tasks associated with this Element cover a variety of administrative functions, including the numerous management and staff activities described in the current Operations Plan. All projects and/or programs (i.e., management meetings and related discussions, selected internal training sessions, personnel recruitment, quality assurance activities, and development of various plans and programmatically related issues) are proceeding consistent with resource availability and time constraints.

Task 1 - Management Support and Planning

Effective coordination of work activities continued during this period. Center management participated in various management and technical meetings both telephonically, at the NRC's White Flint, Nicholson Lane, and Bethesda offices and at the CNWRA offices in San Antonio. An NRC/CNWRA Management meeting was held in White Flint during this period to discuss pending, unresolved, and new issues affecting the conduct of work at the Center. Both the Center ADP Plan and modifications to the COPS Element in the FY92-93 Operations Plans for the Division of High-Level Waste Management were delivered on a timely basis. One such modification will occasion the inclusion of a new task (Task 6) in this Element for the duration of FY92 and, possibly, into FY93. Task 6 activity will be summarized in the Period 6 edition of this section. Draft Administrative Procedures relative to the performance of work by Center staff on projects outside the Center and work for others outside the NRC High-Level Waste Program were developed and presented in accordance with NRC requests. CNWRA management pursued further dialogue with both the Division of Contracts and Property Management and the Office of Nuclear Material Safety and Safeguards on issues affecting the requirements for contract renewal.

The Center continued its input of various documents to the Technical Document Index and items into the Correspondence Control Index. The Center's Commitment Control Log continues to gain acceptance and utility among both the Center and NRC staff.

Interviews continued in a concerted effort to secure the most qualified candidates for the remaining positions in the geosciences, laboratory materials scientist, database

management, and systems engineer. Specific openings and associated recruitment efforts are summarized in Section 1 of this report.

Task 2 - Develop and Sustain Technical and Analytical Capabilities

These activities are funded within Task 3 this fiscal year.

Task 3 - Staff Professional Development

Center staff attended and contributed to both SwRI and professional society sponsored training courses, conducive to their career development.

Task 4 - Operations Plan Development

The next revision of the Operations and Research Project Plans for FY92-93 was scheduled to begin at the end of Period 5 (early February), but, in light of the planned contract renewal effort, it will be necessary to defer consideration of such revisions.

Task 5 - Internal Quality Assurance

Periodic project status review meetings continue to take place between Principal Investigators and Center QA staff to monitor progress of Center technical tasks and identify surveillance points. QA surveillance has been accomplished on research activities conducted by the Center, and surveillance reports continue to be maintained as QA records. Monthly QA status reports on Center activities are issued to all Center Directors, Element Managers, and Principal Investigators identifying the mandatory hold points and status of Center tasks. Center personnel qualification forms are being updated by the cognizant Center Director.

Center QA staff is continuing to update the inventory of the Scientific/Engineering computer software documentation currently stored in a fireproof safe. Software summaries, copies of codes, and supporting documentation have been obtained for approximately half of the codes resident at the Center. This process is continuing, with expectation that the files will be complete for the codes currently within the Center in the near future.

2.2 Major Problems

None to report.

2.3 Forecast for Next Period

The Center will continue to make the necessary preparations for contract renewal during FY92, especially via two meetings with cognizant NRC personnel relative to the presentation of text and cost information associated with the contract renewal. Contingent on the availability of sufficient funding, the Center's recruitment efforts will continue as positions in the geosciences, materials, systems engineering, and ADP areas which remain unfilled. Work will begin on the activities related to Task 6 after the modifications to the

Operations Plan have been accepted or changed to authorize initiation of work. The PMPR will be produced for the sixth period of FY92. Attendance at professional development events and participation in professional/technical society activities will be encouraged. Work will continue on the introduction of new information in the Technical Document and Correspondence Control Indexes.

The QA staff will continue to work with the Center Element Managers to ensure compliance with procedures affecting all products of the Center. Additionally, a timeframe for the Center annual audit has been established which will allow for the auditing of both technical and programmatic compliance levels of Center procedures and methods. Leading edge planning for that internal audit will take place next period.

2.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments in this Element are \$1500. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Costs incurred to date are somewhat less than planned expenditures. This appears to be due primarily with under expenditures associated with IMS work (including upgrading of the TDI and office automation features) which has been deferred to support accomplishment of higher priority LSSA work.

| Table 1. Financial Status | |
|---|-------------|
| FY92 Funds Authorized (a) | \$1,497,608 |
| FY92 Funds Costed to Date (b) | \$ 724,801 |
| FY92 Funds Uncosted (c) | \$ 772,807 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:**
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3702-070

CNWRA OPS

Element Status Cost Report

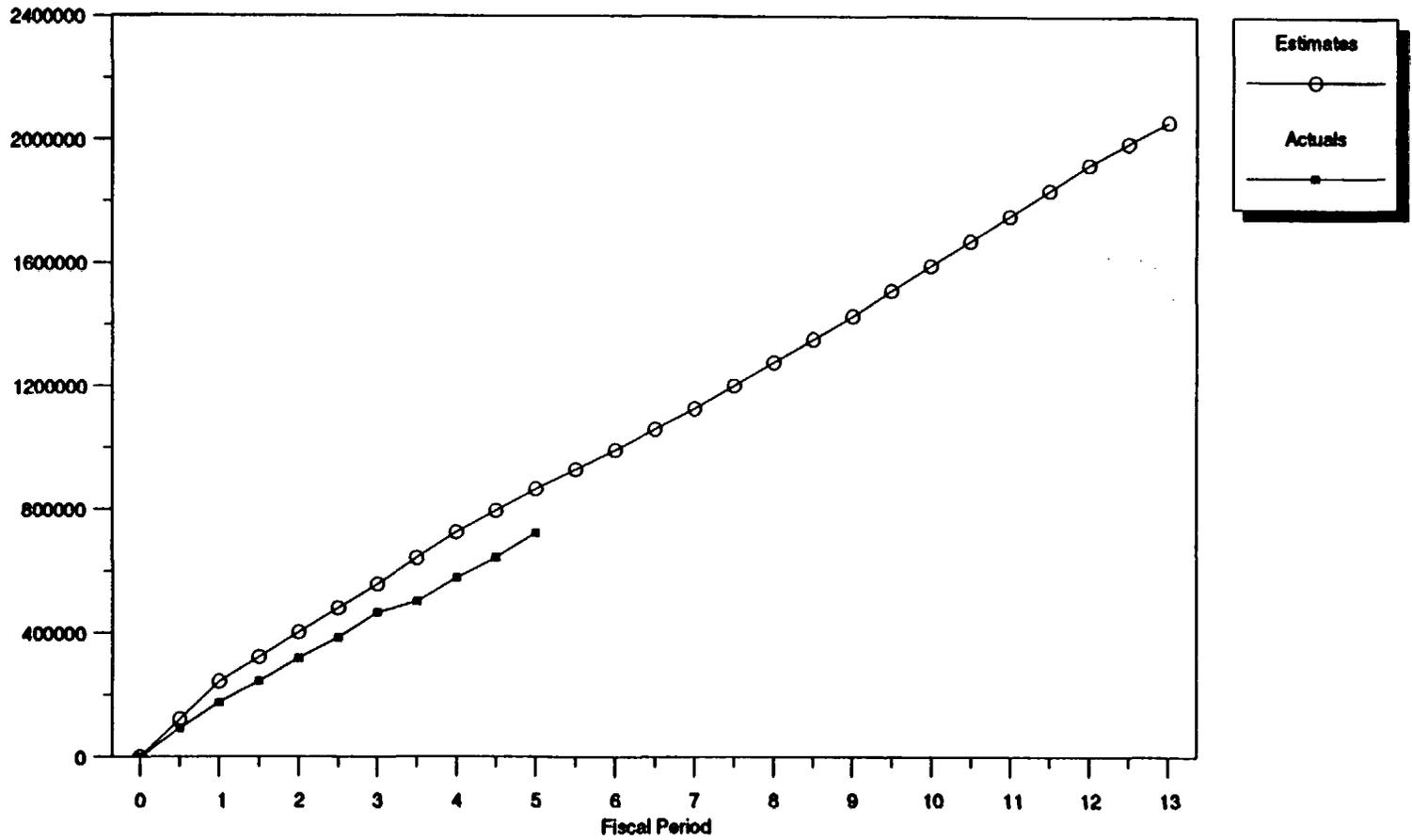
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|--------|
| EST PERIOD COST | 242873 | 159288 | 155476 | 169320 | 141118 | 125090 | 133892 | 149956 | 151718 | 162335 | 161702 | 167068 | 139374 | 868074 |
| ACT. PERIOD COST | 174818 | 142823 | 148900 | 111952 | 146308 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 724801 |
| VARIANCE, \$ | 68055 | 16465 | 6576 | 57368 | -5190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 143273 |
| VARIANCE, % | 28.0 | 10.3 | 4.2 | 33.9 | -3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 16.5 |
| EST. FY CUMUL | 242873 | 402161 | 557637 | 726957 | 868074 | 993165 | 1127057 | 1277012 | 1428731 | 1591065 | 1752768 | 1919836 | 2059210 | |
| ACTUAL FY CUMUL | 174818 | 317641 | 466541 | 570493 | 724801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.085 | 0.154 | 0.227 | 0.281 | 0.352 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| VARIANCE, \$ | 68055 | 84520 | 91096 | 148464 | 143273 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VARIANCE, % | 28.0 | 21.0 | 16.3 | 20.4 | 16.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

2-4

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-070 COPS



3. WASTE SYSTEMS ENGINEERING AND INTEGRATION

NRC Program Element Manager: Joseph Holonich

NRC Project Officer: Philip Altomare, (Tasks 1-2), Robert L. Johnson (Task 3)

CNWRA Element Manager: D. Ted Romine

Key Personnel: R. Adler, R. Johnson, P. LaPlante, J. Latz, P. Mackin, R. Marshall, S. McFaddin, W. Patrick, S. Spector

Subcontractor/Consultant: J. Cooper

3.1 Technical Status

During this period, the major efforts of this Element included: (1) continuing development of Compliance Determination Strategies (CDS) for the Naturally Occurring Materials, Flooding, and Retrievability Regulatory Requirements (RR); (2) revision of the CDS procedure consistent with the development of the CDSs addressed in (1) above; (3) optimizing and extending features of PASS Version 2.0 based on lessons learned; (4) ongoing development of the maintenance module and Interactive Input Support Subsystem (IISS), and configuration control and documentation of PASS and the PADB; (5) continuing the preparation of a procedure for developing Compliance Determination Methods (CDM); (6) participation in an NRC/CNWRA task group established to resolve structural differences between the Format and Content Regulatory Guide (FCRG) and the RR/REOP structures, including implementation of NRC policy with respect to the relationship between the siting and design criteria and the performance objectives of 10 CFR Part 60; (7) discussion with NRC of the approach and limits for the Repository Isolation Criteria (RIC) study; (8) preparation of the final Repository Functional Analysis Report; and (9) continuing development of the Open Item Tracking System (OITS).

Task 1 - Statutory and Regulatory Analysis

WSE&I continued participation with the NRC in the development of CDS examples and subsequent refinement of a procedure for CDS preparation. This process is utilizing selected example RRs (Naturally Occurring Materials, and Flooding). The development of an initial CDS-type selection for RR0002 (Retrievability) also continued during this period, but at lower priority than for the examples associated with CDS procedure development. It is anticipated that the CDSs for the example RRs will not be finalized until FCRG and RR/REOP structural issues are resolved and the RRs associated with these CDSs have been formally approved by the NRC. Previous efforts in this area included development of a CDS for the RR on Mining Regulations. However, this RR will be combined with others to form new RRs dealing with design requirements, and one of these new design requirements RRs will be included in the CDS procedure as an example.

Work continued on refinement of guidance and procedures for the next SRA structural levels (TRC and CDM).

A task force established to resolve SRA-related structural issues continued development of guidance to working groups which will implement its approved recommendations.

Discussions continued with NRC concerning the RIC Study content and approach pending a NRC decision on start date. Preparation of the final RFA Report continued, including coordination of a revised format for the product of the analysis.

Task 2 - Program Architecture Development and Support System

Development of the prototype system for the Open Item Tracking System (OITS) continued, with final resolution of design issues nearing completion.

Development of the prototype IISS continued at a low level of effort. Initial hands-on use to obtain more specific design information will be conducted within the Center GS Element. The maintenance software development is proceeding for Version 2.0 of PASS and will be implemented in conjunction with the other SRA work being performed and the IISS. Completion of both of these subsystems of PASS will be dependent on the rescheduling of related SRA tasks as addressed elsewhere in this section.

Task 3 - Overall Review Strategy and License Application Review Plan

Activity on the Overall Review Strategy (ORS) is awaiting receipt of the draft document from the NRC. This activity is dependent upon resolving SRA-related structural issues.

Began initial activities in the Geotechnology Decision Study (3702-033-020) and the Uncertainty and URM subtasks (3702-031-030 and -040).

3.2 Major Problems

As noted in previous periods, the accomplishment of planned work not only for WSE&I, but for all Center Elements, is contingent upon the completion of several interrelated tasks, all of which are suffering delays. These include review, modification, and approval of the RR/REOP structure; approval of procedures for CDS and TRC development; and delineation and implementation of the NRC policy relative to the relationships between sections 60.112 and 60.122 of 10 CFR Part 60. Proposed alterations to the language of the affected portions on 10 CFR Part 60 are being prepared.

The active recruitment of a system engineer to fill an opening in WSE&I is continuing, as noted in Section 2.

3.3 Forecast for Next Period

Element activities during the next period will be focused on:

- Incorporation of the guidelines for CDS type selection and CDS development into a procedure for CDS preparation that is appropriate for NRC use;
- Participation in work groups which will be established to implement the recommendations from the task force established to resolve structural issues related to the FCRG and the RR/REOP structures;
- Completion of the Work Plan and commencement of work on the RIC;
- Finalizing the RFA Report;
- Continued optimization and extension of features in PASS Version 2.0;
- Continued prototyping of PASS Version 2.1, Interactive Input Support Subsystem;
- Continued implementation of software changes for PADB maintenance in PASS;
- Continued development of the OITS prototype for NRC staff use;
- Anticipated receipt of an NRC draft of the Overall Review Strategy (ORS) Document to initiate Center participation in a task force to develop comments on this document.
- Continuation of the Geotechnology Decision Study and the UN and URM subtasks.

3.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments in this Element are \$49,503. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Expenditures are approximately 22% under plan at this time. This underage is expected to be reduced when an open staff position in WSE&I is filled. Increased billing to WSE&I as a result of planned staff involvement in resolution of SRA-related structural issues will also help resolve the underage.

| Table 1. Financial Status | |
|--|---------------------|
| FY92 Funds Authorized (a) | \$ 1,051,485 |
| FY92 Funds Costed to Date (b) | \$ 438,857 |
| FY92 Funds Uncosted (c) | \$ 612,628 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:**
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3702-030 WSE&I

Element Status Cost Report

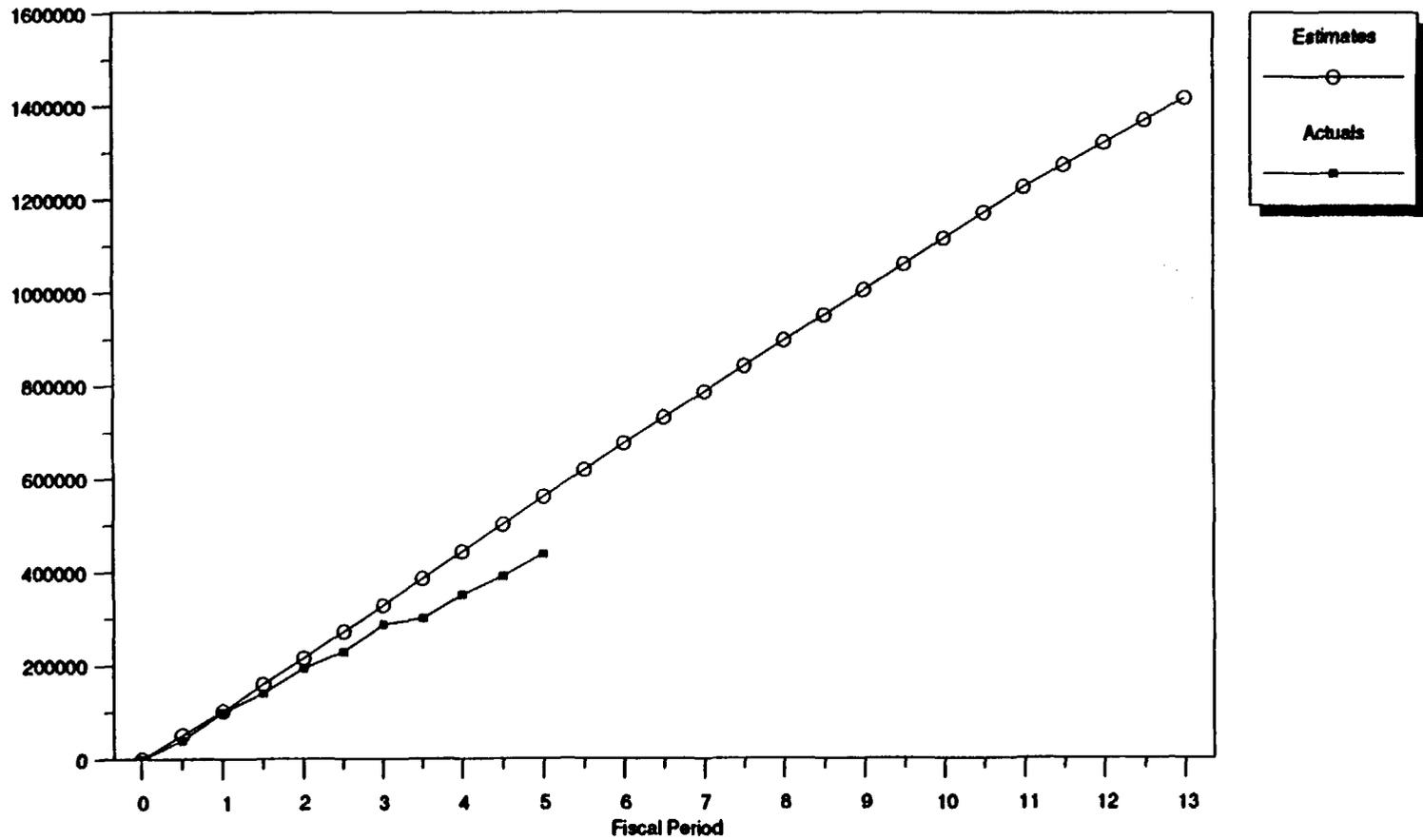
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|--------|
| EST PERIOD COST | 102510 | 112691 | 112406 | 114999 | 118961 | 114681 | 109831 | 110730 | 107588 | 110979 | 110917 | 96344 | 95811 | 561567 |
| ACT. PERIOD COST | 100333 | 92666 | 94252 | 63149 | 88456 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 438856 |
| VARIANCE, \$ | 2178 | 20025 | 18154 | 51849 | 30505 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 122711 |
| VARIANCE, % | 2.1 | 17.8 | 16.2 | 45.1 | 25.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 21.9 |
| EST. FY CUMUL | 102510 | 215201 | 327608 | 442606 | 561567 | 676249 | 786079 | 896809 | 1004397 | 1115376 | 1226293 | 1322638 | 1418448 | |
| ACTUAL FY CUMUL | 100333 | 192999 | 287251 | 350400 | 438856 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.071 | 0.136 | 0.203 | 0.247 | 0.309 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 2178 | 22202 | 40356 | 92206 | 122711 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 2.1 | 10.3 | 12.3 | 20.8 | 21.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

3-5

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-030 WSE&I



4. QUALITY ASSURANCE

NRC Program Element Manager: Kenneth R. Hooks

CNWRA Element Manager: Bruce Mabrito

Key Personnel: B. Mabrito, R. Brient

Subcontractors/Consultants: None

4.1 Technical Status

Task 1 - DOE QA Site Characterization Audit Observations

During this period, discussions were held with NRC QA staff regarding the early CY92 DOE scheduled audits and other site characterization activities which will require NRC Center QA staff action. Planning took place for the Center to support the Oak Ridge National Laboratory NRC Audit Observation Team work next period.

