SOFTWARE RELEASE NOTICE

1. SRN Number: GLGP-SRN-225

2. Project Title: Yucca Mountain Repository Program	Project No. 20-01402-461
3. SRN Title: Arc/Info, version 7.0.2	
4. Originator/Requestor: Brittain Hill	Date: August 16, 2000

5. Summary of Actions

- ■ Release of new software
- ☐ Release of modified software:
  - ☐ Enhancements made
  - ☐ Corrections made
- ☐ Change of access software
- ☐ Software Retirement

6. Persons Authorized Access

Name	Read Only/Read-Write	Addition/Change/Delete
Brittain Hill	RO	A/C/D
Ron Martin	RO	A/C/D
David Farrell	RO	A/C/D
IMS staff	RO	A/C/D
CNWRA Staff	RO	none

7. Element Manager Approval: [signature] for H.L. McKague Date: 08/16/00

8. Remarks:

Commercial code purchased from the Environmental Systems Research Institute

CNWRA Form TOP-6 (05/98)

SOFTWARE SUMMARY FORM

01. Summary Date: August 16, 2000	02. Summary prepared by (Name and phone) Brittain Hill (210-522-6087	03. Summary Action: NEW
04. Software Date: 9/15/94	05. Short Title: Arc/Info, version 7.0.2	
06. Software Title: Arc/Info, version 7.0.2		07. Internal Software ID: None

08. Software Type: ☐ Automated Data System ■ Computer Program ☐ Subroutine/Module	09. Processing Mode: ■ Interactive ☐ Batch ☐ Combination	10. Application Area a. General: ■ Scientific/Engineering ☐ Auxiliary Analyses ☐ Total System PA ☐ Subsystem PA ☐ Other b. Specific: Geographic Information System
11. Submitting Organization and Address: CNWRA/SwRI 6220 Culebra Road San Antonio, TX 78228		12. Technical Contact(s) and Phone: Brittain Hill (210) 522-6087 Ron Martin (210) 522-5541

13. Software Application:
Suite of programs used as a geographical information system to display and manipulate geospatial data sets.

14. Computer Platform Sun/UNIX	15. Computer Operating System: Solaris 5.6	16. Programming Language(s): None (executable only)	17. Number of Source Program Statements: n/a
18. Computer Memory Requirements: 100 Mb minimum	19. Tape Drives: N/A	20. Disk Units: N/A	21. Graphics: X-Windows

22. Other Operational Requirements
At least 100 Mb swap space

23. Software Availability: ■ Available ☐ Limited ☐ In-House ONLY	24. Documentation Availability: ■ Available ☐ Preliminary ☐ In-House ONLY

25. Commercial code developed by the Environmental Systems Research Institute

Software Developer: N/A Date: N/A

CNWRA Form TOP-4-1 (05/98)

Randy Fish 8/18/00

MEMORANDUM

To: Bruce Mabrito August 16, 2000

From: Brittain Hill

Subject: TOP-18 Installation and Configuration Control of ARC/INFO software

This memo documents methods used to demonstrate compliance with TOP-18 requirements for acceptance testing (TOP-18, 5.6), configuration control (TOP-18, 5.7), and design verification and release (TOP-18, 5.8–5.9) for commercial software not to be modified by CNWRA staff.

The ARC/INFO software is a series of programs developed by Environmental Systems Research Institute (ESRI) as a geographical information system (GIS). ARC/INFO is a standard GIS program that is used by many government, industrial, and research agencies to display and manipulate geospatial data. Data sets are maintained in discrete data coverages, where numerical and character attributes can be assigned geographic coordinates that reference common spatial coordinate systems. Data attributes can be displayed directly, or mathematically manipulated through direct calculations or functions using attributes from other data coverages.

Arc/Info consists of an executive program (ARC) and two main submodules that run within an ARC session: ARC/EDIT and ARC/PLOT. Collectively these programs are referred to as ARC/INFO. The CNWRA version of ARC/INFO (7.0.2) is UNIX specific (SOLARIS 5.6), and was installed on the Sun Enterprise 3500 server Vulcan by IMS staff. They reported a normal installation process. Modifications to the users UNIX shell configuration are necessary to run ARC/INFO successfully. An example .cshrc file is included as Appendix A to this memo.

The opening screen for ARC/INFO is shown in Figure 1, giving details of the installation. Note that the license manager returns a Time-Out error at the top of the screen window, but that this error does not affect operation of the ARC/INFO program. To evaluate functionality of the ARC module, I imported a data coverage from the USGS containing contour locations for a detailed map of the Yucca Mountain region (CBCONT.E00). This coverage imported successfully and is saved as CBCONT_TEMP for further use (Figure 2).

