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**OBSERVATION REPORT OQA-02-OR-07 OF BECHTEL SAIC COMPANY, LLC (BSC)
QUALITY ASSURANCE (QA) SURVEILLANCE BSCQA-02-S-16**

Enclosed is Observation Report OQA-02-OR-07, conducted by the Office of Quality Assurance, of Surveillance BSCQA-02-S-16. The surveillance was performed by the BSC QA Organization at BSC's facilities in Las Vegas, Nevada, July 1 through October 24, 2002.

The objective of the observation was to evaluate the BSC surveillance process and the ability of the BSC QA Surveillance Team to evaluate the effectiveness of the Yucca Mountain Project processes for independent verification and validation of project software.

Based on the observation of the surveillance, it was determined to be adequate and effective. The observer also concurs with the conclusions and recommendations of the BSC QA Surveillance Team.

If you have any questions, please contact either James Blaylock at (702) 794-1420 or Sam E. Archuleta at (702) 794-1476.

James Blaylock
R. Dennis Brown, Director
Office of Quality Assurance

OQA:JB-0328

Enclosure:
Observation Report OQA-02-OR-07



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**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OFFICE OF QUALITY ASSURANCE**

OBSERVATION REPORT

OF

BECHTEL SAIC COMPANY, LLC

SURVEILLANCE BSCQA-02-S-16

INDEPENDENT VALIDATION PROCESS FOR SOFTWARE

CONDUCTED AT LAS VEGAS, NEVADA

JULY 1 – OCTOBER 24, 2002

Prepared by:

Sam E. Archuleta

Date: 11-21-02

Sam E. Archuleta
Observer
Navarro Quality Systems

Approved by:

R. Dennis Brown

Date: 11/22/02

R. Dennis Brown
Director
Office of Quality Assurance

1.0 INTRODUCTION

On June 11, 2002, Bechtel SAIC Company, LLC (BSC) submitted a complete response to Corrective Action Report (CAR) BSC-01-C-02. One particular element of the BSC response was the commitment to "perform a surveillance on a sample of baselined software to independently verify software functionality." The issue behind this commitment was the question of the effectiveness of independent verification and validation in the software qualification process. This issue was documented as a deficient condition in the above referenced CAR. The BSC surveillance, which was conducted to meet the CAR commitment, is identified as BSCQA-02-S-16.

AP-SI.1Q, Revision 3, ICN 4, *Software Management*, is the primary procedure governing the management of software used in quality-affecting activities. The procedure requires that the responsible manager for each software code assign an Independent Validation Tester (IVT) to test the code prior to its submission to Software Configuration Management (SCM). The IVT is responsible for executing the Installation Test Plan (ITP) and the Validation Test Plan (VTP), to report any problems encountered, and to document the test results. The processes described in AP-SI.1Q are designed to ensure that software submitted to SCM for use in quality affecting activities operates as designed and provides correct results when used within the range of validation.

The surveillance was conducted and documented in accordance with AP-2.26Q, Revision 0, *Quality Assurance Surveillance*.

2.0 OBJECTIVE

The objective of this observation was to evaluate the BSC surveillance process and the ability of the BSC Quality Assurance (QA) Surveillance Team to evaluate the effectiveness of the Yucca Mountain Project (YMP) processes to conduct independent verification and validation of software used in quality-affecting activities.