Task 2 - Conduct QA On-Site Visits/Periodic Meetings

No visit/meeting activities were conducted within this task during this period, however planning took place to have a Center QA staff member attend the NRC/DOE Quality Assurance Bimonthly meeting at the White Flint NRC offices next period.

Task 3 - Review and Update NRC QA Documents And Staff Technical Positions

During this period, a Center QA staff member traveled to the White Flint offices to assist the NRC HLWM QA Section in revising its High Level Waste Management Manual. There will be follow up work on the Management Manual by Center QA staff as the chapters affecting Center products are finalized.

Task 4 - Review DOE QA Program Documents (Unfunded)

No activity this period.

4.2 Major Problems

None.

4.3 Forecast for Next Period

The next period activity is planned to begin with Center QA staff participation on the Oak Ridge National Laboratory NRC Audit Observation Team. The DOE audit of ORNL is set for February 24-27, 1992 and is the first such NRC observation of the ORNL/DOE Site Characterization activities. Center QA work in other tasks will continue as directed by the NRC Program Element Manager for External QA, and as identified by the Center QA Director. At the present time, the Center QA staff plans to increase travel frequency to support the NRC Audit Observation Teams during the remaining periods of FY92.

Close contact will be maintained with the QA Program Element Manager to ensure prompt Center response is available should the NRC need personnel to be part of an NRC Audit Observation Team or to work on other External QA activities.

4.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of authorized funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Costs incurred to date are significantly less than planned. This reflects the fact that there have been postponements and changes in the DOE audit schedule which affect the NRC Audit Observation Team utilization. It is anticipated the EQA activities will increase in the second through fourth quarters of FY92.

| Table 1. Financial Status | |
|---|-----------|
| FY92 Funds Authorized (a) | \$154,332 |
| FY92 Funds Costed to Date (b) | \$ 31,176 |
| FY92 Funds Uncosted (c) | \$123,156 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:**
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3702-040 QA

Element Status Cost Report

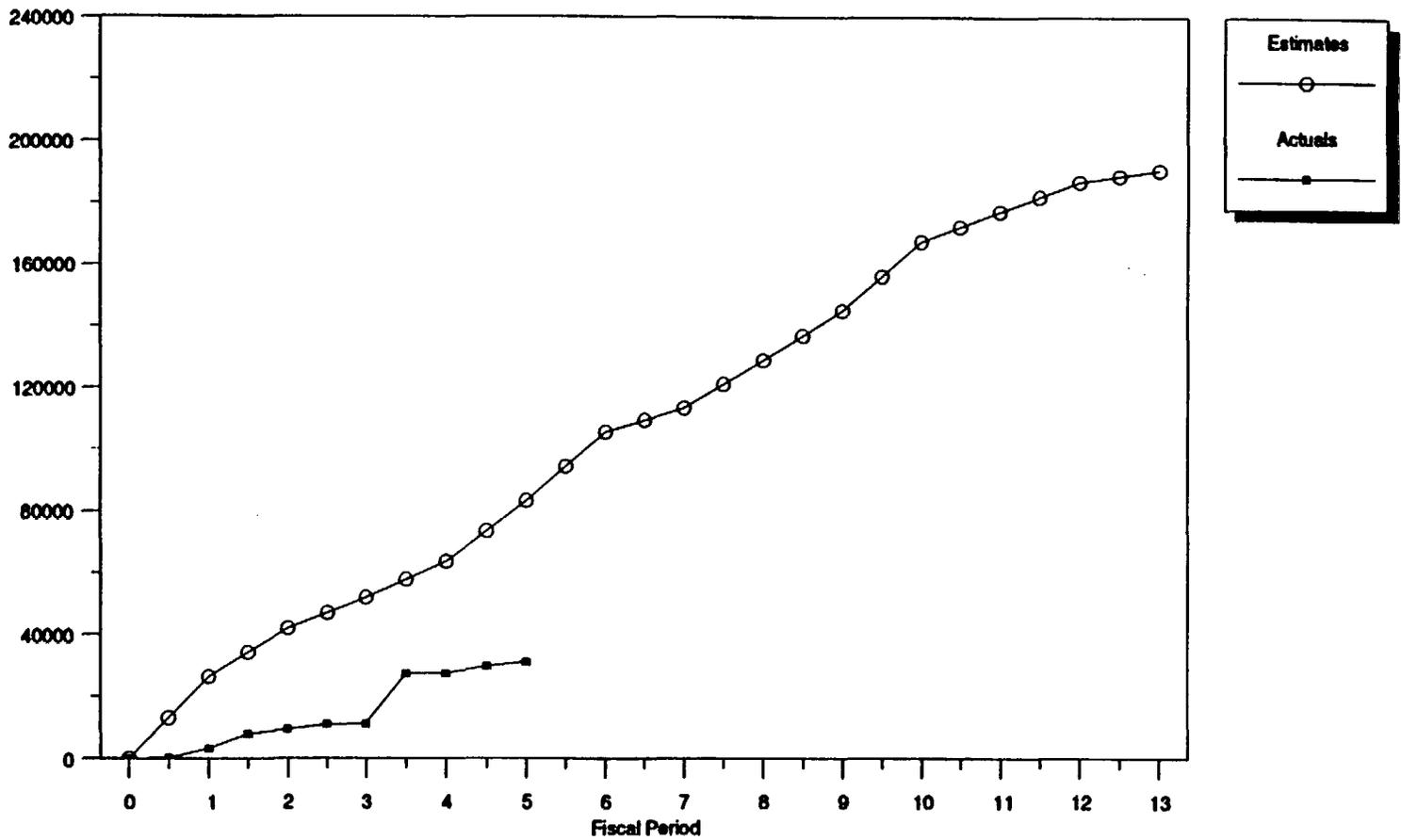
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| EST PERIOD COST | 26256 | 15601 | 9981 | 11752 | 19781 | 22236 | 7647 | 15489 | 16097 | 22373 | 9777 | 9683 | 3830 | 83371 |
| ACT. PERIOD COST | 3224 | 6212 | 1699 | 16256 | 3786 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31176 |
| VARIANCE, \$ | 23033 | 9389 | 8282 | -4504 | 15995 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52195 |
| VARIANCE, % | 87.7 | 60.2 | 83.0 | -38.3 | 80.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 62.6 |
| EST. FY CUMUL | 26256 | 41857 | 51839 | 63590 | 83371 | 105607 | 113254 | 128744 | 144840 | 167213 | 176990 | 186673 | 190503 | |
| ACTUAL FY CUMUL | 3224 | 9435 | 11134 | 27390 | 31176 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.017 | 0.050 | 0.058 | 0.144 | 0.164 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 23033 | 32422 | 40705 | 36201 | 52195 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 87.7 | 77.5 | 78.5 | 56.9 | 62.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

4-4

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-040 QA



5. GEOLOGIC SETTING

NRC Program Element Manager: William Ford

CNWRA Element Manager: John L. Russell

Key Personnel: R. Green, R. Hofmann, B. Leslie, M. Miklas, W. Murphy, R. Pabalan, E. Percy, J. Russell, G. Stirewalt, D. Turner, G. Wittmeyer, S. Young

SwRI Personnel: J. Bangs, K. Mahrer

Subcontractors/Consultants: W. Leeman, J. Luhr, B. Marsh, L. McKague, B. Wernicke

5.1 Technical Status

General

A major activity of Geologic Setting Element personnel during Period 5 was preparation of input for the CNWRA Contract Renewal Cost Proposal.

Geologic Setting Program Element Interfaces With Other Center Activities

Geologic Setting Element personnel participated in working group development of scenarios related to tectonics, human intrusion, volcanism/magmatism, and climatic change for the IPA Phase II efforts.

Center geoscientists conducted other work for the Performance Assessment; Waste Systems Engineering and Integration; Engineered Barrier Systems; and Repository Design, Construction, and Operations Program Elements, promoting integration of technical input from the geosciences into technical assistance activities of the Center's other Program Elements, and in support of the Licensing Support System Administrator. Center geoscientists were also heavily involved with the conduct of geochemistry research performed in three Center research projects and a research project on Volcanism in the Basin and Range Province.

Task 1 - Prelicensing Activity

Subtask 1.1 - Review DOE's Site Characterization Plan (SCP) Progress Reports and Support NRC/DOE Prelicensing Technical Exchange Meetings

No activity occurred for this Subtask during Period 5.

Subtask 1.2 - Review DOE's Study Plans

During this period, in response to comments of J. Trapp and P. Justus of the NRC on the Center's review (submitted January 8, 1992), a supplementary review of DOE Study Plan 8.3.1.8.1.1 entitled "Probability of magmatic disruption of the repository" was

initiated. This brief review will specifically address the potential for problems related to using methods proposed in the study plan for time frames of 10,000 years and beyond.

Subtask 1.3 - Detailed Technical Reviews

No activity occurred in this subtask during the reporting period. This subtask is held in reserve with no funding presently allocated for FY92. Work activity for this subtask is planned for FY93.

Subtask 1.4 - Support NRC in On-Site Visits

No activity occurred in this subtask during the reporting period. This subtask is held in reserve with no funding presently planned for FY92-93.

Task 2 - Regulatory and Technical Guidance Development

Subtask 2.1 - Systematic Regulatory Analysis and Assistance in the Development of Technical Positions, Staff Positions, and Related Regulatory Guidance

Subtask 2.1.1 - Systematic Regulatory Analysis and Assistance in Developing a Probabilistic Seismic Hazard Analysis Staff Position (Center Technical Leader - R. Hofmann)

During this period, Center staff initiated the computer-assisted search of NRC data sources to screen information on regulatory concepts concerned with seismicity. The information will be used to develop a report on regulatory history and intent for issues pertaining to fault displacement and seismic hazards.

The letter report "Identification of Pertinent Regulatory Requirements For Systematic Regulatory Analyses of Issues Related to Probabilistic Fault Displacement and Seismic Hazard Analyses in 10 CFR Part 60" was completed and sent to the NRC on February 7, 1992.

Subtask 2.1.2 - Systematic Regulatory Analysis and Assistance in the Development of Hydrologic System Regulatory Guidance (Center Technical Leader - G. Wittmeyer)

No activity occurred on this Subtask during Period 5, consistent with the decision made February 20 and 21, 1991.

Subtask 2.1.3 - Systematic Regulatory Analysis and Assistance in the Preparation of Groundwater Travel Time/Disturbed Zone Rule Regulatory Guidance (Center Technical Leader - R. Green)

R. Green and M. Miklas met with the joint NRC/HLW and CNWRA working group at White Flint on Feb 20-21 to discuss several aspects of the GWTT issue. Topics discussed at the meeting included revision of the current work plan, resolution of the criteria to be used to evaluate the options, the relationship of GWTT to the repository isolation criteria (RIC) exercise and the revision of the GWTT options. A meeting report is being prepared to summarize these discussions.

Subtask 2.1.4 - Systematic Regulatory Analysis and Assistance in the Development of Natural Resources Regulatory Guidance (Center Technical Leader - M. Miklas)

Center personnel participated in the working group activities on CDS type selection for RR2018: PAC - Naturally Occurring Materials and development of the CDS Synopsis Report. The calculation and discussion of new "tests" of the response of the CCDF to a selected suite of drill holes at the Yucca Mountain proposed repository site was prepared to support CDS type selection decisions. The text of Chapter 3 of the Natural Resources Options Paper which deals with the geologic bases for natural resource assessment at Yucca Mountain, Nevada was revised as per NRC comments. New figures have been added and improvement of the original figures to accommodate NRC suggestions has been accomplished.

Subtask 2.1.5 - Systematic Regulatory Analysis and Assistance in the Development of Flooding Regulatory Guidance (Center Technical Leader - G. Wittmeyer)

G. Wittmeyer was selected to work in conjunction with Rex Wescott and Mike Lee from NMSS on performing a complete SRA of RR2002 on flooding of the repository due to changes made to the surface. To date, only a preliminary CDS type selection exercise for RR2002 has been completed by the SRA team, owing to the current state of uncertainty regarding the RR/REOP structure of SRA.

Subtask 2.1.6 - Systematic Regulatory Analysis and Assistance in the Development of Volcanic Hazards Regulatory Guidance (Center Technical Leader - G. Stirewalt)

During Period 5, references obtained from the computer-assisted search of NRC data sources on regulatory concepts concerned with volcanism and magmatism were circulated to appropriate CNWRA technical staff. The information will be used in development of the regulatory history and intent report for issues related to volcanic/magmatic hazards.

Subtask 2.1.7 - Systematic Regulatory Analysis and Assistance in the Development of Tectonics Regulatory Guidance (Center Technical Leader - S. Young)

During this period, Center staff conducted computer-assisted search of NRC data sources (e.g. NUDOCS) to screen information on regulatory concepts concerned with tectonics. References obtained from the computer-assisted search of NRC data sources on regulatory concepts concerned with tectonics were circulated to appropriate CNWRA

technical staff. The information will be used in development of the regulatory history and intent report for issues related to tectonics.

Subtask 2.1.8 - Systematic Regulatory Analysis and Assistance in the Development of Geochemical System Regulatory Guidance

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.1.9 - Systematic Regulatory Analysis and Assistance in the Development of Climatologic and Meteorological System

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.1.10 - Assistance in the Development of the Technical Basis of SRA Defined Regulatory Guidance

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.2 - Systematic Regulatory Analysis and Assistance in the Development of Rules and Amendments

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.3 - Preparation of Technical Input for Other Guidance Documents

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Task 3 - Analysis, Codes and Methods

Utilization of SwRI professional staff with expertise in the use of computer applications in the geosciences and with experience in supporting scientific computing was increased in Period 5.

Subtask 3.1 - Groundwater Travel Time Analyses, Codes and Methods

The Center staff has identified five activities that are proposed to be conducted in support of this subtask. A proposed work plan has been prepared for submission to NRC/HLW. These computational analyses may be used to perform groundwater travel time calculations for assessing methodologies that may provide information on the resolution of groundwater travel time issues.

Subtask 3.2 - Tectonic and Structural Geology Analyses, Codes and Methods

Work continued in Period 5 on the development of methods for review of tectonic models, detailed evaluation of DOE cross section models of Yucca Mountain, integration of seismic reflection data into tectonic models, and development of alternative structural geologic/tectonic models. Work is currently focusing on development of a range of alternative solutions to the DOE cross section models of Yucca Mountain. Specifically, the depth range of possible low-angle detachment zones is being determined from refined interpretations of deformation of Yucca Mountain.

A working session which included Center, SwRI, Center consultants, and NRC technical staff was conducted on February 12, 1992. The very productive session included technical background presentations, demonstrations of computer modeling products, and associated discussions.

Subtask 3.3 - Probabilistic Fault Displacement and Seismic Hazard Analyses, Codes and Methods

The SEISM 1 PSHA code was sent to CNWRA by LLNL. Source and SUN executables were loaded on the CNWRA SUN Sparc2 computer. CRAY versions were also in the LLNL package and are available on the SUN should they be needed. Reading of the code documentation was initiated. Secure storage of the original LLNL package is being handled by the Center QA staff. USGS code routines for reading USGS tapes of seismic records (a sample tape was supplied by the NRC) were received and installed on the CNWRA SUN Sparc2 workstation. The sample tape was read and will be processed and the seismic data plotted by using the USGS software. Additional software for processing seismic records has been ordered to permit independent calculations as required.

Subtask 3.4 - Geochemical Analyses

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 3.5 - Hydrological Analyses

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 3.6 - Other Analyses, Codes and Methods

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

5.2 Major Problems

NRC-CNWRA closure on the relationship between 10 CFR 60.112 and 60.122 and implementation into SRA activities in the GS Element must be formalized if the timely development of appropriate CDSs, TRCs, and CDMs is to occur. The development and

reviews of CDSs and TRCs is dependent on the availability of accepted procedures for their development and improved definition of expected content. Task forces have been developed to address these concerns.

5.3 Forecast for Next Period

The Center staff will support the NRC staff review of the draft "Options Paper on Groundwater Travel Time as the Performance Measure of the Geologic Setting of a High-Level Radioactive Waste Geologic Repository" report, the draft "Options Paper Including Comments on an Acceptable Methodology for Assessment of the Natural Resources of a Proposed High-Level Waste Repository Site" and the "Probabilistic Fault Displacement and Seismic Hazard Analysis Literature Review." Staff will assist the NRC in obtaining closure on decisions which impact the development of the final reports on groundwater travel time and natural resources. Work Plans for Task 3 activities on Probabilistic Fault Displacement and Seismic Hazard Analyses and on Groundwater Travel Time will be completed and submitted to NRC.