Functionality of the ARC/EDIT module was evaluated by successfully editing the coverage CBCONT_TEMP, as shown in Figure 3. I was able to successfully move arcs, edit point nodes, recover from errors, and save all changes. Geographic coordinates on the contour coverage were verified as accurate through comparison with the USGS topographic version of this map, which is attached as Figure 4. No significant discrepancies were noted between the coordinates of identifiable contour lines on the digital coverage and the coordinates on the USGS topographic map. This test appears to meet the design verification requirements of TOP-18, 5.8.

Functionality of the ARC/PLOT module was evaluated by successfully plotting and displaying the data coverage CBCONT_TEMP as shown in Figure 5. I was able to successfully change line attributes and colors within ARC/PLOT, and save changes to the plot.

In addition to these tests, routine use of the ARC/INFO programs by myself and Ron Martin throughout the past month has confirmed that these programs are installed and operating correctly. Attached are completed forms TOP-4-1 (software summary form) and TOP-6 (software release notice). Included also are copies of the ARC/INFO installation and program CDs for UNIX, thus meeting all requirements of TOP-18 5.6–5.9.

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
DESIGN VERIFICATION REPORT FOR CNWRA SOFTWARE

ACQUIRED CODE - NOT TO BE MODIFIED[1]

Software Title/Name: Arc / Info

Version: 7.0.2

Demonstration workstation: Vulcan

Operating System: Solaris 5.6

Developer: Brian Hill

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1. Output: TOP-018, Section 5.5.4

Software designed so that individual runs are uniquely identified by Date, Time, Name of software and version?

Yes: ☐ No: ☒ N/A: ☐

Date and time of run: None

Name and version: Arc Version 7.0.2 on opening screen

Notes: Acquired code that is not to be modified is accepted as is.

See attached opening screen. Figure 1

2. Medium and Header Documentation: TOP-018, Section 5.5.6

The physical labeling of software medium (tapes, disks, etc.) contain required information?

Yes: ☒ No: ☐ N/A: ☐

Program Name: Arc Info

Module/Name/Title: -

Module Revision: 7.0.2

File Type (ASCII, OBJ, EXE): TAR

Recording Date: 9/15/00

Operating System of Supporting Hardware: Solaris

Notes: Acquired code that is not to be modified may not have all above elements.

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[1] See TOP-018. Table 1 for criteria.

3. User's Manual: TOP-018, Section 5.5.5

a) Is there a Users' Manual for the software?

Yes: ☒ No: ☐ N/A: ☐

User's Manual Version and Date: On-line

Notes:

b) Are there basic instructions for the use of the software?

Yes: ☒ No: ☐ N/A: ☐

Location of Instruction: On-line

Notes:

4. Acceptance Testing: TOP-018, Section 5.6

a) Has installation testing been conducted for each intended computer platform and operating system?

Yes: ☒ **No:** ☐ N/A: ☐

Platform(s): Solaris 5.8

Operating System(s): Unix

Location of Test Results: Attached

Notes: See Memo Hill to Mabrito, 8/16/00

5. Configuration Control: TOP-018, Section 5.7

a) Is the Software Summary Form completed and signed?

Yes: ☒ No: ☐ N/A: ☐

Software Summary Form Approval Date: 8/16/00

Notes: Reference Made to developer of The software

b) Is a software technical description prepared, documenting the essential mathematical and numerical basis?

Yes: ☒ No: ☐ N/A: ☐

Location Technical Description: On-line user's Manual

Notes:

c) Is the source code available (or, is the executable code available in the case of (acquired/commercial codes)?

Yes: ☒ No: ☐ N/A: ☐

Location of Source Code: Sun Enterprise 3500 Server Vulcan

Notes:

6. Configuration Control, continued: TOP-018, Section 5.7

Have all the script/make files and executable files been submitted to the Software Custodian?

Yes: ☐ No: ☐ N/A: ☒

Location of Script/Make Files: No script or Make files

Notes:

7. Software Release: TOP-018, Section 5.9

Upon acceptance of the software as verified above, has a Software release Notice, Form TOP-6 been issued?

Yes: ☒ No: ☐ N/A: ☐

Version number on software (1.0 for 1st issue): 7.0.2

Version number on SRN: 7.0.2

Notes:

8. Software Validation: TOP-018, Section 5.10

a) Has a Software Validation Test Plan (SVTP) been prepared for the range of application of the software?