3.0 SURVEILLANCE PARTICIPANTS/ORGANIZATION/TEAM FUNCTION

Judith E. Gebhart, BSC/QA, Surveillance Team Lead
Stephen B. Splawn, BSC/Information Compliance (IC)/IT, SCM/IC/IT Support
Jefferson R. McCleary, BSC/IC/Software Quality-Compliance (SQ-C),
Scientific Technical Expert
Lyle C. Southworth, BSC/IC/SQ-C, SQ-C/IT Support
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Alda Behie, BSC/Performance Assessment, Tester/Technical Expert
Noel Simpson, BSC/Performance Assessment Technical Input (PATI), Tester/Scientist

Michael Jaeger, BSC/PATI, Observer
Robert M. Latta, U.S. Nuclear Regulatory Commission, Observer
Sam E. Archuleta, Navarro Quality Services, Observer

4.0 REVIEW OF THE SURVEILLANCE PROCESS

Elements of the surveillance process observed included, planning, conducting, documenting and reporting. The majority of the surveillance consisted of observation of hands-on testing of the selected software. The tests consisted of the re-execution of the ITP and VTP by Information Technology (IT) professionals and scientists with expertise in the technical areas relevant to the software.

Planning

Planning for the surveillance was completed with team members participating in the development of test protocols, development test process flow diagrams, test document development, and finally, the development of the plan itself. Planning meetings were conducted to develop and refine the surveillance plan. At the completion of the planning phase, team members were fully informed as to the surveillance process. Questions were satisfactorily answered and open issues were resolved prior to initiating the testing phase of the surveillance. The overall evaluation of the planning phase was deemed to be satisfactory.

Conducting

Software testing was initiated with the preparation of the test environment. Codes to be tested were set up in a special, segregated compartment within the Telelogic SCM Tool. Accounts were established for test personnel who received training in the use of the SCM Tool. Test platforms were identified and "ghosted" (a process in which all extraneous programs and files are removed from the computer's storage, except for the operating system on which the code to be tested was originally qualified).

The overall test protocol consists of: The tester installs the software using only the ITP. Acceptance criterion is replication of the ITP without recourse to the originator or to the IVT who performed the testing as part of the qualification process. The tester then attempts to replicate the VTR, again, without recourse to the originator or the IVT. If problems are encountered, the failed test will again be executed by a different tester to assure that failures are not the result of tester error or other operator-induced cause. If there is still a failure, the test will be performed again, this time in consultation with the developer or IVT. Anomalies encountered in these efforts are recorded in the test documents. The conduct of testing was deemed to be satisfactory.

Documenting

All test documentation packages were reviewed. Documentation of testing was found to be clear and complete. Test results were documented on the checklists, which were

supplemented by the tester log. During early testing, some inconsistencies among testers were noted. The Surveillance Team Leader convened a meeting to define a more consistent method of documentation. Those test packages already completed were reviewed in order to correct any existing problems. Test documentation also includes the "tester log." The log is used as means for testers to record their activities and make notes of anything unusual or unexpected during testing. Test runs are also included in the document packages.

During review of the test documents, the Surveillance Team Leader and the IT Technical Specialist looked for any results wherein anomalies were noted, or when it was less than clear that acceptance criteria had been met. These test packages were set aside, and the code was assigned to a different tester to assure that less than acceptable results were not the result of operator error or inexperience. In addition, the failed code was given to a scientific/technical specialist to double-check the results. The results of the subsequent test were then compared with the original test prior to making the final determination of "pass" or "fail." Complete test documentation (checklists, test logs, email correspondence, test runs, etc.) is on file in the Software Configuration Management archives. Documentation of test results was deemed to be satisfactory.

Reporting

Results of the surveillance were documented in the BSC surveillance report. Through observation of the surveillance, the observer has determined that the BSC surveillance activities have been accurately and factually documented in accordance with AP-2.26Q. Reporting of surveillance activities was properly documented and therefore deemed to be satisfactory.

5.0 CONCLUSION

Overall, the surveillance was thoroughly planned and well executed. Surveillance personnel involved displayed excellent technical and professional skills, and were well aware of the importance of the surveillance. The integrity of the effort was guaranteed by close attention to details by the Surveillance Team Lead. Decisions regarding conduct of the test protocol were informed and appropriate.

The thoroughness of testing and the accuracy of the conclusions fully support the recommendations. Adoption of the recommendations specified in the surveillance report should provide a higher level of confidence in the functionality of project software.