5.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments for this Element are \$20,861. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Spending is significantly under plan at this point. This results from less than anticipated expenditures for subcontractors and consultants which would support Tasks 1 reactive work and activities in Task 3. Delayed SRA work in Task 2 also has contributed to cost underruns. Corrective actions include increased utilization of consultants and SwRI professional staff to accomplish Tasks 1 and 3. In additions two students have been employed part-time to assist the Center professional staff.

| Table 1. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 973,245 |
| FY92 Funds Costed to Date (b) | \$ 314,798 |
| FY92 Funds Uncosted (c) | \$ 658,447 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3702-000 GS

Element Status Cost Report

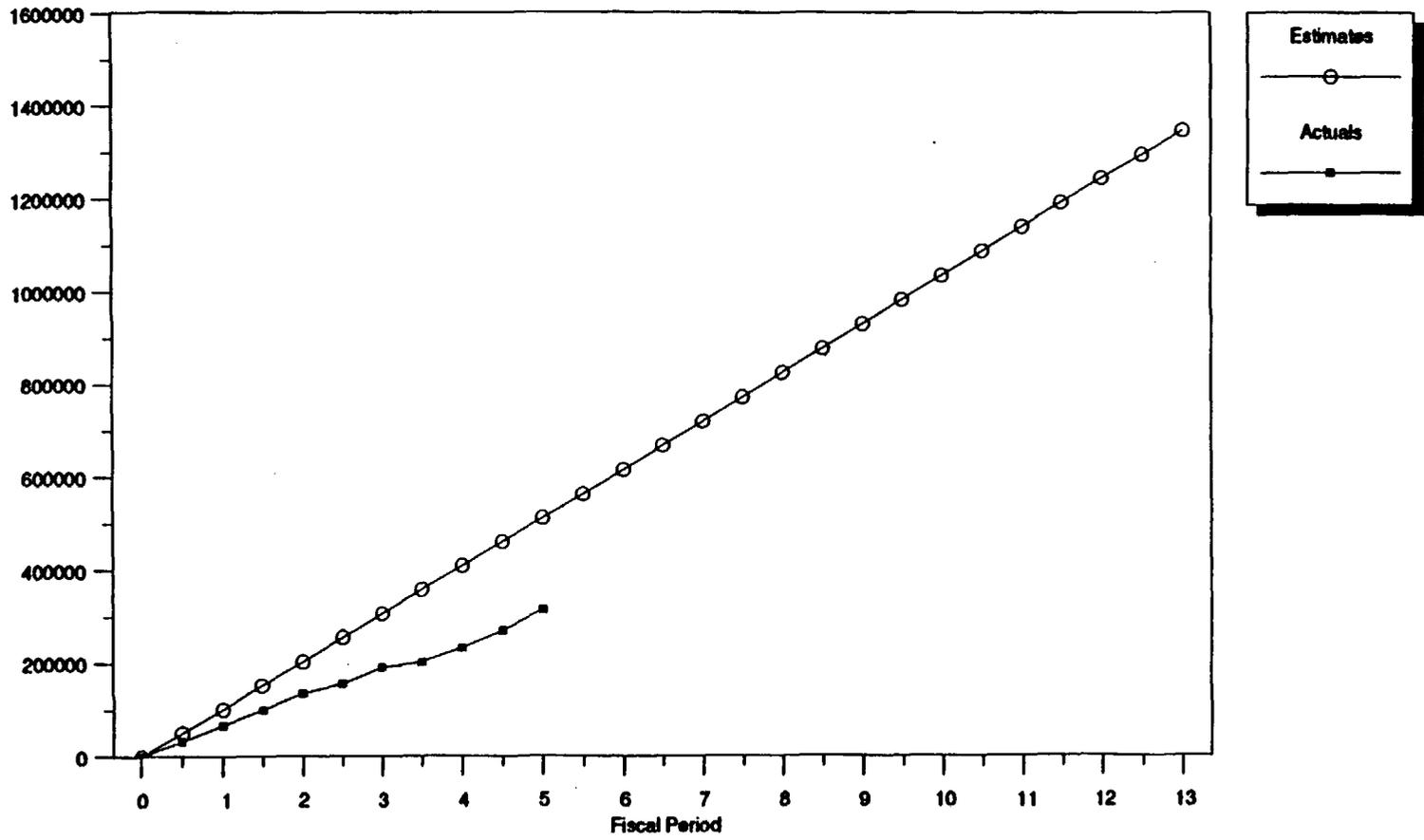
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|--------|
|] EST PERIOD COST] | 100415 | 102454 | 103348 | 102933 | 102774 | 103487 | 103655 | 104649 | 105034 | 104869 | 105473 | 104385 | 102746 | 511924 |
|] ACT. PERIOD COST] | 67019 | 67918 | 55816 | 41391 | 82654 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 314798 |
|] VARIANCE, \$] | 33396 | 34536 | 47533 | 61541 | 20120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 197126 |
|] VARIANCE, %] | 33.3 | 33.7 | 46.0 | 59.8 | 19.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 38.5 |
|] EST. FY CUMUL] | 100415 | 202869 | 306217 | 409150 | 511924 | 615411 | 719066 | 823715 | 928749 | 1033618 | 1139091 | 1243476 | 1346222 | |
|] ACTUAL FY CUMUL] | 67019 | 134937 | 190753 | 232144 | 314798 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|] PERCENT COMPLETE] | 0.050 | 0.100 | 0.142 | 0.172 | 0.234 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
|] VARIANCE, \$] | 33396 | 67932 | 115464 | 177006 | 197126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|] VARIANCE, %] | 33.3 | 33.5 | 37.7 | 43.3 | 38.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

5-7

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-000 GS



6. **ENGINEERED BARRIER SYSTEM**

NRC Program Element Manager: Charles G. Interrante

NRC Project Officer: Kien C. Chang (Tasks 1 and 3)

CNWRA Element Manager: Prasad K. Nair

Key Personnel: G. Cragnolino, H. Manaktala, P. Nair, W. Patrick,
N. Sridhar, E. Tschoepe, J. Walton, and Y. Wu

Subcontractors/Consultants: None

6.1 **Technical Status**

The EBS staff provided support to the RDCO and SRA activities this reporting period.

Professional Activities

- H. Manaktala attended the meetings of the American Society for Testing and Materials (ASTM) in New Orleans, Louisiana, January 27-29, 1992, and actively participated as a member of the task force that is developing a standardized leaching test procedure for borosilicate glass called the "Product Consistency Test (PCT)". Manaktala is also the Secretary of the ASTM sub-committee C-26.13 on High-Level Radwaste Repository Materials and Testing. Additional details are available in a trip report that is being issued separately.
- P. Nair and J. Walton attended the Nuclear Waste Technical Review Board's EBS Panel Meeting at Augusta, Ga. on February 10, 1992. The thermal load effects on the EBS and the status of the defense high level wastes were discussed. A trip report was prepared and issued.

Staff Activities

- Dr. John Walton joined the EBS staff this period. He filled the numerical analyst position at the Center. He will support the EBSPAC and the IPA source term activities.

Task 1 - Prelicensing Activities

No planned activity this period.

Task 2 - Regulatory and Technical Guidance Development

The SCC example problem work plan is being revised to incorporate the review comments by Center staff on a preliminary draft.

Task 3 - Analysis Codes and Methods

The documentation of the Initiation Model for Occluded Cell Corrosion (IMOCC), which was developed as part of EBSPAC, and its subsequent modifications for use in the IPA project was completed. The documentation is under review.

An initial draft of the EBSPAC Plan Update was completed. The plan has integrated the structure to be consistent with the IPA executive driver. It is expected that all the performance assessment codes at the Center will use the same driver. Several new models have been incorporated in the plan to address both the SCC and gradual release rate requirements.

Three laboratory procedures related to testing of borosilicate glass leaching characteristics were completed and issued as CNWRA Technical Operating Procedures in full compliance with the Center QA requirements.

Leaching tests on borosilicate glass samples obtained from Savannah River Laboratory was initiated using the approved QA procedures. The first run of the leaching test has been completed, and the leachate samples are in the process of being sent to an external laboratory for analyses. The results will be reported in the next periodic report.

6.2 Major Problems

None.

6.3 Forecast for Next Period

The SCC work plan will be completed and transmitted to NRC.

The EBSPAC plan will be completed and transmitted to the NRC.

Preparation of the review report on the glass waste form will continue. Testing of the borosilicate glass will continue based on the developed test procedures.

6.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. The commitment for this Element is \$3,672. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Expenditures for this Program Element are now 25% below the planned target and are expected to be lower than planned for the next period as well. This will change with the addition of J. Walton to the staff. It is anticipated that the expenditures will be as planned in about two periods.

| Table 1. Financial Status | |
|--|-------------------|
| FY92 Funds Authorized (a) | \$ 474,460 |
| FY92 Funds Costed to Date (b) | \$ 206,510 |
| FY92 Funds Uncosted (c) | \$ 267,950 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:**
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3702-010 EBS

Element Status Cost Report

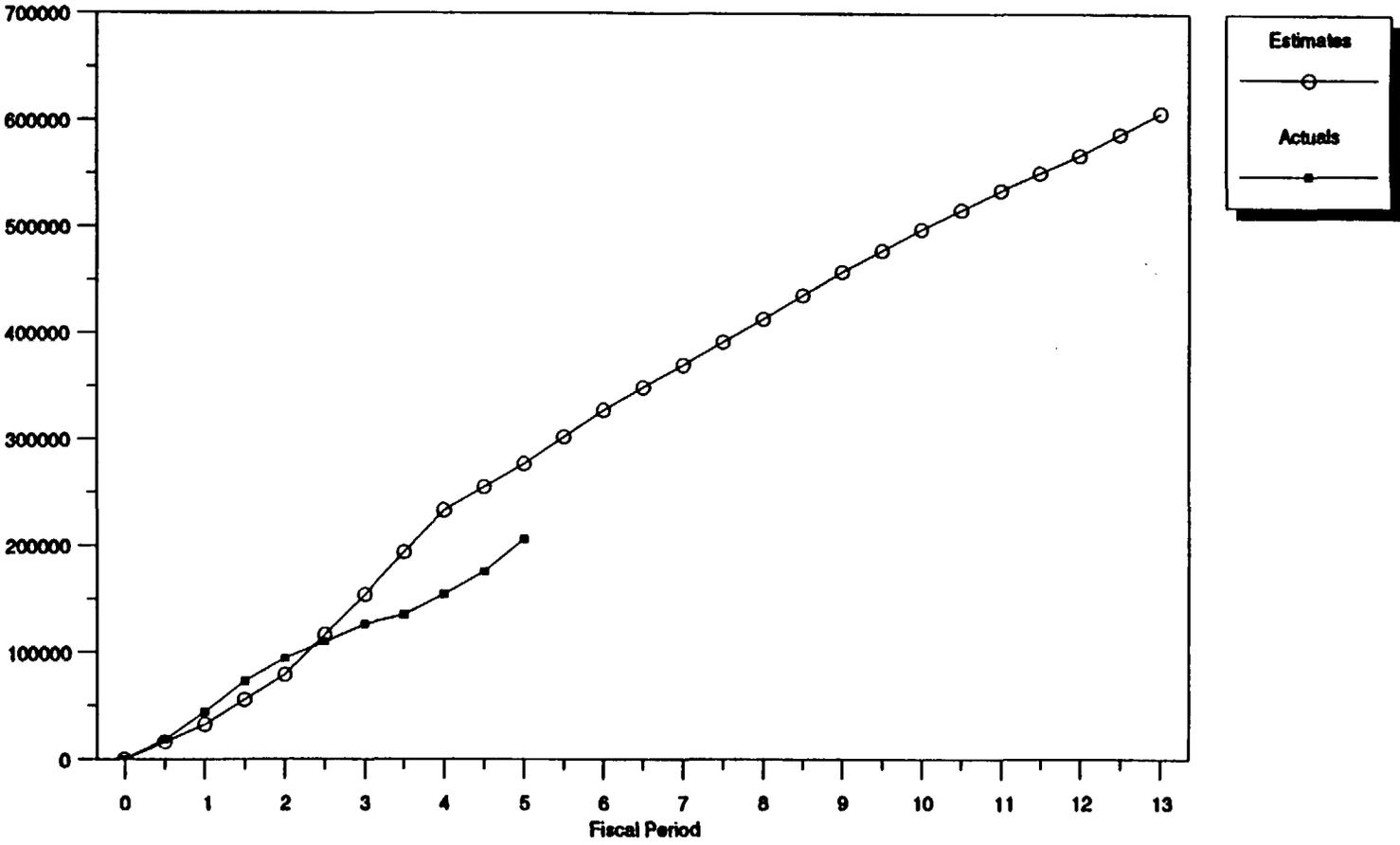
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 32587 | 46279 | 74942 | 79514 | 43685 | 50436 | 42270 | 43597 | 44179 | 40000 | 36596 | 33196 | 39635 | 277007 |
| ACT. PERIOD COST | 44050 | 50180 | 31852 | 28143 | 52285 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 206510 |
| VARIANCE, \$ | -11463 | -3900 | 43090 | 51370 | -8600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70496 |
| VARIANCE, % | -35.2 | -8.4 | 57.5 | 64.6 | -19.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 25.4 |
| EST. FY CUMUL | 32587 | 78866 | 153808 | 233322 | 277007 | 327443 | 369713 | 413310 | 457489 | 497488 | 534085 | 567281 | 606915 | |
| ACTUAL FY CUMUL | 44050 | 94229 | 126081 | 154225 | 206510 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.073 | 0.155 | 0.208 | 0.254 | 0.340 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | -11463 | -15363 | 27726 | 79097 | 70496 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | -35.2 | -19.5 | 18.0 | 33.9 | 25.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

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NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-010 EBS



7. REPOSITORY DESIGN, CONSTRUCTION, AND OPERATIONS

NRC Program Element Manager: Banad N. Jagannath

NRC Project Officers: Dinesh C. Gupta (Task 1)

CNWRA Element Manager: Asadul H. Chowdhury

Key Personnel: M. Ahola, A. Chowdhury, J. Hageman, S. Hsiung, H. Karimi, L. Lorig,
R. Manteufel, W. Patrick, E. Tschoepe

Subcontractors/Consultants: Itasca Consulting Group, Inc., R. Field, T. Krauthammer, C. Shih,
K. Unrug

7.1 Technical Status

During reporting Period 5 of FY92, the RDCO staff performed activities for the RDCO, WSE&I, Waste Solidification System (WSS), Performance Assessment (PA), and CNWRA Operations Program Elements and Seismic Rock Mechanics Research Project.

Professional Activities

- A. Chowdhury, S. Hsiung, and D. Kana along with J. Philip and D. Gupta of NRC, attended a meeting of the U. S. National Committee for Rock Mechanics in Irvine, California, on January 21, 1992. J. Philip, S. Hsiung, and D. Kana made presentations on the Seismic Rock Mechanics research project.
- A. Chowdhury and S. Hsiung attended the meeting of the Nuclear Waste Technical Review Board's Panel on Structural Geology and Geoengineering in Irvine, California, on January 22-23, 1992. S. Hsiung of CNWRA and J. Philip, K. McConnell, and D. Gupta of NRC made presentations to the panel members.

Task 1 - Prelicensing Activities

A. Chowdhury, M. Ahola, and S. Hsiung conducted preliminary review of the DOE Site Characterization Plan (SCP) Progress Report for the Period of October 1, 1990 - March 31, 1991, in order to identify the references relevant to RDCO where details of the significant results can be found that may need detailed technical review by NRC. The review findings were transmitted to NRC on February 10, 1992, as RDCO Intermediate Milestone No. 20-3702-021-010-000.

S. Hsiung and A. Chowdhury attended the meeting of NWTRB's Panel on Structural Geology and Geoengineering in Irvine, California, on January 22-23, 1992. The main topic of this meeting was Seismic Vulnerabilities of Geologic Repository. The speakers at this meeting included representatives from DOE, NRC, CNWRA, State of Nevada, USGS, EPRI, and the American Society of Civil Engineers.

Task 2 - Regulatory and Technical Guidance Development

During this reporting period, S. Hsiung spent two weeks at the NRC on a staff exchange to provide support to NRC staff to revise NRC's public comment draft version of the technical position on underground facility design--thermal loads, to incorporate the comments made by DOE and the State of Nevada. In this activity, he was assisted for one and a half weeks by Terje Brandshaug of Itasca. W. Patrick conducted a technical review of NRC's draft resolution of DOE's and the State of Nevada's comments on the thermal loads technical position that was prepared by NRC staff, S. Hsiung, and T. Brandshaug.

A portion (first two pages) of the proposed DBA Rulemaking package that has been prepared by J. Wolf has been reviewed. This portion of the proposed DBA Rulemaking has been found to be consistent with the findings of the ROC Study.

The review and revision of regulatory requirements (RRs) relevant to RDCO was conducted by a CNWRA team. This included identification of segments of NRC regulations and statute that will be contained in each RR. The draft revised regulatory requirements have been prepared to make them consistent with NRC's Format and Content Regulatory Guide as recommended by the NRC-CNWRA Structural Task Force. L. Lorig of Itasca visited the Center on January 27-28, 1992, to assist the CNWRA team with the revision of RRs relevant to RDCO.

Task 3 - Analysis Codes and Methods

The literature review to prepare a state-of-the-art report on available numerical models and computer codes for fully or partially coupled thermal-hydrological-mechanical-chemical (THMC) processes continued. The reference publications which have been identified through computer and manual searches are being reviewed and summarized. A draft outline of the report was prepared during this period. S. Hsiung, M. Ahola, R. Manteufel, D. Turner, and A. Chowdhury are carrying out this activity.

Task 6 - Repository Operational Criteria Feasibility Studies

The Acceptance Criteria Report for ROC Activity 3 was submitted the NRC on January 24, 1992, as RDCO Intermediate Milestone No. 20-3702-026-312. These criteria define the details of work to be accomplished during Activity 3 of the ROC Study. Initial work on ROC Activity 3 was directed toward making changes to the preliminary analysis done in ROC Activities 1 and 2 that were related to the DBA rulemaking. These changes are needed to incorporate the conclusions reached for the DBA rulemaking and presented to the Director of NMSS on January 17, 1992. The five preliminary ROC Topics related to DBA (Definitions, Design Bases, Normal Radiation Control, Radiation Accidents, and Maximum Potential Radiation Accidents) will be retitled and reformatted to ensure compatibility with the proposed DBA rulemaking. J. Hageman, E. Tschoepe, R. Field, and A. Chowdhury are carrying out this activity.

7.2 Major Problems

None.

7.3 Forecast for Next Period

Work on the technical position on thermal loads, DBA rulemaking, literature review on existing coupled T-H-M-C numerical models, ROC Activity 3, and precicensing activities will continue during the next reporting period.

7.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and reported actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments in the Element are \$83,509. The attached figure following Table 2 displays the estimated cumulative spending plan and the reported actual cumulative costs to date.