Yes: ☐ No: ☒ N/A: ☐

Version/Date of SVTP:

Date reviewed and approved via QAP-002: See QAP-002 Review dated 9/6/00

Notes:

b) Has a Software Validation Test Report (SVTR) been prepared that documents the results of the validation cases, interpretation of the results, and determination if the software has been validated?

Yes: ☒ No: ☐ N/A: ☐

Version/Date of SVTR: Approved by Em 09/15/00

Date reviewed and approved via QAP-002: Last Review QA 9/16/00

Notes:

Additional Remarks:

11/3/00 — **CNWRA Software Developer/Date**

11/03/00 — **CNWRA Software Custodian/Date**

APPENDIX A

UNIX shell (.cshrc) modifications for running ARC/INFO 7.0.2

```
# @(#)cshrc 0.90 96/10/18 SwRI/PICO
##########################################################################
# last modified:  96/10/18 by Pat Starkweather.  File Creation.
#
# This .cshrc is broken into sections.  There is a section for each:
#         - common settings
#         - Solaris 1.x settings
#         - Solaris 2.x settings
# This is to support using a single .cshrc to login at both Solaris
# 1.x and 2.x systems. This is controlled by the "uname -r" statement.
#
# Migrated prompt and aliases from BREN 10/2/97 BHILL
#
##########################################################################
#
# Common Section.  These settings are good for either operating system.
#
umask 022
set path=(/bin /usr/bin /usr/ucb /etc .)
if ( $?prompt ) then
        set history=200
endif

# common setenv section
setenv ELMHOST bashful
setenv XPLOT_HOST bashful
setenv FM_FLS_HOST bashful
setenv MDSERVER_HOST bashful
setenv MDSERVER_MASTER bashful
setenv FONTPATH `printenv FONTPATH`:/usr/openwin/lib/fonts
setenv OPENWINHOME /usr/openwin

# common aliases
alias prt3825           'qpr -lpcl4 -Pps3825'
alias ps3825            'qpr -lps -Pps3825'
alias prt2425           'qpr -lpcl4 -Pps2425'
alias ps2425            'qpr -lps -Pps2425'
# change -P below to adjust for your default printer
alias lp        'qpr -lpcl4 -Pps3825'
#alias cd               'cd \!*;echo $cwd'
# alias cp              'cp -i'
alias mv                'mv -i'
alias rm                'rm -f'
alias pwd               'echo $cwd'

##########################################################################
#
# Find out which OS and run the right commands from that.
#

switch (`uname -r | awk '{printf("%s\n", substr($0,1,1))}'`)
```

```
case '4':
   # SunOS
   #     add directories for sysadmin users
         set path = (/sbin /usr/sbin $path)
   #     add directories for local commands and printing
         set path = ($path /usr/openwin/bin)
         set path = ($path /usr/local /usr/local/bin)
         set path = ($path /usr/local/QMSoft /usr/local/QMSoft/bin)
         set path = ($path /usr/etc /usr/ucb /usr/openwin/bin)
   #     add directories for programming
         set path = ($path /ipx4/lang /ipx4/lang/SC2.0.1 /ipx4/lan/SW2.0.1/bin)
         set path = ($path /sunapps/X11/bin)
         set path = ($path /sunapps/bin)
   #     add directories for Word Processing
         set path = ($path /ipx4/wp/wpbin /ipx4/wp/shbin)
         set path = ($path /ipx4/wp60/wpbin /ipx4/wp60/shbin10)
   #     add miscelleaneous directories
         set path = ($path /ipx4/utils/igateway /ipx4/utils/bin .)
         set path = ($path /sunapps/bin)
   # Env Vars
         setenv MANPATH /ipx4/lang/man:/usr/man:/usr/share/man:/usr/openwin/man
         setenv SUNPRO_SB_EX_FILE_NAME /sunapps/lang/SW3.0.1/lib/sun_source_browser.ex
         setenv LD_LIBRARY_PATH /usr/lib:/usr/openwin/lib:/sunapps/X11/lib:/usr/local/lib
         setenv WPTERM51 gui_color
         setenv GS_LIB /sunapps/X11/lib/ghostscript:/sunapps/X11/lib/ghostscript/fonts
   # Aliases
         alias netscape          '/sunapps/netscape/netscape &'
         alias wp5               '/ipx4/wp/wpbin/xwp &'
         alias tecplot           'tecplot /ipx5/tecplot6/tecplot -h /ipx5/tecplot6'
         alias preplot           '/ipx5/tecplot6/preplot'
         alias f77               '/ipx4/lang/SC2.0.1/f77'
         alias cc          '/ipx4/lang/SC2.0.1/cc'
         alias ll          'ls -lag'
         alias timesheet       '/usr/openwin/bin/xterm -fn 10x20 -e /ipx4/utils/igateway/itelnet
ccfibm.ccf.swri.edu'

   # ------ Environment variables needed for ARC/INFO 7.0 -------
         setenv ARCHOME /solapps/arcexe70
         setenv AVHOME /solapps/arcview3
         setenv FVHOME /export/apps/esri/fm_solaris1
