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# CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

## NONCONFORMANCE **REPORT**

Project No. 20-2705-053 NCR No. 94-04

PART 1: DESCRIPTION OF NONCONFORMANCE

1. There was no objective evidence of software license concerning this package (TOP-018, para. 6.2.1).
2. No objective evidence was observed to indicate that any version of BIGFLOW has been released to any users (TOP-018, Appendix C and 8.1.3).
3. No objective evidence exists to indicate the evaluation tools (FORWARN, CRAFT, PCMETRICS) data is being reviewed or acted on by CNWRA technical and management staff (TOP-018, para. 6.3.1).

Initiated by: [signature] Date: 2/7/94

PART 2: PROPOSED DISPOSITION AND CORRECTIVE ACTION

Disposition:

The (A paperwork ha> been brought into compliance.

Basis of Disposition:

N/A

Action to correct nonconformance:

1) See attached CNWRA memorandum
2) see attached software release notice
3) Evaluation report on BIGFLOW has been reviewed and signed by the Principal Investigator

Target date for completion: 2/14/94

Proposed by: [signature] Date: 2/9/94

PART 3: APPROVAL

Element Manager: [signature] Date: 2/15/93

Director of QA: [signature] Date: 2/15/93

Comments/Instructions:

PART 4: CLOSE OUT

Comments: The three discrepant items are addressed by the documentation attached to this NCR.

Verified by: [signature] Date: 2/2/94

# CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
# QUALITY ASSURANCE
# SURVEILLANCE REPORT

PROJECT NO.: 20-2705-053 | REPORT NO.: 93-20 | PAGE 1 OF 1

REFERENCE DOCUMENTS: TOP-18, Rev 3, Chg 2.

STARTING DATE: 12-6-93 ENDING DATE: 12-10-93

QA REPRESENTATIVE: R. Mielke

PERSONS CONDUCTING TEST/EXAM/ACTIVITY: R. Mielke

SATISFACTORY FINDINGS: CNWRA File #Q19931022002 was reviewed to determine the level of conformance to TOP-18. Objective evidence exists to support the requirements for user and technical documentation. The software is in an acceptable language. The backup files are stored in an acceptable format on an acceptable media. Procedure-required software tool analysis had been performed.

UNSATISFACTORY FINDINGS:
1. There was no objective evidence of software license concerning this package (TOP-018, para. 6.2.1).
2. No objective evidence was observed to indicate that any version of BIGFLOW has been released to any users (TOP-018, Appendix C and 8.1.3).
3. No objective evidence exists to indicate the evaluation tools (FORWARN, CRAFT, PCMETRICS) data is being reviewed or acted on by CNWRA technical and management staff (TOP-018, para. 6.3.1).

NONCONFORMANCE REPORT NO.: 94-04

ATTACHMENTS: None

RECOMMENDATIONS/ACTIONS: Results of the INEL analysis tools do not seem to be acted on by CNWRA and this is not required by TOP-18. Results of code coverage indicated that 31% of code segment exercised by provided test case. TOP-18 does not provide guidelines/standards to the community as to the minimum level of test that should be required. This appears to be another shortcoming of the standard. Based on data found concerning software license, the use of this code appears to be highly questionable at this time. Software license and uselrights need to be determined and documented.

APPROVED: _____
CENTER DIRECTOR OF QUALITY ASSURANCE

DATE: 2/7/94

DISTRIBUTION:
ORIGINAL - CENTER QA DIRECTOR - Bruce Mabrito
ORIGINATOR - RWM/TCT
Principle Engineer/Scientist - R. Bagtzoglou
Element Manager - R. Baca
B. Sagar, R. Johnson

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# CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

**MEMORANDUM**

TO: Tom Ratchford
CNWRA Code Custodian

FROM: Ross Bagtzoglou

RE: BIGFLOW and SLIM Licenses

DATE: February 7, 1994

Following up your request for information regarding the numerical codes BIGFLOW and SLIM, which I am currently using, I was given the following guidance by Budhi Sagar.

BIGFLOW was originally developed at the Massachusetts Institute of Technology by Rachid Ababou, under U.S. NRC funding. Upon the original developerjoining CNWRA, the code was enhanced, modified, tested, and documented, again under U.S. NRC funding, by Rachid Ababou and Ross Bagtzoglou. Therefore, BIGFLOW version 1.1 is a public domain numerical code, for which Rachid Ababou and Ross Bagtzoglou have waived any intellectual property rights by signing the acceptance of employment with CNWRA.

Similarly, SLIM was originally developed at the Massachusetts Institute of Technology by Andrew Tompson, under U.S. NRC funding. This code was then modified and enhanced by Ross Bagtzoglou at the University of California at Irvine. It was then, after Ross Bagtzoglou joined CNWRA, enhanced and modified further under U.S. NRC funding. Therefore, SLIM version 2.41 is a public domain numerical code, for which Ross Bagtzoglou has waived any intellectual property rights by signing the acceptance of employment with CNWRA.

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| 02. Project Title: Hydrogeologic Flow Simulation, CNWRA Version 1.1 | Project No. 20-2705-053 |
|---|---|
| 04. Originator/Requester: R. Bagtzoglou | Date: 02/09/94 |

☐ Release of new code admitted to CM System

■ Release of modified code: See remarks below 4/JK 2/17/94

☐ Enhancements made

☐ Corrections made

☐ Change of access code

06. Persons Authorized Access

| Name | RO/RW | A/C/D |
|---|---|---|
| | | |

07. Element Manager Approval: RG Bace Date: 2/15/94

08. Remarks:

A copy of the software package BIGFLOW CNWRA Ver. 1.1 was retained by the Principle Investigator for use in the CNWRA work center; therefore, a new release was not necessary. AL 4/JK 2/15/94

Subj: Analysis of Bigflow was reviewed and suggestions were noted.

A.C. Baptzoglou 2/8/94

# BIGFLOW Fortran Program Static and Dynamic Analysis

June 28,1993

Earl S. Marwil
John E. Tolli
Scientific Computing Unit
Idaho National Engineering Laboratory

## 1. Introduction

This analysis was performed on the Cray version of the software as provided by Southwest Research Institute (SwRI).

The program was analyzed using the Craft (Cross Reference Analysis of Fortran) tool, FORWARN, the Fortran 77 analyzer, and PC-Metric. These tools provide static analysis, coverage analysis, and complexity analysis.

One sample problem was supplied along with the source code. Because the program runs much slower with the performance tracing turned on, the input file "INPUT1" was modified to run a shorter problem (1200 seconds) rather than the original one which was for 20000 seconds.

## 2. References

[1] N.H. Marshall and ES. Marwil, Cross Reference Analysis of Fortran (CRAFT), EG&G-CATT-9198, EG&G Idaho, Inc., July 1991.
[2] Fortran 77 Analyzer User's Manual, National Bureau of Standards, NBS GCR 81-359, 1981
[3] FORWARN User's Guide, Quibus Enterprises, Inc., July 1991.
[4] PC-Metric User's Guide, SET Laboratories, Inc., 1987.

## 3. Functions

The BIGFLOW program contains 45 Fortran routines.

BIGFLOW has no alternate entry points and no extraneous subroutines.

## 4. Common Block Irregularities

There are 7 common blocks in the BIGFLOW program.

All common block declarations are consistent.

There are many instances of a common block being declared in a routine in which none of its elements are otherwise referenced. This is primarily due to all common blocks being included in a single comdeck.