Costs incurred to date are less than planned. This is primarily due to continued delay in receiving scheduled study plan review and major design report review assignments from NRC for RDCO Task 1, and delay to start scheduled SRA work for RDCO Task 2, caused by RR/REOP issue resolution activity. Now that the work on the technical position on thermal load is being carried out with an accelerated schedule and the ESF Title I Design review and the SRA work are expected to be started with an accelerated schedule, it is anticipated that these cost variances will be remedied during the next few periods.

| Table 1. Financial Status | |
|--|-------------------|
| FY92 Funds Authorized (a) | \$ 625,607 |
| FY92 Funds Costed to Date (b) | \$ 317,563 |
| FY92 Funds Uncosted (c) | \$ 308,044 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:**
- (a) Authorized funds remaining after FY91 reported actual expenditures with fee.
 - (b) Reported actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3702-020 RDCO

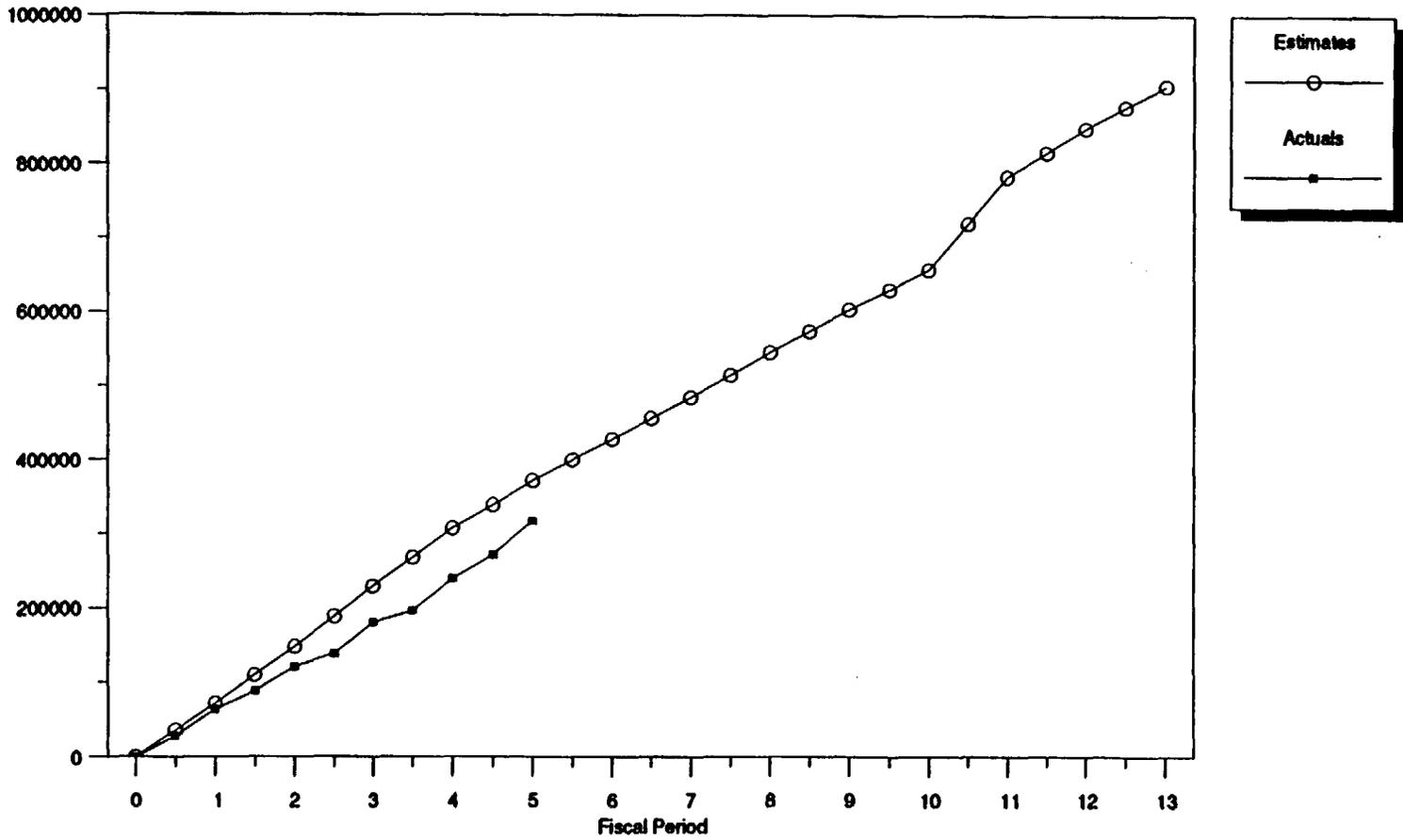
Element Status Cost Report

| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 71598 | 76282 | 81180 | 78049 | 64839 | 56151 | 55862 | 60707 | 58115 | 53794 | 125592 | 66056 | 57196 | 371948 |
| ACT. PERIOD COST | 63878 | 56570 | 59840 | 58879 | 78397 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 317563 |
| VARIANCE, \$ | 7720 | 19712 | 21340 | 19170 | -13558 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54384 |
| VARIANCE, % | 10.8 | 25.8 | 26.3 | 24.6 | -20.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14.6 |
| EST. FY CUMUL | 71598 | 147880 | 229060 | 307109 | 371948 | 428099 | 483961 | 544668 | 602783 | 658577 | 782169 | 848225 | 905421 | |
| ACTUAL FY CUMUL | 63878 | 120447 | 180288 | 239167 | 317563 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.071 | 0.133 | 0.199 | 0.264 | 0.351 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 7720 | 27433 | 48772 | 67942 | 54384 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 10.8 | 18.6 | 21.3 | 22.1 | 14.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

7-4

- NOTES:
1. All Estimated and actual costs exclude award fee.
 2. Estimates are taken from November 1991 Operations Plan or Project Plan.
 3. TOTAL column reflects YTD total.

3702-020 RDCO



8. PERFORMANCE ASSESSMENT

NRC Program Element Manager: S. Coplan

NRC Project Officers: R. Neel (Tasks 1-4), N. Eisenberg (Task 5)

CNWRA Element Manager: Budhi Sagar

Key Personnel: R. Ababou, M. Ahola, A. Bagtzoglou, R. Green, A. Gureghian, R. Janetzke, R. Manteufel, W. Murphy, J. Walton, G. Wittmeyer, Y. Wu

Subcontractors/Consultants: None

8.1 Technical Status

General Activities

In a meeting held at the NRC offices on January 24, the content of the Performance Assessment training course was discussed. Dr. Sagar and Mr. Baca from the Center participated in the meeting. It was decided that two training courses should be developed. The first one for managers should take no more than a day, and the second one for practioners may be of three-days duration. Mr. Baca will prepare an outline which will then be discussed with NRC.

Dr. John Walton was assigned the task of coordinating work on IPA Task 4: The Source Term Code.

Task 1 - Prelicensing Reviews

No activity this period.

Task 2 - Regulatory and Technical Guidance Development

Subtask 2.1 - Systematic Regulatory Analysis of EPA Standard

A new draft of the EPA rule was received. A review of this document is planned along with the technical support documents that would be available shortly.

Subtask 2.2 - Rules and Amendment Support to Conform to the EPA Standard

No significant activity this period.

Subtask 2.3 - Implementing the EPA HLW Standard

No significant work this period.

Subtask 2.4 - Review and Continue Development of Guidance for Formal Use of Expert Judgment

A meeting was held at NRC offices on January 24 for discussing the outstanding issues regarding the use of expert elicitations in performance assessments. In addition to the NRC and Center staffs, two Center consultants, Drs. Winkler and Hora, were also present in the meeting. The work scope for the consultants is currently under preparation.

Task 5 - Iterative Performance Assessment

Drs. Sagar and Walton participated in an IPA coordinators meeting on February 13, 1992. The status of all six IPA tasks was reviewed. It appeared that the development of the source term code and consequence modules for disruptive scenarios were behind schedule.

In a meeting between Drs. Eisenberg and Trapp from NRC and Dr. Sagar and Mr. Ahola from the Center, cases for further simulation of the saturated zone were selected. The eight identified cases are currently being set up for simulation.

A report (CNWRA92-004) titled, "Effects of Layering, Dipping Angle, and Faulting on Two-Dimensional Variably Saturated Flow" was completed and transmitted to the NRC. This report documents results obtained from an auxiliary analysis performed under IPA Task 3.

Work on the source term code is continuing. The waste package failure module is now complete. The waste dissolution and near-field transport module is under development.

Work also continued on completion of the second part of sensitivity/uncertainty report.

8.2 Major Problems

None.

8.3 Forecast for Next Period

Work on Task 2 and several of the Phase 2 Iterative Performance Assessment activities will continue as well as the work on the SRA of 40 CFR Part 191.

8.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments in this Element are \$4,399. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

The spending level is nearly 30% less than estimated in the revised Operations Plan. This results primarily from lower than expected levels of activity in Tasks 1 and 2. Task 5 expenditures are anticipated to accelerate as Phase 2 nears completion and final staff come on board. Commencement of Task 2 work related to elicitation of expert judgement will accelerate expenditures in this area, as well.

| Table 1. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 943,134 |
| FY92 Funds Costed to Date (b) | \$ 350,279 |
| FY92 Funds Uncosted (c) | \$ 592,855 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

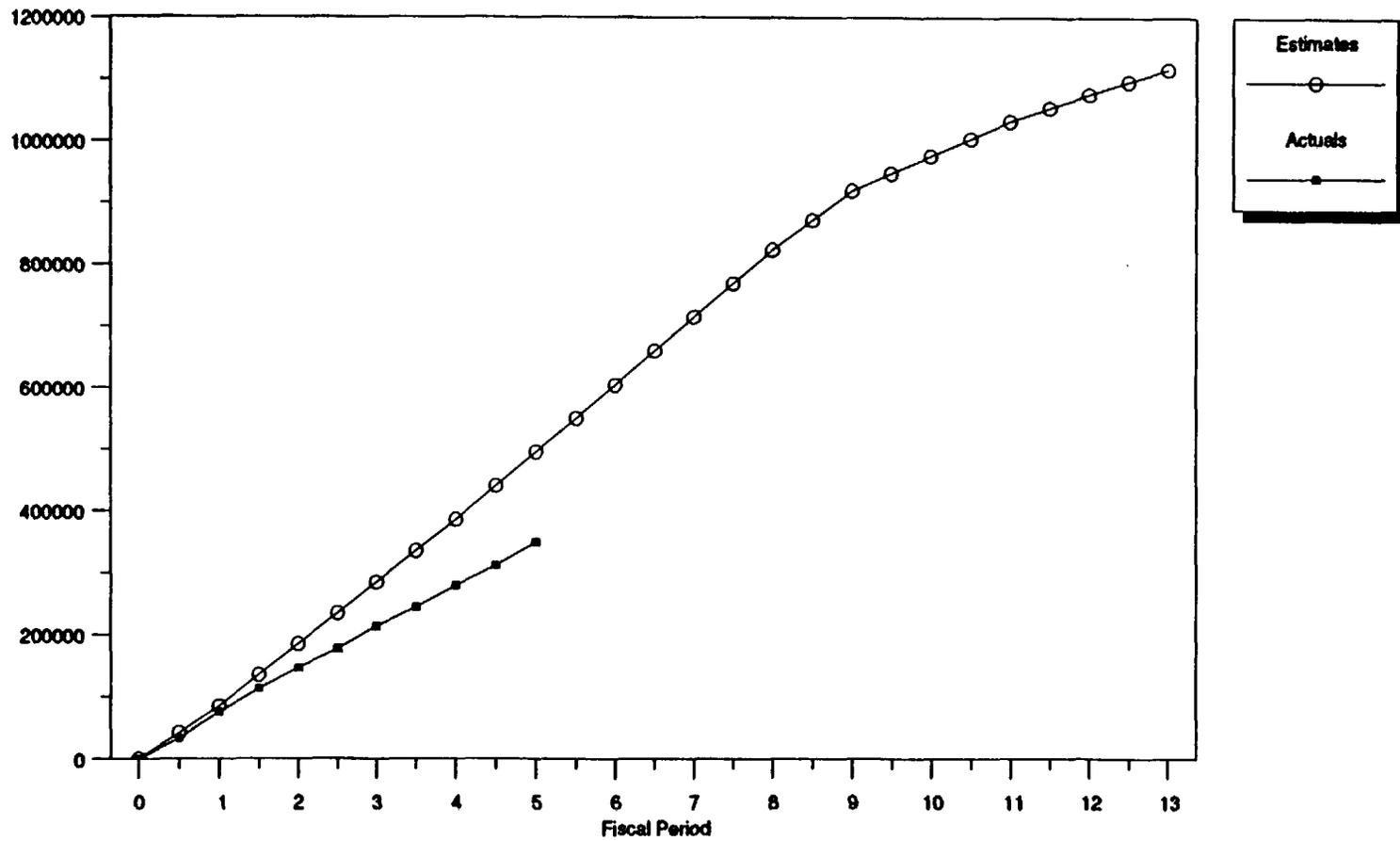
3702-060 PA

Element Status Cost Report

| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|----------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|----------|---------|
|] EST PERIOD COST] | 84881 | 100308 | 99197 | 102264 | 109360 | 108409 | 110360 | 108770 | 95979 | 55636 | 56752 | 44001 | 41087 | 496010] |
|] ACT. PERIOD COST] | 75676 | 70660 | 67114 | 66266 | 70564 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 350279] |
|] VARIANCE, \$] | 9205 | 29648 | 32083 | 35998 | 38796 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 145730] |
|] VARIANCE, %] | 10.8 | 29.6 | 32.3 | 35.2 | 35.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 29.4] |
|] EST. FY CUMUL] | 84881 | 185189 | 284386 | 386649 | 496010 | 604418 | 714778 | 823548 | 919527 | 975163 | 1031915 | 1075915 | 1117003] | |
|] ACTUAL FY CUMUL] | 75676 | 146336 | 213450 | 279715 | 350279 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|] PERCENT COMPLETE] | 0.068 | 0.131 | 0.191 | 0.250 | 0.314 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
|] VARIANCE, \$] | 9205 | 38853 | 70936 | 106934 | 145730 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|] VARIANCE, %] | 10.8 | 21.0 | 24.9 | 27.7 | 29.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

- 4-8
- NOTES:
1. All Estimated and actual costs exclude award fee.
 2. Estimates are taken from November 1991 Operations Plan or Project Plan.
 3. TOTAL column reflects YTD total.

3702-060 PA



9. RESEARCH

NRC Program Element Manager:
John R. Randall

NRC Project Officer for Geochemistry Research Project: George F. Birchard

NRC Project Officer for Thermohydrology Research Project: Timothy S. Margulies

NRC Project Officer for Seismic Rock Mechanics Research Project: Jacob Philip

NRC Project Officer for Waste Package Experiments Research Project: Phillip R. Reed

NRC Project Officer for Geochemical Analogs Research Project: Linda A. Kovach

NRC Project Officer for Stochastic Analysis Research Project: Thomas Nicholson

NRC Project Officer for Sorption Modelling Research Project: George F. Birchard

NRC Project Officer for Performance Assessment Research: Timothy S. Margulies

NRC Project Officer for Volcanic Systems Research Project: Linda A. Kovach

Key Personnel: R. Ababou, M. Ahola, A. Bagtzoglou, A. Chowdhury, G. Cragolino, F. Dodge, R. Green, R. Hart, S. Hsiung, D. Kana, H. Manaktala, R. Manteufel, W. Murphy, P. Nair, R. Pabalan, E. Percy, J. Russell, N. Sridhar, G. Stirewalt, D. Turner, G. Wittmeyer, and S. Young

Subcontractors/Consultants: Itasca, ABC, Inc., Ohio State University, University of Arizona, P. Goodell, I. Reyes

CNWRA Project Manager for Overall Research Project: Prasad K. Nair

CNWRA Project Manager for Geochemistry Research Project: John L. Russell

CNWRA Project Manager for Thermohydrology Research Project: Budhi Sagar

CNWRA Project Manager for Seismic Rock Mechanics Research Project: Asadul H. Chowdhury

CNWRA Project Manager for Integrated Waste Package Experiments Research Project: Prasad K. Nair

CNWRA Project Manager for Geochemical Analogs Research Project: John L. Russell

CNWRA Project Manager for Stochastic Analysis Research Project: Budhi Sagar

CNWRA Project Manager for Sorption Modelling Research Project: John L. Russell

CNWRA Project Manager for Performance Assessment Research: Budhi Sagar

CNWRA Project Manager for Volcanic Systems Research Project: Gerry Stirewalt

9.1 Technical Status

Staff continued work on preparation of the 1991 Annual Research Report. Modifications to Building 57 commenced to install an additional fume hood.

During this period, Center staff initiated review of the draft Statement of Work on Tectonics from NRC Research.

Research Project 1 - Overall Research Plan

In Task 2 of the Overall Research project, coordination continued for the preparation and review of contributed papers for the proceedings of the 1991 Workshop on the Role of Natural Analogs in the Geologic Disposal of Nuclear Waste.

Preparation of a two-day workshop on the Use of Geochemical Modeling Software EQ3/6 commenced, including identification and notification of workshop participants. The workshop will be conducted February 25-26, 1992.

No staff development activities were experienced during this period as reflected in the absence of any expenditures for Task 3.

Internal Quality Assurance activities conducted during the period included continued implementation of the Center Quality Assurance Manual and Operating Procedures. In particular, emphasis was placed on training and coordination with the Technical Staff for implementation of QAP-002, "Review of CNWRA Documents, Reports, Papers, and Presentation Materials;" QAP-014, "Documentation and Verification of Routine Calculations;" QAP-015, "Qualification of Existing Data," and TOP-018, "Configuration Management and Control of Scientific and Engineering Computer Codes." These efforts are most closely associated with preparation and review of the Center's Annual Research Report, as well as various contributions to technical meetings and journals.

Surveillance of experimental activities continued as well as consultation with Principal Investigators who are preparing for the initiation of their experimental activities. P.I.s were assisted in developing experimental procedures, identifying measurement parameters and calibration requirements, and with the use of Scientific Notebooks and documentation of experimental methods and activities.

All research project plans were revised and transmitted to NRC September 16, 1991, with the cost portions being revised November 22, 1991. The status of these Plans is as indicated in the following table.

| PROJECT | TITLE | REVISED PLAN COMPLETION DATE | APPROVAL STATUS |
|-------------|---|------------------------------|---------------------------------|
| Research 1 | Overall Research Plan | 09/16/91 | Await Approval of Tasks 3 and 5 |
| Research 2 | Geochemistry | 09/16/91 | Approved |
| Research 3 | Thermohydrology | 09/16/91 | Approved |
| Research 4 | Seismic Rock Mechanics | 09/16/91 | Await Approval |
| Research 5 | Integrated Waste Package | 09/16/91 | Await Approval |
| Research 6 | Stochastic Analysis of Unsaturated Flow and Transport | 09/16/91 | Approved |
| Research 7 | Geochemical Analog of Contaminant Transport | 09/16/91 | Approved |
| Research 8 | Climatology/Recharge | TBD | TBD |
| Research 9 | Sorption Modeling Mechanisms | 09/16/91 | Approved |
| Research 10 | Performance Assessment | 09/16/91 | Approved |
| Research 11 | Volcanic Systems | 09/16/91 | Task 1 Approved |

Research Project 2 - Geochemistry

Reverse experiments at 25°C to study analcime precipitation from supersaturated solutions continued. These experiments will be used to demonstrate reversibility of the dissolution reaction and to better constrain the equilibrium solubility of analcime. In addition, experiments to study phase equilibrium between analcime + clinoptilolite + aqueous-solutions continued with aqueous samples having been taken for Si, Al, Na, and pH analyses. Equilibrium solubility studies on analcime are also still ongoing, and aqueous samples were taken during this period.

Ion exchange experiments to evaluate the effect of anionic composition on exchange equilibria between aqueous solutions and the zeolite mineral clinoptilolite continued for systems involving mixed cations and mixed anions (e.g., Na/Ca/Cl/NO₃). Results from these experiments will provide further tests for the predictive ability of thermodynamic models developed in the previous reporting periods. Reverse ion exchange experiments have been completed for the NaCl/KCl and NaCl/CaCl₂ systems, which demonstrate reversibility of the ion exchange reactions.

Chapter 2 of the CNWRA annual research report on the Geochemistry Research project was written, reviewed, revised, and completed. A paper titled "Dissolution rate and solubility of analcime at 25°C" was abstracted from the annual report chapter for submission to the International Water-Rock Interaction conference.