         setenv ADOCHOME /solapps/arcexe70/arcdoc_70
      setenv ATHOME $ARCHOME/arctools
         setenv LD_LIBRARY_PATH `printenv
LD_LIBRARY_PATH`:$ARCHOME/lib:$AVHOME/lib
         setenv SAMPLESHOME /export/apps/esri/samples70
         setenv CROSSHAIRCOLOR RED
         setenv ARCBACKINGSTORE OFF
         setenv XBACKINGSTORE ON
         alias arc \$ARCHOME/programs/arc
         alias info \$ARCHOME/programs/info
         alias arcview \$AVHOME/bin/arcview
         limit stacksize 16384
         limit coredumpsize 0
         set noclobber
```

```
    # ----- End of necessary A[illegible]nfo Environment variables -----

breaksw

case '5':
   # Solaris 2.x
   #     add directories for sysadmin users and functions
         set path = (/sbin /usr/sbin $path)
   #  Directories for local and printing progs
         set path = ($path /usr/openwin/bin)
         set path = ($path /opt/QMSoft /opt/QMSoft/bin)
         set path = ($path /usr/local/QMSoft /usr/local/QMSoft/bin)
         set path = (/usr/local /usr/local/bin /usr/etc $path)
         set path = ($path /solapps/bin /solapps/netscape)
         set path = ($path /solapps/X11/bin/X11)
   #  Programming
         set path = ($path /solapps/SUNWspro/bin)
         set path = ($path /solapps/SUNWspro/SW3.0.2 /solapps/SUNWspro/SW3.0.2/bin)
         set path = ($path /solapps/SUNWspro/SC3.0.1 /solapps/SUNWspro/SC3.0.1/bin)
         set path = ($path /usr/ccs/bin)
   #  WordPerfect. Uncomment/Comment for correct version.
         set path = ($path /solapps/wp51/wpbin /solapps/wp51/shbin)
#        set path = ($path /solapps/wp60/wpbin /solapps/wp60/shbin10)
   #  other programs
         set path = ($path /ipx5/Xplot40 /ipx5/mathematica/bin)
   #
   # Env Vars
         setenv MANPATH /solapps/SUNWspro/man:/usr/man:/usr/share/man:/usr/openwin/man
         setenv MANPATH `printenv MANPATH`:/usr/local/man:/usr/local/QMSoft/man
         setenv LD_LIBRARY_PATH /usr/lib:/usr/openwin/lib:/solapps/X11/lib:/usr/local/lib
         setenv LD_LIBRARY_PATH `printenv LD_LIBRARY_PATH`:/solapps/SUNWspro/lib
         setenv WPTERM51 gui_color
   #     setenv WPTERM51 xcolor
         setenv GS_LIB /solapps/X11/lib/ghostscript:/solapps/X11/lib/ghostscript/fonts
   # Aliases
         alias wabi              '/opt/SUNWwabi/bin/wabi'
         alias netscape          '/solapps/netscape4/netscape &'
         alias wp5               '/solapps/wp51/wpbin/xwp &'
         alias wp                '/solapps/wp51/wpbin/xwp &'
         alias tecplot           '/ipx5/tecplot6/tecplot -h /ipx5/tecplot6'
         alias preplot           '/ipx5/tecplot6/preplot'
         alias f77               '/solapps/SUNWspro/bin/f77'
         alias cc          '/solapps/SUNWspro/bin/cc'
         alias ll          'ls -la'
         alias timesheet         '/usr/openwin/bin/xterm -fn 10x20 -e /solapps/bin/itelnet
ccfibm.ccf.swri.edu'

    # ------ Environment variables needed for ARC/INFO 7.0 -------
         setenv ARCHOME /solapps/arcexe70
         setenv AVHOME /solapps/arcview3
      setenv FVHOME /solapps/fm_solaris2/bin
         setenv ADOCHOME /solapps/arcdoc_70
      setenv ATHOME $ARCHOME/arctools
         setenv LD_LIBRARY_PATH `printenv
```

```
LD_LIBRARY_PATH`:$ARCHOME/lib:$AVHOME/lib
        setenv SAMPLESHOME /solapps/arcexe70/esri/samples70
        setenv CROSSHAIRCOLOR RED
        setenv ARCBACKINGSTORE OFF
        setenv XBACKINGSTORE ON
        alias arc \$ARCHOME/programs/arc
        alias info \$ARCHOME/programs/info
        alias arcview \$AVHOME/bin/arcview
        limit stacksize 16384
        limit coredumpsize 0
        set noclobber
    # ----- End of necessary Arc/Info Environment variables -----

breaksw

endsw

##########################################################################

# User-specific configuration
source ~/.cshrc.local

#
# skip remaining setup if not an interactive shell
#
if ($?USER == 0 || $?prompt == 0) exit

#       settings  for interactive shells

#set prompt = "DS9.bhill: `pwd` {\!} "
# set prompt = "`uname -n`:$cwd> "
# setenv PROMPT "`uname -n`:$cwd> "
#alias cd 'chdir \!*; set prompt="DS9.bhill: `pwd` {\!} "'

if (! $?DISPLAY ) then
  setenv DISPLAY `uname -n`:0.0
  echo "Display set to default `uname -n`:0.0"
endif

if ( $?prompt ) then
  set history=200
  echo "Remember to check your DISPLAY setting, i.e. setenv DISPLAY system:0"
endif
```