Research Project 3 - Thermohydrology

The first thermohydrological experiment conducted as part of Task 3 is continuing. The temperature at the heater element has been maintained at 90 C in an attempt to induce a greater stress on the system. The results of this thermal adjustment are being monitored.

Analysis of data collected during Test 5 and 6 has continued. Results of these analyses will be included in the Peer-Review report and future annual and quarterly research reports.

Work on the interim summary report on this project, which will be the subject of a peer review, has continued. The report was submitted to internal review and review comments are being incorporated where appropriate. The report is due to NRC/RES on the revised date of March 9, 1992. All five peer-review members have supplied their personal qualification and COI credentials. The peer-review member accreditation process at the CNWRA is continuing.

Research Project 4 - Seismic Rock Mechanics Studies

S. Hsiung, A. Chowdhury (both of CNWRA), D. Kana (SwRI), and J. Philip (NRC) were invited by the U. S. National Committee for Rock Mechanics to give a presentation and participate in a round table discussion on the Seismic Rock Mechanics research project at a meeting of the Committee in Irvine, California, on January 21, 1992. This 3-1/4 hour presentation provided an opportunity for technical interaction between the members of the Committee and the participants from NRC, CNWRA, and SwRI. The Committee acted as an informal peer reviewer and provided verbal comments which are in general positive; written comments from this committee are expected within the next few months. Chowdhury, Hsiung, and Philip also attended a meeting of the Nuclear Waste Technical Review Board's Panel on Structural Geology and Geoengineering in Irvine, California, on January 22-23, 1992, where Hsiung and Philip made a presentation entitled "Seismic Field Studies at Lucky Friday Mine, Mullan, Idaho." A presentation on Seismic Rock Mechanics research was given to Commissioner Kenneth C. Rogers by A. Chowdhury, S. Hsiung, M. Ahola, and D. Kana in the Dynamics Laboratory at SwRI on January 28, 1992.

The collection of instrumented field studies data from the Lucky Friday Mine, Mullan, Idaho, continued during this period. Significant cumulative displacement responses of rock and transient hydrologic response of water in fractured zones were observed. The responses from the extensometers and the piezometers are being retrieved through a personal computer at the Center which is connected to the data acquisition system computer located at the Lucky Friday Mine. The deformation response of the two tunnel openings continues to be measured manually. The data from the velocity gauges and the hydrophone are being collected by the macro-seismic data acquisition system of the U.S.

Bureau of Mines, Spokane. A Blast Vibration Monitor that was used in parallel with the velocity gauges to check the calibration of the velocity gauges was returned to the owner rental company. Hardware problems were encountered with the field data acquisition system; the component with hardware problem has been identified by Center's field consultant, W. Blake, who has sent it to its manufacturer, GEOCON, for repairing.

The laboratory experimental work for direct shear tests of single jointed rock specimens continued during Period 5. The pseudostatic direct shear test results of all the single jointed specimens tested to date are being analyzed to evaluate the parameters for three rock joint models: (i) Coulomb Model, (ii) Barton-Bandis Model, and (iii) Continuously-Yielding Model. The results of step velocity tests are being assessed before making any more step velocity tests.

The analysis of the second benchmark problem using the discrete element code DECICE continued during this reporting period. NRC's official instruction for initiation of DECOVALEX coupled modeling work was received during this period and work has been started. The results of DECOVALEX coupled modeling of one benchmark problem and one test case problem using the distinct element computer code UDEC will be presented by M. Ahola at the next DECOVALEX meeting in Stockholm, Sweden on May 18-20, 1992.

Research Project 5 - Integrated Waste Package Experiments

Task 1: Corrosion

Investigation of repassivation potential of type 316L stainless steel and alloy 825 as a function of prior pit growth continued. Initial results indicated that the repassivation potentials attained an approximately constant value regardless of the extent of initial pit growth. These experiments were performed after growing relatively deep pits. More recent experiments indicate that for shallower pits, repassivation potential may be dependent on prior pit depth. Additionally, longer term tests (greater than five day) indicate that repassivation potential reaches a relatively steady value at the end of one day followed by small downward shifts after 5 days. These tests are continuing.

Equipment for the wet-dry tests has been assembled. The tests will be initiated after the glass cell is made.

Task 2: Stress Corrosion Cracking

A series of slow strain rates tests (SSRT) was conducted on CDA 102 (Oxygen-free copper) at room temperature (20°C). After initial reference tests in air, SSRTs were carried out in a solution containing 8500 ppm HCO₃⁻, 6 ppm Cl⁻, 20 ppm SO₄²⁻, 10 ppm NO₃⁻ and 2 ppm F⁻ using circumferentially notched (CN) and smooth waisted (SW) tensile specimens at a nominal extension rate of 1.0 x 10⁻⁶ sec⁻¹. This solution composition was selected because anodic polarization of the specimens leads to the formation of a dark film, that under straining conditions may be the precursor of crack initiation as a result of localized film rupture. A CN specimen was tested at the open circuit potential obtained

in the presence of air ($-105 \text{ mV}_{\text{SCE}}$), which is about 100 mV higher than that in deaerated solution. Through visual examination at 70X magnification, only ductile failure was observed, in agreement with the measured time to failure which was similar to that in air. In addition, two specimens (CN and SW) were strained under an applied potential of 400 mV_{SCE} , which is just above the broad anodic peak observed in the polarization curves. As expected, a thick, dark film was formed on the metal surfaces. However, only ductile failure was observed after testing. Complete analyses of the collected data have been initiated and further testing is continuing.

Task 3: Material Stability

The initial set of intergranular corrosion tests in accordance with ASTM A-262, Procedure C for the heat treated samples of alloy 825 has been completed. Analysis of the results has been initiated, and when completed, selected samples will be prepared for metallographic examination.

Research Project 6 - Stochastic Analysis of Large-Scale Flow and Transport in Unsaturated Fractured Rock

The currently active task of the Stochastic Project is Task 2, where new activities were initiated in an effort to introduce auxiliary hydrodynamic models (effective flow models) suitable for large-scale simulations of partially saturated flow in heterogeneous fractured rocks. Specific activities of the project during the reporting period were focused in part on organizing and putting together of results from previously implemented numerical tests of the BIGFLO code, and in part on writing Chapter 6 of the 1991 Research Annual Report. Activities will re-focus on the important task of introducing effective hydrodynamic models suitable for large-scale unsaturated flow simulations in fractured porous media. One such model has already been developed and is being described in the Annual Report. Finally, related activities outside this project were the finalization and interpretation of 2-D unsaturated flow simulations for Iterative Performance Assessment of Yucca Mountain; the latter results are presently being assembled in a report.

Research Project 7 - Geochemical Analogs

Planning and preparation for additional field research at the Peña Blanca site continued. A trip is planned for March 1 to 6, 1992. Participants will include: J. Bradbury (NRC), L. Kovach (NRC), J. Russell (CNWRA), E. Percy (CNWRA), and B. Leslie (CNWRA). Activities during this trip are expected to include detailed sampling of ore and related rocks at the Nopal I deposit; quality assurance checks of maps completed under contract with I. Reyes of the University of Chihuahua; and meetings with representatives from the *Comision Nacional de Seguridad Nuclear y Salvaguardias*, the *Consejo Recursos Minerales*, and the *Fideicomiso de Fomento Minero*.

Characterization of high-grade uranium ore and associated host rocks from Peña Blanca continued with additional scanning electron microscopy, x-ray diffractometry, energy-dispersive spectrometry, and optical petrography. Evaluation and interpretation of electron microprobe data continued. Sample preparation experiments for transmission

electron microscopy continued. A detailed work plan outlining the use of radioisotopes was submitted to the SwRI radiation safety committee for approval. Preparation of chemical reagents for U and Th isotopic analysis of fluid samples by alpha spectrometry continued. Measurement of the radioisotope content of Peña Blanca rock samples by gamma spectrometry began. Sample preparation of Peña Blanca rock samples for isotope dilution alpha spectroscopy was begun.

A presentation describing results of the Geochemical Natural Analog Research Project was made by E. Percy to NRC Commissioner Rogers on January 27.

Research Project 9 - Sorption Modeling

Experiments to study uranium sorption on the zeolite mineral clinoptilolite at 25°C and in nitrogen atmosphere [to keep out CO₂(g)] were initiated. The experiment (No. A-I-1) consists of 14 mixtures of 2 × 10⁻⁴ M uranium nitrate solution (100 ml) and 0.20 g of Na-clinoptilolite. The initial pH conditions, which were adjusted by addition of HNO₃ or carbonate-free NaOH, ranged from 2.5 to 9.0 to evaluate the effect of pH on uranium sorption. Meanwhile, uranium sorption experiments (No. A-II-1) under conditions open to the atmosphere continued. The mixtures for these experiments are similar to those in the glove box, except that the pH was adjusted by addition of HNO₃ or NaHCO₃. Aqueous samples (10-ml) were taken from each mixture in experiment A-II-1 for analysis of uranium concentration using polarographic methods. The equilibrium pH of those mixtures was also measured.

A detailed workplan for the Sr adsorption experiments was submitted to the radiation safety office at SWRI for approval. Preparation for the start of the Cs and Sr sorption experiments began by obtaining the appropriate shielding and supplies. Initiation of these experiments will begin as soon as approval of the workplans from the SWRI radiation safety committee is obtained.

Thermodynamic data from the EQ3/EQ6 database on aqueous species, solids, and redox reactions have been adapted to and merged with the MINTQA2 database for U, Th, Ra, Cs, Sr, Sn, Zr, and Ru. Version 2.0 of the FITEQL code has been obtained from Dr. J. Westall of the Department of Chemistry, Oregon State University for use in extracting surface complexation constants from experimental data.

Research Project 10 - Performance Assessment

General Information

Dr. Gordon Wittmeyer attended the INTRAVAL meeting in Sydney, Australia from February 10-14, 1992. In the meeting, he presented results of his research on model validation. In addition, a copy of the paper on model validation authored by Ababou, Sagar and Wittmeyer was distributed. He also carried official invitation to hold the next INTRAVAL meeting at the Center. This workshop is planned for November 9-13, 1992.

Task 1 - Technology Transfer

This task has been completed.

Task 2 - Two-Phase Flow and Transport

Documentation of PORFLOW has been completed. This document contains a description of the theory of the code and also detailed instructions for the user of the code. However, it does not contain description of tests that are being conducted currently at the Center. These tests will be documented in another report.

Task 3 - Evaluation and Modification of SNL Technology

No significant activity in this period.

Task 4 - Identification of Phenomena Important to Repository Performance

No significant activity in this period.

Task 5 - Incorporation of Existing Models into PA Methodology

Further progress was made on parallel computations. A code for solving the partially saturated flow is now being tested on the Connection machine located at Los Alamos. The results of this phase of work will be documented in a technical paper and also in the Research Quarterly.

Considerable literature on colloid transport has been collected and is being reviewed. We intend to report the literature review in the next Research Quarterly.

Task 7 - Methodology for Validation of Models

In addition to extending the work already performed on the Las Cruces trench, we are considering the new data set that is being developed by the USGS at the Yucca Mountain Site. This new data set may be added to the INTRAVAL problem set. Dr. Wittmeyer will document his trip to INTRAVAL in a trip report.

Research Project 11 - Volcanic Systems

During this period, Center staff continued surveying, compiling, and reading literature pertinent for conduct of the Volcanism Research Project.

On February 13, 1992, an intensive workshop was held in San Antonio with Center consultants in volcanism, tectonics, and Yucca Mountain area geology to discuss planning and integration of Center activities in the areas of volcanism and tectonism. The meeting successfully targeted the consultants and Center staff toward timely completion of Task 1 of the research project (i.e. - the literature review), and set the stage for undertaking the remaining tasks of the project. Consultants present included W. Leeman, J. Luhr, and B. Marsh in volcanism/magmatism; A. Morris and B. Wernicke in tectonics/structural geology; and L. McKague in Yucca Mountain area geology/stratigraphy.

9.2 Major Problems

None.

9.3 Forecast for Next Period

Research activities will continue in accordance with the approved Project Plans.

9.4 Element Financial Status

Tables 1 through 9 below indicate the financial status of each Project in the context of "authorized" funds established by the NRC. The figures following the tables display planned and actual costs to date on both a per period and a cumulative basis, without allowance for fee. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. The aggregate commitments in the Research FIN total \$140,708.

The cumulative cost underrun in the Geochemistry Research Project at the end of Period 5 was less than 7%. Increased activities in Task 2, which consisted of interpretation of completed analcime dissolution studies and thermodynamic data base evaluations, and in Task 4, which consisted of intensive efforts to prepare the 1991 Annual Research Report, resulted in decrease of the underrun.

The 12% cost underrun on the Thermohydrology Project is due to the delay in conducting a peer-review of the project. Costs will accelerate in the April-May timeframe as a result of peer-review activities.

Costs incurred to date on Seismic Rock Mechanics (SRM) Research project are significantly less than planned. This is primarily due to the delay in starting the SRM Task 3 modeling work. Also, there is a time lag in receiving the bills from the subcontractor and the consultant. The cost variances will be remedied by accelerating the SRM Task 3 modeling activities during the remaining periods of FY92.

The cost variance in the IWPE Project is about 22% under plan. This results from (i) delayed initiation of some task activities, while awaiting samples to be heat-treated and various pieces of glassware and equipment to be procured, and (ii) expending a significant amount of time in activities related to IPA and EBS. Equipment has been or will soon be received and we anticipate that other activities will be back on schedule starting next month.

The 10% cost underrun on the Stochastic Project, a major improvement from previous periods, results from the PI involvement on the IPA, Phase 2 work which must be completed by May 1992.

At the end of Period 5, the Natural Analog Project was on target.

The Sorption Modeling Research Project ended Period 5 with an overrun of 12%, compared to 90% at the end of Period 3. The trend of the actual spending curve is likely to continue. It is therefore anticipated that the variance between actual and estimated costs will be eliminated within the next period.

Because of delay in starting the work on Adaptive Grids and Colloid Transport, the PA Research Project is underspent by about 24%. The work and associated expenditures are expected to accelerate with the addition of R. Baca, Manager of PA and HT, who will work on these two activities.

The cumulative cost variance in the Volcanism Research Project is approximately 47% under plan at the end of Period 5. The variance, which is much improved from prior periods, resulted from (i) the lack of activity in Period 1 due to formal receipt by the Center late in Period 1 of NRC approval to initiate the project, (ii) greater than anticipated time required to begin utilization of consultants services, and (iii) reactive activities for NRC requiring more time than planned for the Center principal investigators. Corrective actions include acquisition of a student employee to assist the principal investigators and acceleration of consultant activities in Periods 6 and 7.

Overall Research

| Table 1. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 179,019 |
| FY92 Funds Costed to Date (b) | \$ 97,282 |
| FY92 Funds Uncosted (c) | \$ 81,737 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Geochemistry

| Table 2. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 117,765 |
| FY92 Funds Costed to Date (b) | \$ 90,537 |
| FY92 Funds Uncosted (c) | \$ 27,228 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Thermohydrology

| Table 3. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 187,854 |
| FY92 Funds Costed to Date (b) | \$ 132,135 |
| FY92 Funds Uncosted (c) | \$ 55,719 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Seismic Rock Mechanics

| Table 4. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 196,415 |
| FY92 Funds Costed to Date (b) | \$ 92,544 |
| FY92 Funds Uncosted (c) | \$ 103,871 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Integrated Waste Package

| Table 5. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 227,699 |
| FY92 Funds Costed to Date (b) | \$ 141,550 |
| FY92 Funds Uncosted (c) | \$ 86,149 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Stochastic Analysis

| Table 6. Financial Status | |
|---|-----------|
| FY92 Funds Authorized (a) | \$ 92,594 |
| FY92 Funds Costed to Date (b) | \$ 67,502 |
| FY92 Funds Uncosted (c) | \$ 25,092 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Geochemical Analogs

| Table 7. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 171,623 |
| FY92 Funds Costed to Date (b) | \$ 138,772 |
| FY92 Funds Uncosted (c) | \$ 32,851 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Sorption

| Table 8. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 146,004 |
| FY92 Funds Costed to Date (b) | \$ 120,223 |
| FY92 Funds Uncosted (c) | \$ 25,781 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Performance Assessment

| Table 9. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 194,683 |
| FY92 Funds Costed to Date (b) | \$ 119,599 |
| FY92 Funds Uncosted (c) | \$ 75,084 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

Volcanic Systems

| Table 10. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 167,231 |
| FY92 Funds Costed to Date (b) | \$ 71,914 |
| FY92 Funds Uncosted (c) | \$ 95,317 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES:**
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3704-000 OVERALL

Element Status Cost Report

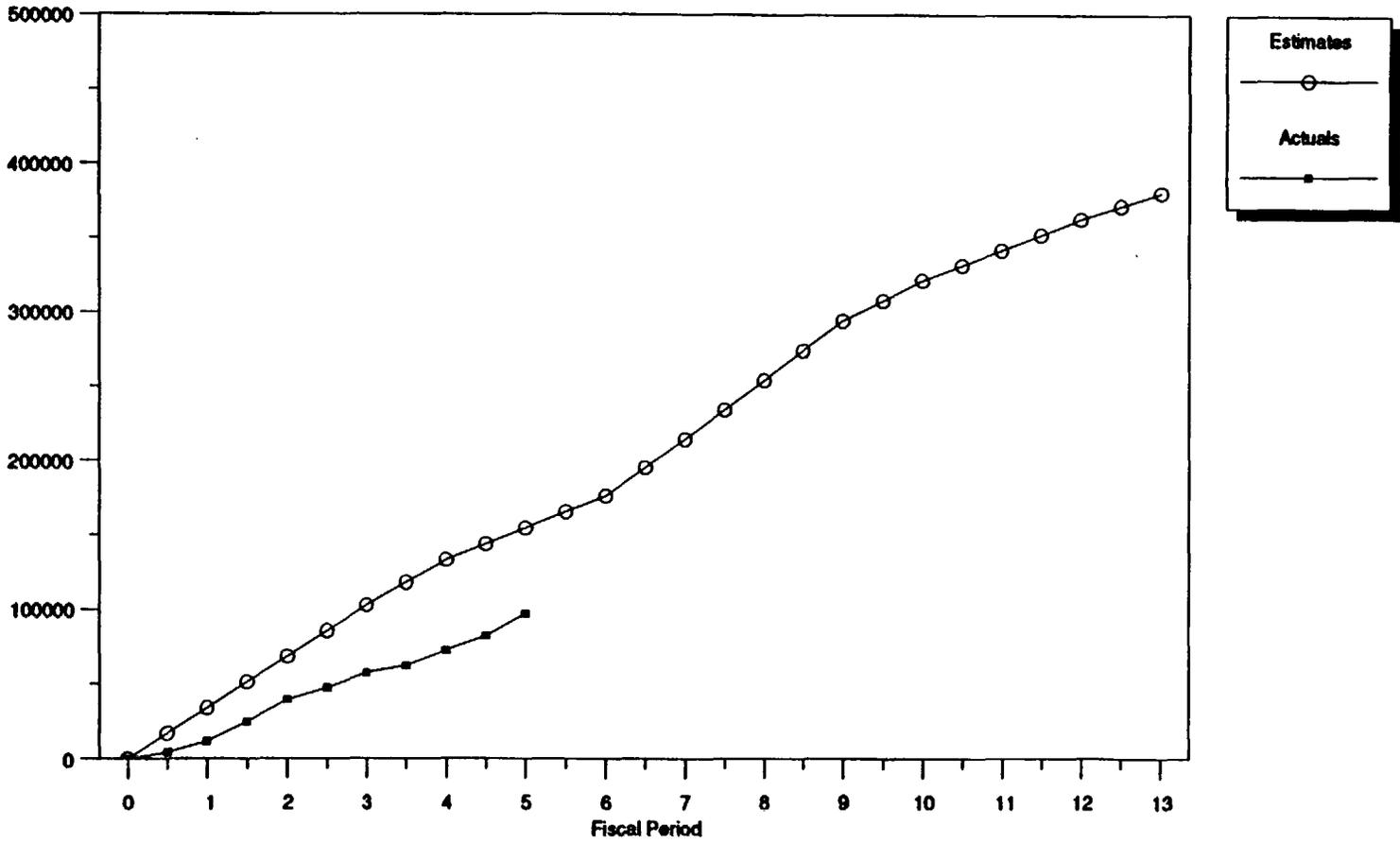
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 34021 | 34246 | 34451 | 30426 | 21480 | 21800 | 37825 | 39809 | 40152 | 27096 | 20435 | 20955 | 17825 | 154624 |
| ACT. PERIOD COST | 11699 | 27833 | 17908 | 15014 | 24828 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 97282 |
| VARIANCE, \$ | 22322 | 6413 | 16543 | 15411 | -3348 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57343 |
| VARIANCE, % | 65.6 | 18.7 | 48.0 | 50.7 | -15.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 37.1 |
| EST. FY CUMUL | 34021 | 68267 | 102719 | 133145 | 154624 | 176425 | 214250 | 254059 | 294211 | 321307 | 341742 | 362697 | 380522 | |
| ACTUAL FY CUMUL | 11699 | 39532 | 57440 | 72454 | 97282 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.031 | 0.104 | 0.151 | 0.190 | 0.256 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 22322 | 28736 | 45279 | 60690 | 57343 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 65.6 | 42.1 | 44.1 | 45.6 | 37.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

71-6

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-000 Overall Research



3704-010 GEOCHEM

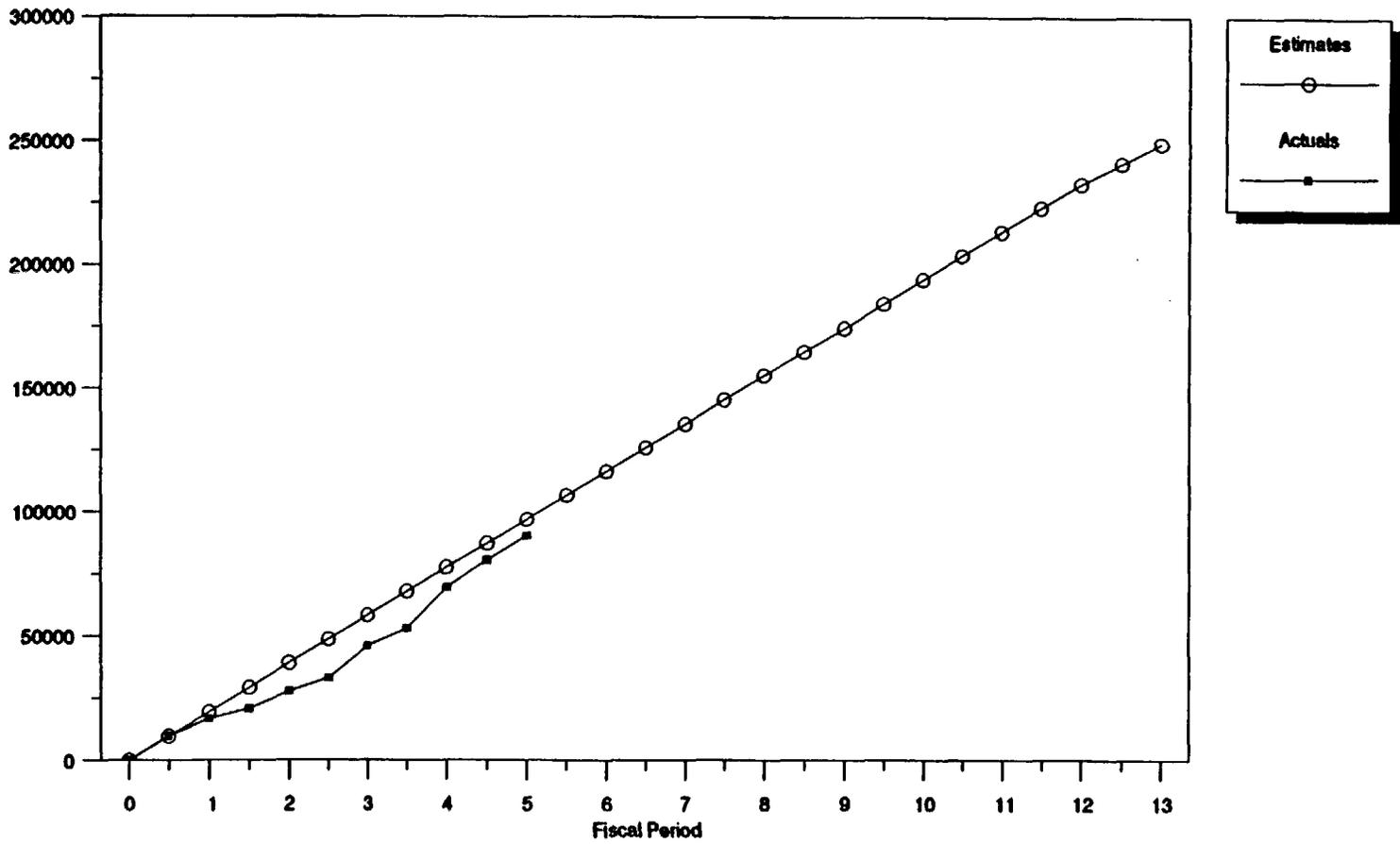
Element Status Cost Report

| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| EST PERIOD COST | 19371 | 19573 | 19210 | 19528 | 19337 | 19431 | 19170 | 19551 | 19128 | 19697 | 19307 | 19481 | 16217 | 97019 |
| ACT. PERIOD COST | 16663 | 11054 | 18091 | 23698 | 21032 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 90537 |
| VARIANCE, \$ | 2708 | 8519 | 1119 | -4170 | -1694 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6482 |
| VARIANCE, % | 14.0 | 43.5 | 5.8 | -21.4 | -8.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.7 |
| EST. FY CUMUL | 19371 | 38944 | 58154 | 77682 | 97019 | 116451 | 135620 | 155171 | 174299 | 193995 | 213303 | 232783 | 249000 | |
| ACTUAL FY CUMUL | 16663 | 27717 | 45807 | 69505 | 90537 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.067 | 0.111 | 0.184 | 0.279 | 0.364 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 2708 | 11227 | 12346 | 8177 | 6482 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 14.0 | 28.8 | 21.2 | 10.5 | 6.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

91-6

- NOTES:
1. All Estimated and actual costs exclude award fee.
 2. Estimates are taken from November 1991 Operations Plan or Project Plan.
 3. TOTAL column reflects YTD total.

3704-010 Geochemistry



3704-020

THERMO

Element Status Cost Report

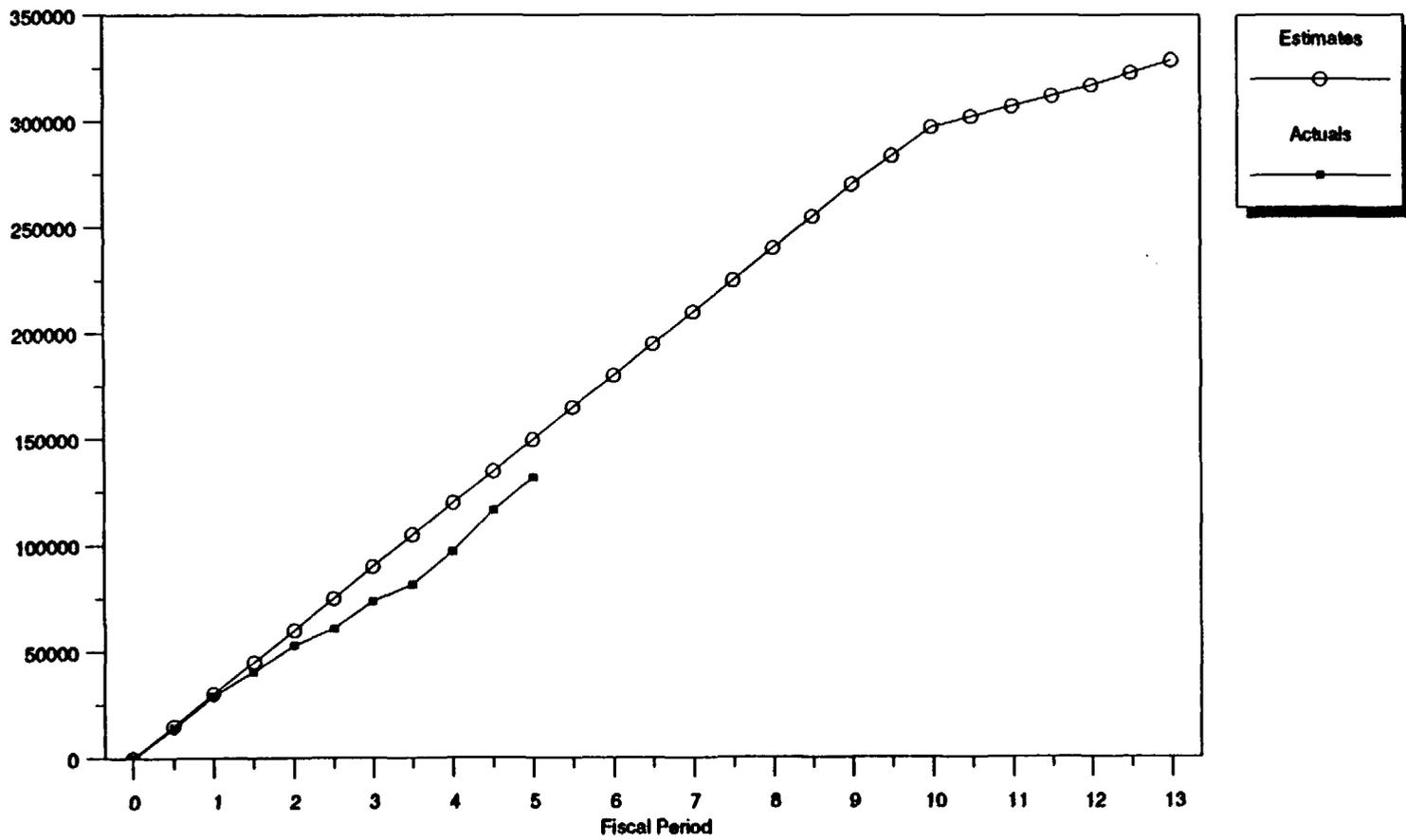
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST. PERIOD COST | 29952 | 30046 | 29902 | 30099 | 29902 | 30070 | 29877 | 30249 | 30095 | 27008 | 9844 | 10050 | 11751 | 149901 |
| ACT. PERIOD COST | 28901 | 24125 | 20523 | 23662 | 34924 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 132135 |
| VARIANCE, \$ | 1050 | 5921 | 9380 | 6437 | -5022 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17766 |
| VARIANCE, % | 3.5 | 19.7 | 31.4 | 21.4 | -16.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.9 |
| EST. FY CUMUL | 29952 | 59998 | 89900 | 119999 | 149901 | 179971 | 209848 | 240097 | 270192 | 297200 | 307045 | 317094 | 328845 | |
| ACTUAL FY CUMUL | 28901 | 53026 | 73549 | 97211 | 132135 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.088 | 0.161 | 0.224 | 0.296 | 0.402 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 1050 | 6971 | 16351 | 22788 | 17766 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 3.5 | 11.6 | 18.2 | 19.0 | 11.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

81-6

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-020 Thermo



3704-030

SEISMIC

Element Status Cost Report

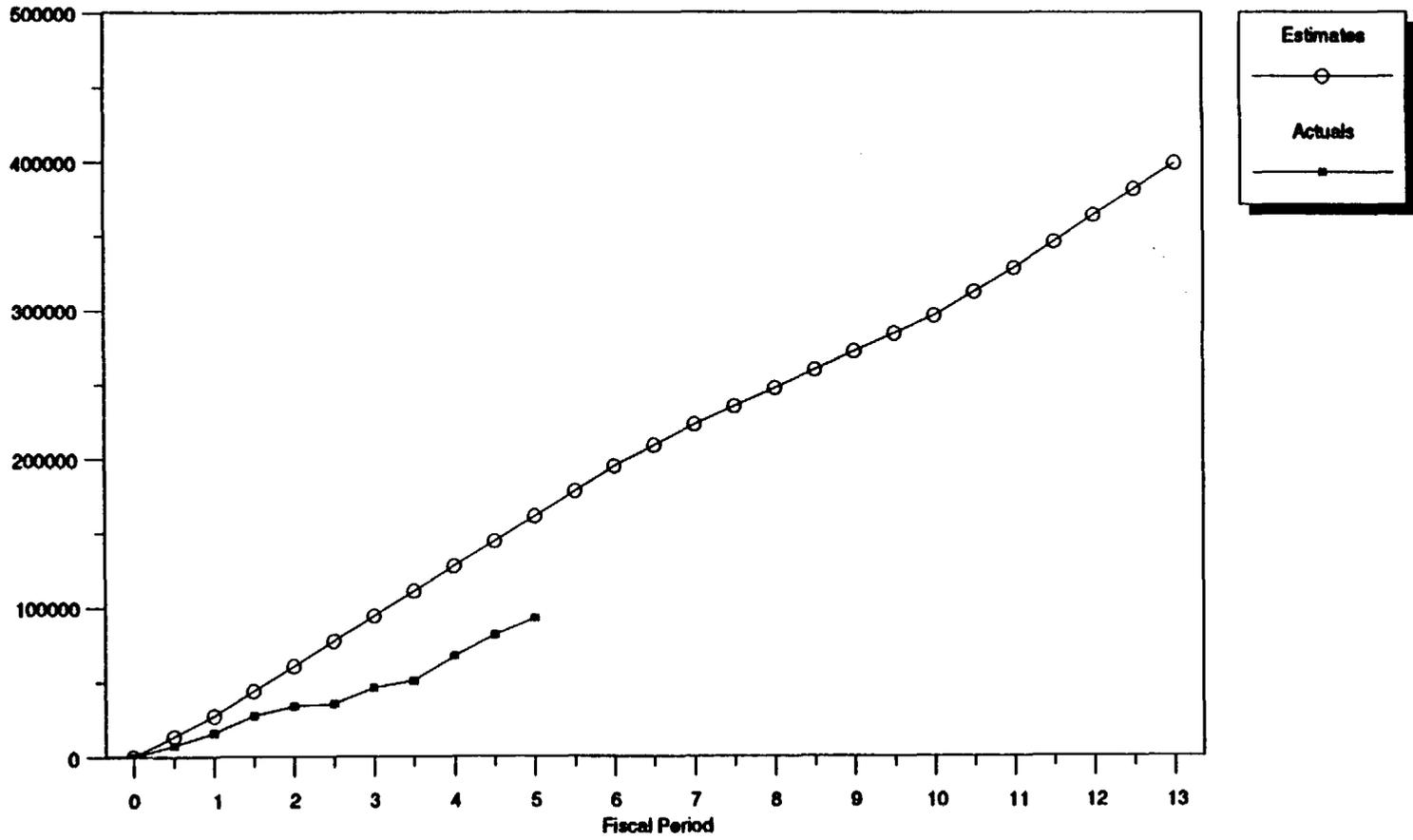
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 27307 | 33147 | 33511 | 33804 | 33511 | 33394 | 28314 | 24471 | 24663 | 23881 | 32220 | 35566 | 35033 | 161079 |
| ACT. PERIOD COST | 16132 | 17630 | 12178 | 21324 | 25280 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 92544 |
| VARIANCE, \$ | 11175 | 15516 | 21333 | 12280 | 8231 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 68535 |
| VARIANCE, % | 40.9 | 46.8 | 63.7 | 36.5 | 24.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 42.5 |
| EST. FY CUMUL | 27307 | 60453 | 93964 | 127568 | 161079 | 194473 | 222787 | 247258 | 271921 | 295802 | 328022 | 363588 | 398620 | |
| ACTUAL FY CUMUL | 16132 | 33762 | 45940 | 67264 | 92544 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.040 | 0.085 | 0.115 | 0.169 | 0.232 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 11175 | 26691 | 48024 | 60304 | 68535 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 40.9 | 44.2 | 51.1 | 47.3 | 42.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