Software Validation Test for Arc/Info Version 7.0.2
Brittain Hill, September 6, 2000

This report documents methods used to demonstrate compliance with TOP-18 requirements for a software validation test (TOP-18, 5.10), for commercial software not to be modified by CNWRA staff.

The ARC/INFO software is a series of programs developed by Environmental Systems Research Institute (ESRI) as a geographical information system (GIS). ARC/INFO is a standard GIS program that is used by many government, industrial, and research agencies to display and manipulate geospatial data. Data sets are maintained in discrete data coverages, where numerical and character attributes can be assigned geographic coordinates that reference common spatial coordinate systems. Data attributes can be displayed directly, or mathematically manipulated through direct calculations or functions using attributes from other data coverages. TOP-18 requirements for acceptance testing (TOP-18, 5.6), configuration control (TOP-18, 5.7), and design verification and release (TOP-18, 5.8–5.9) for ARC/INFO are documented in the 16 August 2000 memo from B. Hill to Bruce Mabrito.

ARC/INFO consists of an executive program (ARC) and two main submodules that run within an ARC session: ARC/EDIT and ARC/PLOT. Collectively these programs are referred to as ARC/INFO. The CNWRA version of ARC/INFO (7.0.2) is UNIX specific (SOLARIS 5.6), and is installed on the Sun Enterprise 3500 server Vulcan.

The primary function of ARC/INFO is to correctly maintain geospatial relationships for digital data. To evaluate the validity of the ARC/INFO software in maintaining geospatial relationships, the following tests were conducted:

1) Benchmark data were provided from the U.S. Geological Survey digital line graph file for the Crater Flat 7.5' quadrangle, Nevada. A digital copy of this file is attached as CF100.E00, which is an ARC/INFO export coverage.

2) Part of the Crater Flat digital contour coverage was printed at a scale of 1:24,000 using ARC/PLOT (Figure 1). This print can be compared directly to a copy of the USGS 7.5' topographic map (Figure 2). Note that across the region of the map, contour lines do not align exactly between the ARC/INFO plot (Figure 1) and the copy of the topographic map (Figure 2). This misalignment reflects the slight distortion created during copying of the base topographic map. In contrast, note that the location of coordinate tics relative to the location of contour lines does not change between figure 1 and figure 2. These figures demonstrate that ARC/INFO can correctly display and plot original geospatial data in correct geographic coordinates.

3) Using the original USGS topographic map, the outlines of lava flows (dark areas on figure 2) were digitized using the large-format digitizing tablet (Sumagraphics 3) in the GIS room and the ARC/EDIT software. Digitized arcs were projected into the same base coordinates as the contour data and attached as CFBASALT.E00, and plotted in figure 3. The locations of lava flow contacts that were digitized into the ARC/INFO software are the same as locations of the lavas on the original topographic map (Figure 2). This test indicates that data can be entered accurately into the ARC/INFO system using the digitizer. Data coverages created in ARC/EDIT can be accurately combined with other geospatial data sets, and plotted accurately as well.

Based on the results of these tests, I conclude that the ARC/INFO software is valid for entering, manipulating, and displaying complex geospatial data sets.

ELEMENT MANAGER [signature] 09/15/00