9-20

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-030 Seismic



3704-040 INTEGR. WASTE PACKAGE E Element Status Cost Report

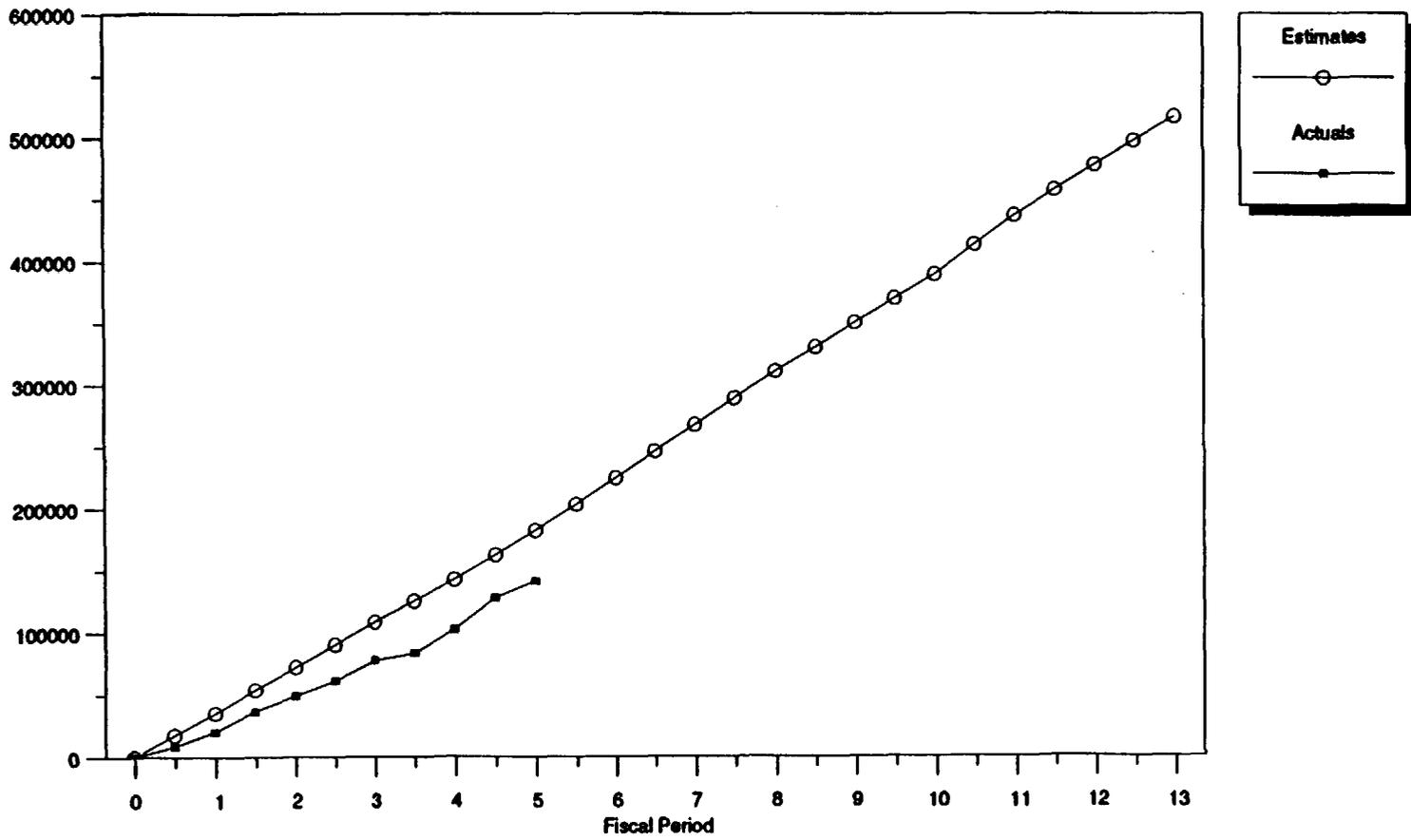
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 35482 | 36645 | 36200 | 34268 | 39798 | 42349 | 43112 | 42892 | 39620 | 39115 | 47996 | 40443 | 39296 | 182393 |
| ACT. PERIOD COST | 20416 | 28590 | 28574 | 24690 | 39280 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 141550 |
| VARIANCE, \$ | 15066 | 8055 | 7626 | 9579 | 517 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40843 |
| VARIANCE, % | 42.5 | 22.0 | 21.1 | 28.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 22.4 |
| EST. FY CUMUL | 35482 | 72127 | 108327 | 142595 | 182393 | 224742 | 267853 | 310746 | 350365 | 389481 | 437477 | 477920 | 517215 | |
| ACTUAL FY CUMUL | 20416 | 49006 | 77580 | 102269 | 141550 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.039 | 0.095 | 0.150 | 0.198 | 0.274 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 15066 | 23121 | 30747 | 40326 | 40843 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 42.5 | 32.1 | 28.4 | 28.3 | 22.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

9-22

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-040 IWPE



3704-050

STOCH MODELING

Element Status Cost Report

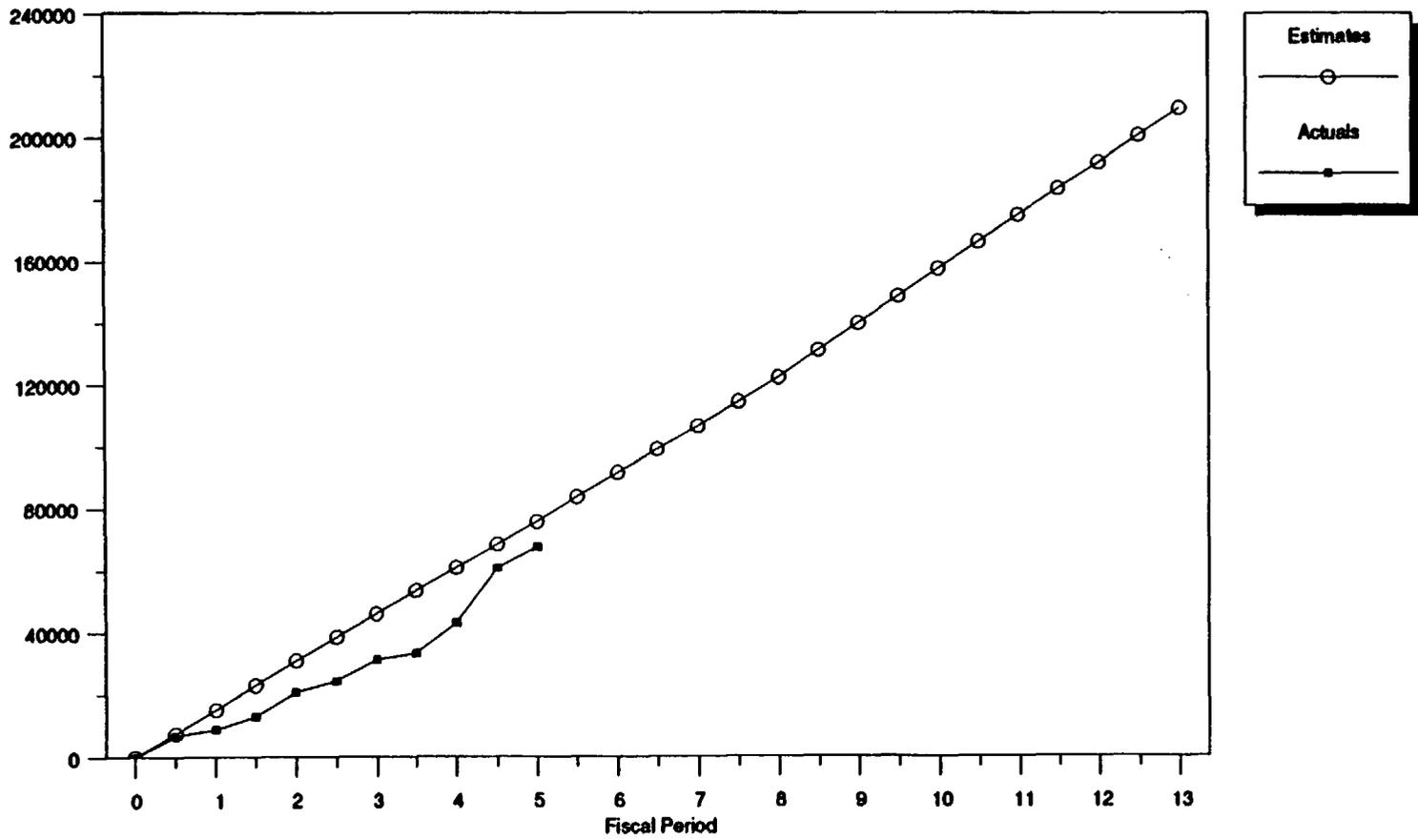
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|-------|
| EST PERIOD COST | 15050 | 15901 | 15018 | 14945 | 14763 | 15888 | 14988 | 15672 | 17473 | 17643 | 17380 | 16949 | 17691 | 75677 |
| ACT. PERIOD COST | 8807 | 12026 | 10381 | 11861 | 24428 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 67502 |
| VARIANCE, \$ | 6244 | 3876 | 4638 | 3083 | -9665 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8175 |
| VARIANCE, % | 41.5 | 24.4 | 30.9 | 20.6 | -65.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.8 |
| EST. FY CUMUL | 15050 | 30951 | 45970 | 60914 | 75677 | 91566 | 106554 | 122226 | 139700 | 157342 | 174722 | 191671 | 209362 | |
| ACTUAL FY CUMUL | 8807 | 20832 | 31213 | 43074 | 67502 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.042 | 0.100 | 0.149 | 0.206 | 0.322 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 6244 | 10119 | 14757 | 17840 | 8175 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 41.5 | 32.7 | 32.1 | 29.3 | 10.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

9-24

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-050 Stochastic



3704-060

GEOCHEMICAL ANALOGS

Element Status Cost Report

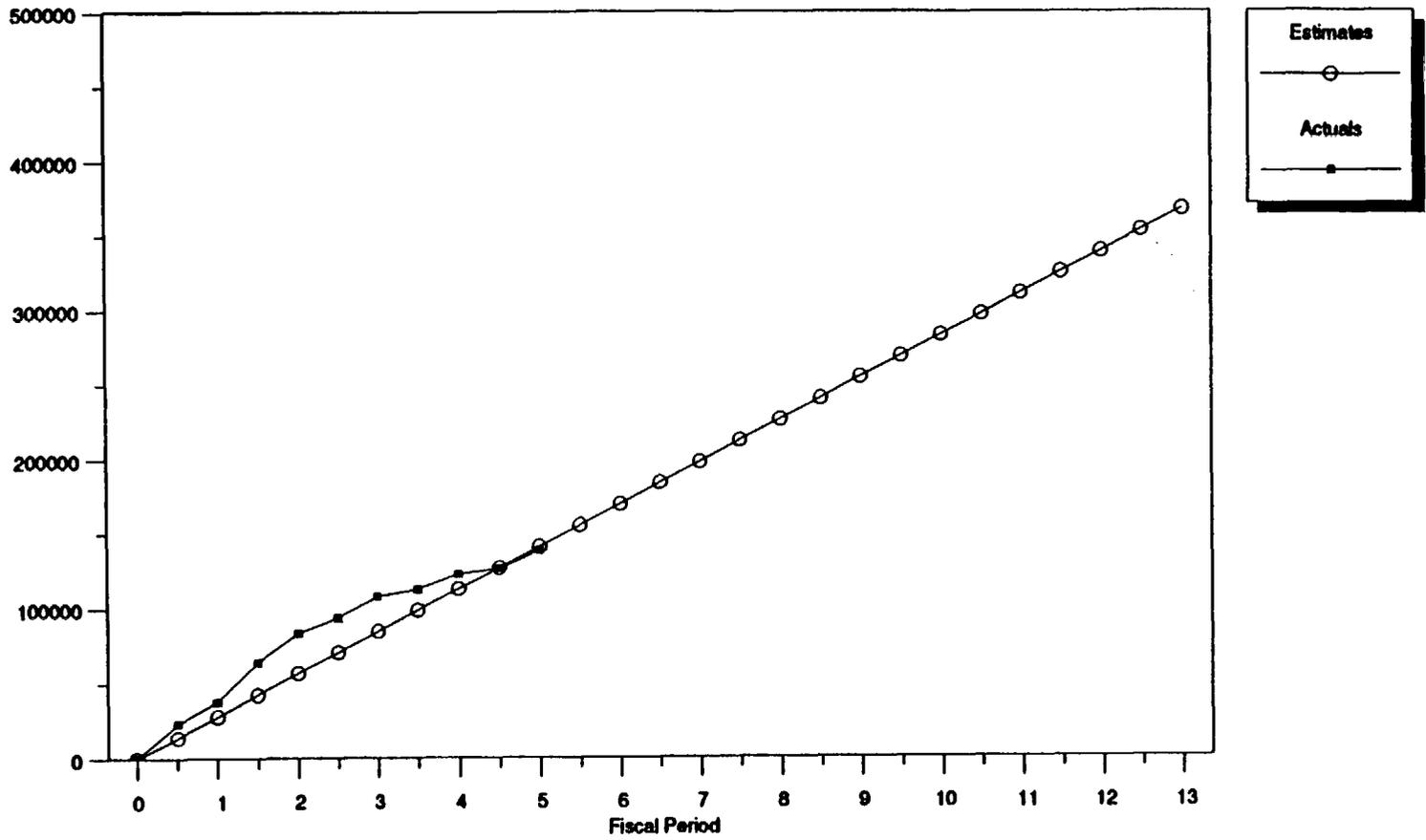
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST. PERIOD COST | 28006 | 28663 | 27970 | 28272 | 28319 | 28466 | 28091 | 28292 | 28443 | 28194 | 28165 | 28382 | 28197 | 141230 |
| ACT. PERIOD COST | 37625 | 45691 | 24536 | 14875 | 16045 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 138772 |
| VARIANCE, \$ | -9619 | -17027 | 3433 | 13397 | 12274 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2458 |
| VARIANCE, % | -34.3 | -59.4 | 12.3 | 47.4 | 43.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 |
| EST. FY CUMUL | 28006 | 56669 | 84638 | 112911 | 141230 | 169695 | 197787 | 226079 | 254522 | 282717 | 310882 | 339264 | 367460 | |
| ACTUAL FY CUMUL | 37625 | 83315 | 107851 | 122727 | 138772 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.102 | 0.227 | 0.294 | 0.334 | 0.378 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | -9619 | -26646 | -23213 | -9816 | 2458 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | -34.3 | -47.0 | -27.4 | -8.7 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

9-26

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-060 Analogs



3704-070

SORPTION MECHANISMS

Element Status Cost Report

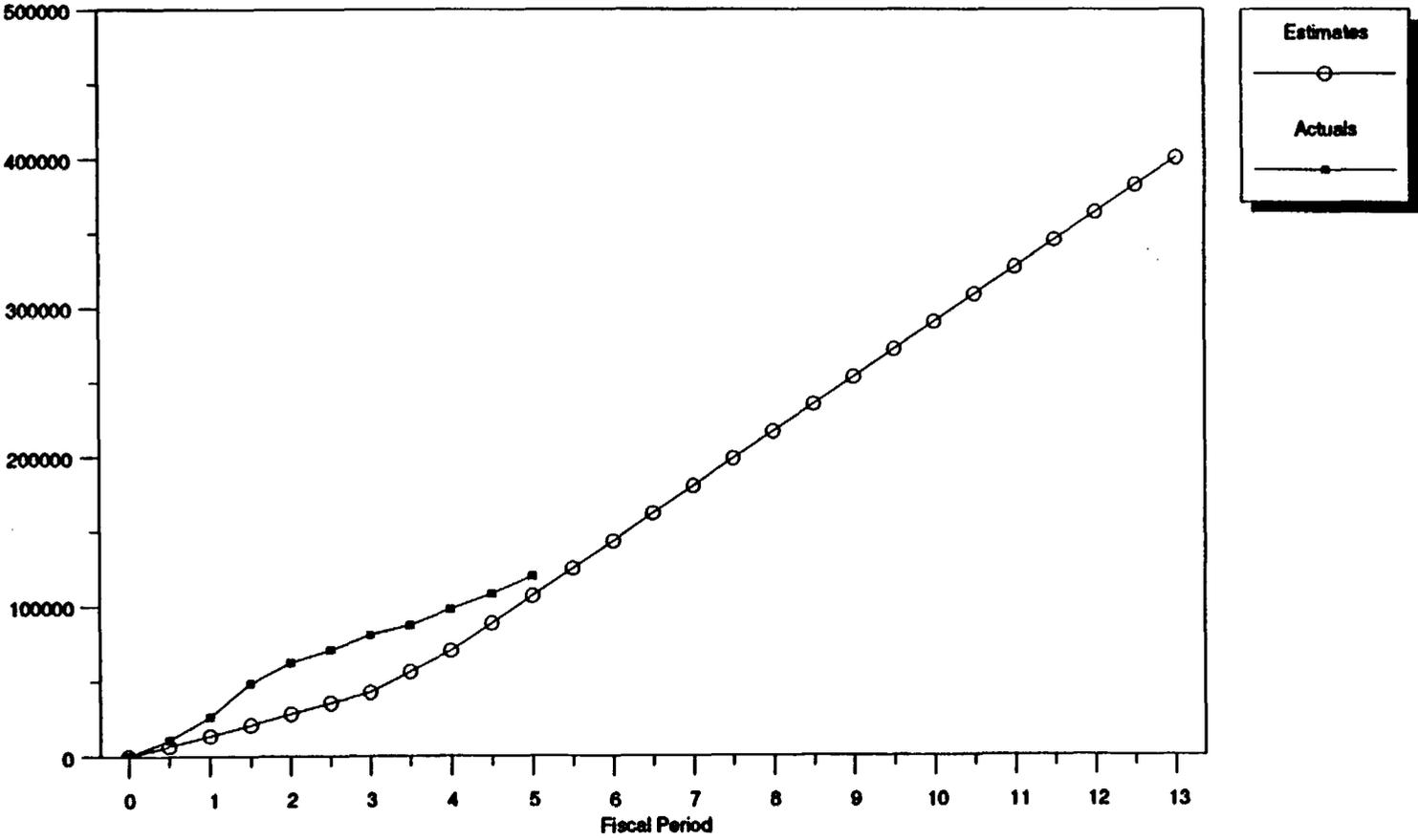
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 13733 | 14421 | 14284 | 27808 | 36734 | 36503 | 37029 | 36544 | 36664 | 36649 | 36955 | 36810 | 36576 | 108980 |
| ACT. PERIOD COST | 26210 | 36022 | 18568 | 17017 | 22406 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 120223 |
| VARIANCE, \$ | -12477 | -21600 | -4304 | 10791 | 14328 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -13262 |
| VARIANCE, % | -90.9 | -149.8 | -30.2 | 38.8 | 39.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -12.4 |
| EST. FY CUMUL | 13733 | 28154 | 424 | 70226 | 106960 | 143463 | 180492 | 217037 | 253701 | 290350 | 327305 | 364115 | 400691 | |
| ACTUAL FY CUMUL | 26210 | 62232 | 80800 | 97816 | 120223 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.065 | 0.155 | 0.202 | 0.244 | 0.300 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | -12477 | -34078 | -38382 | -27591 | -13262 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | -90.9 | -121.0 | -90.5 | -39.3 | -12.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

9-28

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-070 Sorption



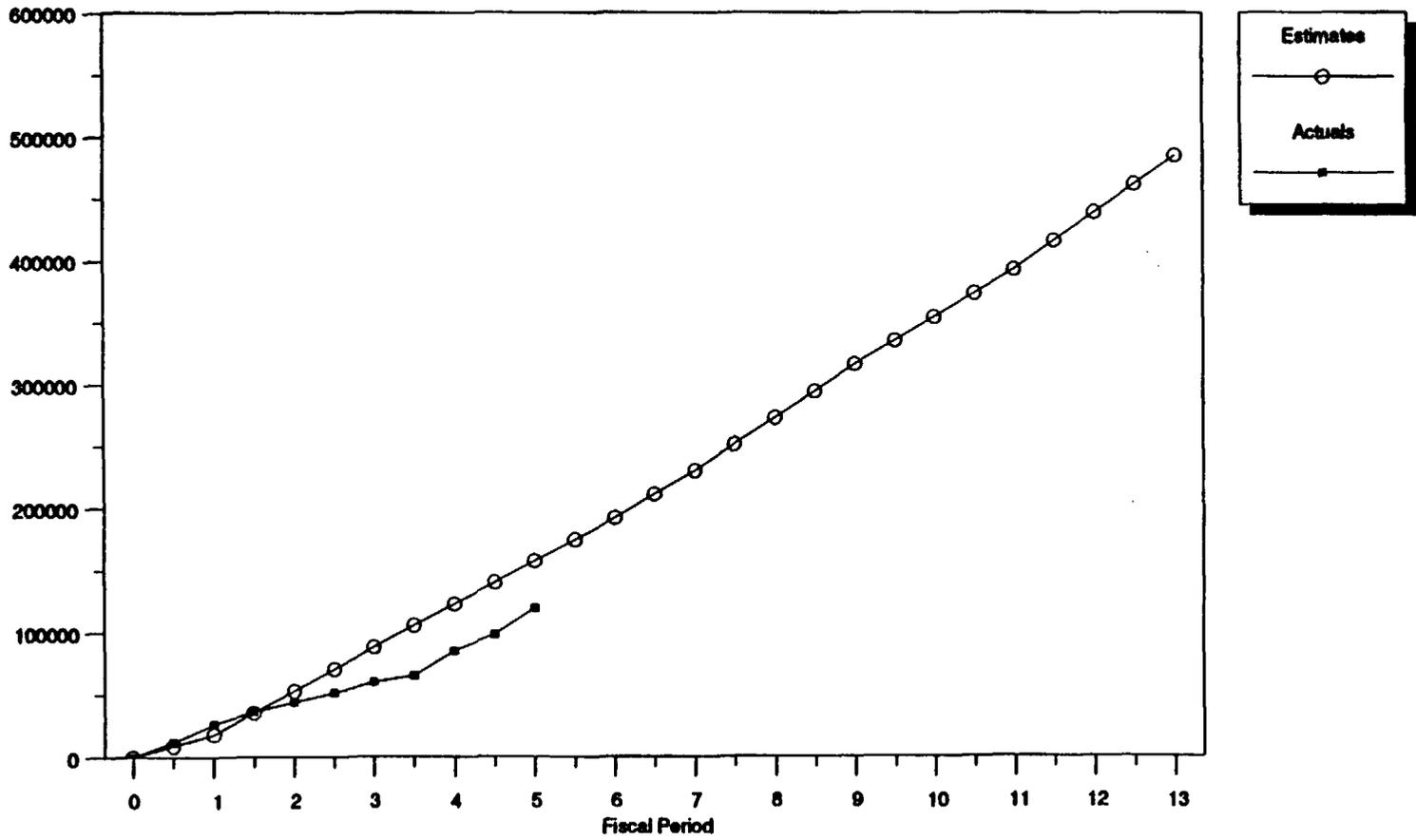
3704-110 PERFORMANCE ASSESSMENT Element Status Cost Report

| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 18156 | 34687 | 35224 | 34706 | 34668 | 34644 | 37885 | 43757 | 42330 | 38192 | 38410 | 46220 | 45745 | 157439 |
| ACT. PERIOD COST | 26550 | 17249 | 16267 | 25033 | 34500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 119599 |
| VARIANCE, \$ | -8395 | 17438 | 18957 | 9673 | 167 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37840 |
| VARIANCE, % | -46.2 | 50.3 | 53.8 | 27.9 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 24.0 |
| EST. FY CUMUL | 18156 | 52842 | 88066 | 122772 | 157439 | 192083 | 229969 | 273725 | 316055 | 354247 | 392657 | 438877 | 484622 | |
| ACTUAL FY CUMUL | 26550 | 43799 | 60066 | 85099 | 119599 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.055 | 0.090 | 0.124 | 0.176 | 0.247 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | -8395 | 9043 | 28000 | 37673 | 37840 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | -46.2 | 17.1 | 31.8 | 30.7 | 24.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

9-30

- NOTES:
1. All Estimated and actual costs exclude award fee.
 2. Estimates are taken from November 1991 Operations Plan or Project Plan.
 3. TOTAL column reflects YTD total.

3704-110 Research PA



3704-120

VOLCANISM (REVIEW)

Element Status Cost Report

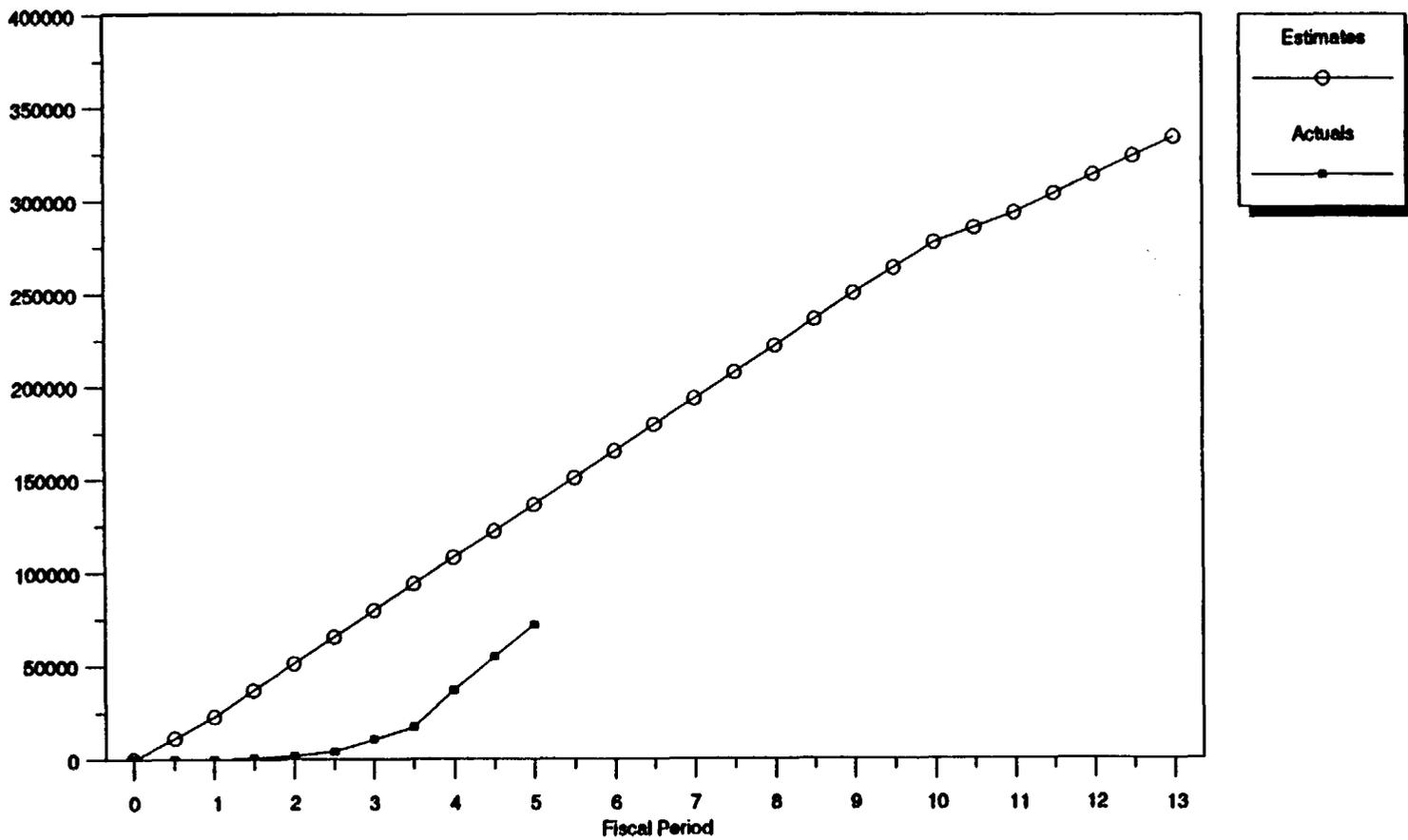
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|---------------------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|]EST PERIOD COST] | 22811 | 28256 | 28693 | 28346 | 28361 | 28828 | 28223 | 28346 | 28439 | 27202 | 16163 | 20513 | 20286 | 136466 |
|]ACT. PERIOD COST] | 0 | 1750 | 9026 | 26270 | 34867 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 71914 |
|]VARIANCE, \$] | 22811 | 26506 | 19667 | 2076 | -6506 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64552 |
|]VARIANCE, %] | 100.0 | 93.8 | 68.5 | 7.3 | -22.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 47.3 |
|]EST. FY CUMUL] | 22811 | 51067 | 79760 | 108105 | 136466 | 165295 | 193518 | 221864 | 250303 | 277506 | 293668 | 314181 | 334468 | |
|]ACTUAL FY CUMUL] | 0 | 1750 | 10777 | 37047 | 71914 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|]PERCENT COMPLETE] | 0.000 | 0.005 | 0.032 | 0.111 | 0.215 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
|]VARIANCE, \$] | 22811 | 49316 | 68983 | 71059 | 64552 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
|]VARIANCE, %] | 100.0 | 96.6 | 86.5 | 65.7 | 47.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

9-32

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-120 Volcanism



10. LICENSING SUPPORT SYSTEM ADMINISTRATOR

NRC Program Element Manager: Betsy Shelburne

CNWRA Element Manager: Rawley Johnson

Key Personnel: S. Young, R. Marshall

Subcontractor/Consultant: C. Acree (P.I.), J. Cooper

10.1 Technical Status

Task 1 - Development of Access Protocols to LSS Technical Data

The LSSA staff continued its review of the overall outline the Center provided for an access protocols plan which they have redefined as a report. The Center prepared changes to the Operations Plans for delivering the report which calls for the preparation of a succession of draft reports, conducting meetings with all parties involved, and making revisions as necessary to complete the final report. The Center has finished the draft of the Operations Plan changes and will submit them with the changes for Task 2. The Center staff is reviewing and commenting further on the classification, by form, of non-text searchable documentary materials and their attributes. The items typically listed in a document package of table of contents (TOC) has also been further defined.

Task 2 - Development of a Document Loading Plan (DLP): An Evaluation of the HLW Program Information and Development of a Priority Document Loading Schedule (PDLs)

After meeting with the LSSA and discussing the "Preliminary Report on the Feasibility of Priority Loading of the Licensing Support System (LSS)", the Center is revising its approach for surveying the LSS participants in regard to their timing and use of various document categories. The LSSA is reviewing and changing the approach based on discussions with the Center. The final agreed upon approach will be submitted as change pages to the Operations Plan for Task 2. The date for submitting the changes for both tasks has been rescheduled for February 27, 1992.

10.2 Major Problems

None to report.

10.3 Forecast for Next Period

Task 1 - Development of Access Protocols to LSS Technical Data

The Center staff will submit its report which defines the attributes for the non-text-searchable materials and the TOC for packages. The LSSA will provide the completed outline for the access protocols report to the Center for discussion and use in developing

the report. Operations Plans and schedules will be revised and submitted to include the additional deliverables and associated meetings and review cycles with all of the participants on the LSSARP.

Task 2 - Development of a Document Loading Plan (DLP): An Evaluation of the HLW Program Information and Development of a Priority Document Loading Schedule (PDLs)

The Center will complete its proposal for the next steps that should be taken in arriving at a more fully substantiated answer to the feasibility questions. This will lead to revisions in Task 2 of the Operations Plans which the Center will prepare and deliver by February 27, 1992.

10.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. Variances are shown on both a dollar and percentage basis. Commitments in this Element are \$1,500. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Costs incurred to date are on target. Further attention will be given to adjusting the scope of efforts (and attendant expenditures) to available funding in the revised Operations Plans.

| Table 1. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 244,264 |
| FY92 Funds Costed to Date (b) | \$ 132,088 |
| FY92 Funds Uncosted (c) | \$ 112,176 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

- NOTES: (a) Authorized funds remaining after FY91 actual expenditures with fee.
 (b) Actual expenditures FY92 YTD without fee.
 (c) Difference between (a) and (b).

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Element Status Cost Report

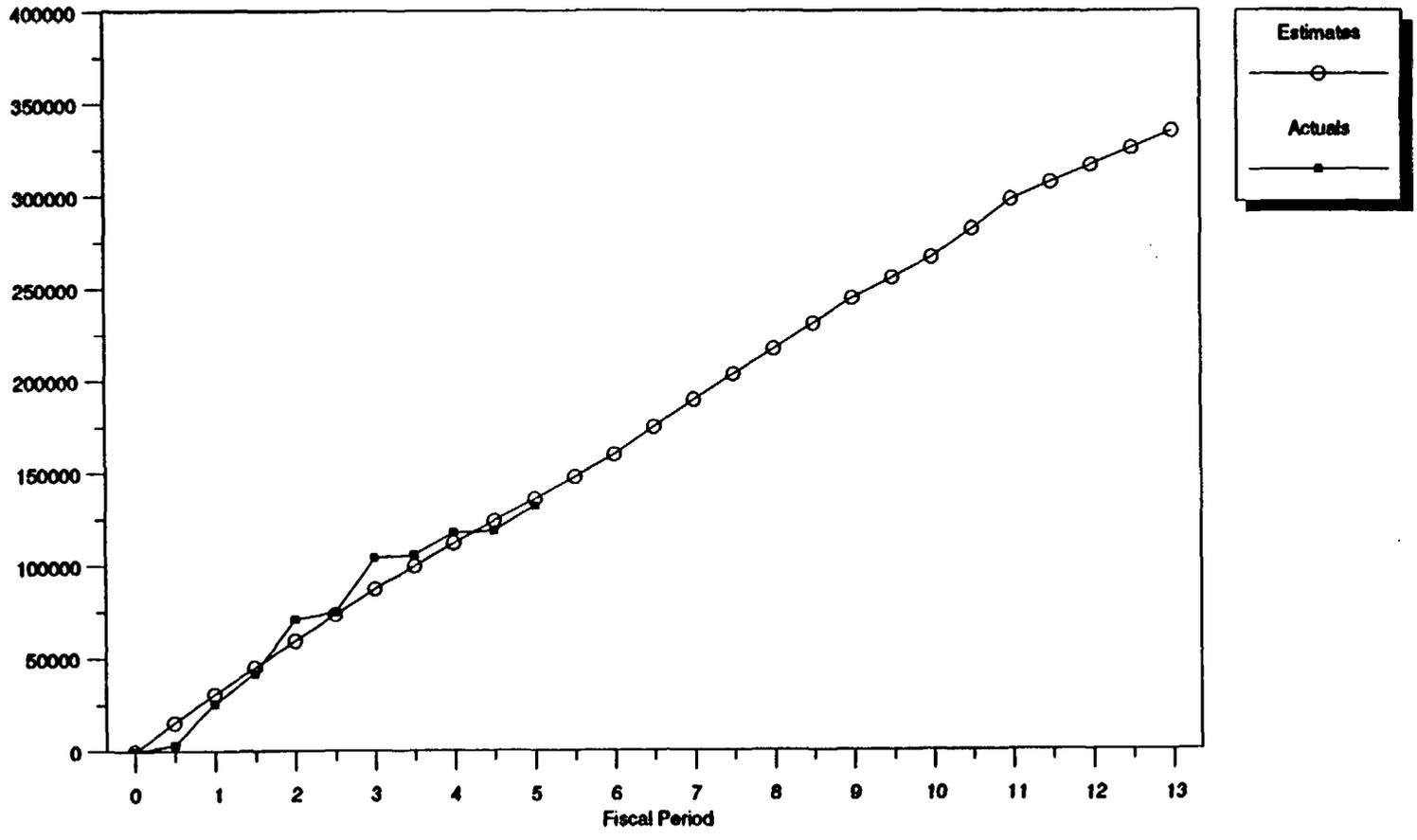
| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 30505 | 28857 | 27884 | 24881 | 23771 | 23936 | 29512 | 27588 | 27491 | 21997 | 31599 | 18520 | 18533 | 135898 |
| ACT. PERIOD COST | 25660 | 45325 | 33134 | 13710 | 14260 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 132088 |
| VARIANCE, \$ | 4846 | -16468 | -5250 | 1171 | 9511 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3810 |
| VARIANCE, % | 15.9 | -57.1 | -18.8 | 44.9 | 40.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.8 |
| EST. FY CUMUL | 30505 | 59362 | 87247 | 112128 | 135898 | 159834 | 189347 | 216935 | 244425 | 266423 | 298022 | 316542 | 335075 | |
| ACTUAL FY CUMUL | 25660 | 70984 | 104118 | 117828 | 132088 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.077 | 0.212 | 0.311 | 0.352 | 0.394 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 4846 | -11622 | -16872 | -5701 | 3810 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 15.9 | -19.6 | -19.3 | -5.1 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

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NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

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11. WASTE SOLIDIFICATION SYSTEMS

NRC Program Element Manager: Gary Comfort

CNWRA Element Manager: Prasad Nair

Key Personnel: A. Chowdhury, H. Karimi, H. Manaktala, E. Tschoepe

Subcontractor/Consultant: G. Lamping

11.1 Technical Status

Task 1 - Assessment of Vitrification Off-Gas Generation and Treatment

There are no significant reportable activities in this task for this period. The schedules for the Intermediate Milestones for this task are to be reestablished following the issue of the DOE's off-gas sample analysis report. There is no change of status this reporting period.

Task 2 - Sludge Mobilization and Mixing

All task activities completed.

Task 3 - Seismic Analysis of the Vitrification Facility

No reportable activities this period.

Task 4 - High-Level Waste Tank Storage

A trip report was prepared and issued by E. Tschoepe on the International Symposium on Above Ground Storage Tanks in Houston, Texas, January 14-16, 1992. Storage tanks at West Valley (and at Savannah River) present problems similar to those described in the industry with respect to design, inspection, testing, and maintenance.

Task 5 - Environmental Issues

No planned activity this reporting period.

11.2 Major Problems

None.

11.3 Forecast for Next Period

Activities in Tasks 1 and 5 will be initiated and schedules will be developed with guidance from the NRC Program Element Manager.

Tasks 3 and 4 activities will resume with preliminary review of pertinent DOE

reports/design analyses.

11.4 Summary Financial Status

Table 1 below indicates the financial status of this Element in the context of authorized funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments for the Element are \$1,000. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Delayed work has resulted in significant (44%) under expenditures with respect to the plan.

| Table 1. Financial Status | |
|---|------------|
| FY92 Funds Authorized (a) | \$ 206,654 |
| FY92 Funds Costed to Date (b) | \$ 63,190 |
| FY92 Funds Uncosted (c) | \$ 143,464 |
| Recommended Adjustment to Complete (+/-) | \$ -0- |
| See the enclosed Element Status Cost Report | |

NOTES: (a) Authorized funds remaining after FY91 actual expenditures with fee.
(b) Actual expenditures FY92 YTD without fee.
(c) Difference between (a) and (b).

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Element Status Cost Report

| ITEM | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | TOTAL |
|------------------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| EST PERIOD COST | 47409 | 16862 | 19517 | 14375 | 14689 | 15687 | 15242 | 11049 | 16739 | 16265 | 7074 | 6316 | 4430 | 112852 |
| ACT. PERIOD COST | 24188 | 26350 | 6056 | 5617 | 980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63190 |
| VARIANCE, \$ | 23220 | -9487 | 13461 | 8759 | 13709 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49662 |
| VARIANCE, % | 49.0 | -56.3 | 69.0 | 60.9 | 93.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 44.0 |
| EST. FY CUMUL | 47409 | 64271 | 83788 | 98163 | 112852 | 128539 | 143781 | 154830 | 171569 | 187834 | 194908 | 201224 | 205654 | |
| ACTUAL FY CUMUL | 24188 | 50538 | 56594 | 62210 | 63190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PERCENT COMPLETE | 0.118 | 0.246 | 0.275 | 0.302 | 0.307 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| VARIANCE, \$ | 23220 | 13733 | 27195 | 35953 | 49662 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| VARIANCE, % | 49.0 | 21.4 | 32.5 | 36.6 | 44.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

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NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

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