SOFTWARE RELEASE NOTICE

8/30/02 N

1. SRN Number: GLGP-SRN-~~215~~ 276

2. Project Title: PVHA_YM	Project No. 20.01402.462
3. SRN Title: PVHA_YM Version 2.0	
4. Originator/Requestor: Brittain Hill	Date: 8/27/2002

5. Summary of Actions

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

6. Validation Status

- ■ Validated
- ☐ Limited Validation
- ☐ Not Validated   Explain: ______________________

7. Persons Authorized Access

Name	Read Only/Read-Write	Addition/Change/Delete
Brittain Hill	RW	Addition
Larry McKague	RO	Addition
John Trapp (NRC)	RO	Addition
Chuck Connor (USF)	RW	Addition
Laura Connor	RW	Addition
Nathan Franklin	RW	Addition

8. Element Manager Approval: H. Lawrence McKague   Date: 8/27/02

9. Remarks:

CNWRA Form TOP-6 (09/01)

SOFTWARE SUMMARY FORM

01. Summary Date: 8/19/02	02. Summary prepared by (Name and phone) Brittain Hill (210) 522-6087	03. Summary Action: Update with new functions.
04. Software Date: 8/19/02	05. Short Title: PVHA_YM Version 2.0	
06. Software Title: PVHA_YM Version 2.0		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:

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) Chuck Connor (813-974-2654)

13. Software Application:
PVHA_YM calculates the probability of different types of volcanic events intersecting proposed repository sites at Yucca Mountain, Nevada.

14. Computer Platform Windows, SUN, SGI, Linux	15. Computer Operating System:Windows, ~~Unix~~ 9/19/02 BH	16. Programming Language(s): JAVA	17. Number of Source Program Statements: 6000
18. Computer Memory Requirements: 256 Mb	19. Tape Drives: None	20. Disk Units: HDD >1 Gb	21. Graphics: JVM 1.1

22. Other Operational Requirements:
JAVA™ 2 Runtime Environment version 1.4.0

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

25.

Software Developer: [signature] Date: 8/19/02

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

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
QA VERIFICATION REPORT
FOR
→DEVELOPED OR ACQUIRED TO BE MODIFIED SOFTWARE←

Software Title/Name: PVHA_YM
Version: 2.0
Demonstration workstation: Sawgrass
Operating System: Windows NT (Windows 98)
Developer: Brittain Hill

Software Requirements Description (SRD) [TOP-018, Section 5.3]

SRD Version: Version 1.0
SRD Approval Date: Sept. 20, 1996 & Feb 20, 1997

SRD and any changes thereto reviewed in accordance with QAP-002 requirements?
TOP-018 did not require QAP-002 review of SRS's during 1996-1997.
Yes: ☐ No: ☑ N/A: ☐

Is a Software Change Report(s) (SCR) used for minor modifications (i.e., acquired code), problems or changes to a configured version of software?
Yes: ☑ No: ☐ N/A: ☐

Comments: GLGP-~~SRS~~-~~276~~ SCR 407 [initials] 09/09/02

Software Development Plan (SDP) [TOP-018, Section 5.4]

SDP Version:
SDP (EM) Approval Date:

The SDP addresses applicable sections of TOP-018, Appendix B, SDP Template?
Yes: ☐ No: ☐ N/A: ☑

Is the waiver (if used) in accordance with specified guidelines?
Yes: ☐ No: ☐ N/A: ☑

Comments: Version 1.0 was issued prior to the requirement for development of a SDP.

Design and Development [TOP-018, Section 5.5.1 - 5.5.4]

Is code development in accordance with the conventions (i.e., coding conventions)described in the SDP/SCR?
Yes: ☐ No: ☐ N/A: ☑

Module(s) Reviewed:

Comments: No coding conventions specified since there is no SDP.

(04/01)

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Is code internally documented to allow a user to understand the function(s) being performed and to follow the flow of execution of individual routines?

Yes: ☑ No: ☐ N/A: ☐

Module(s) Reviewed: ProbMap1.out

Comments: Well structured code & good use of "white space." Commenting is minimal but adequate.

Is development of the code and informal module/subroutine-level testing documented in scientific notebook and/or SCR?

Yes: ☑ No: ☐ N/A: ☐

SCR's and/or Scientific Notebook(s) Reviewed: GLGP-SCR-407

Comments:

Software designed so that individual runs are uniquely identified by date, time, name of software and version?

Yes: ☑ No: ☐ N/A: ☐

Date and Time Displayed: 8/20/2002 13:52

Name/Version Displayed: PVHA-YM Version 2.0

Comments: See Validation report for examples.

Medium and Header Documentation [TOP-018, Section 5.5.6]

A program title block of main program contains: Program Title, Customer Name, Customer Office/Division, Customer Contact(s), Customer Phone Number, Associated Documentation, Software Developer and Phone Number, Date, and Disclaimer Notice?

Yes: ☑ No: ☐ N/A: ☐

Comments: See "About Code"
* Email provide rather than telephone #. See attached.

Source code module headers contain: Program Name, Client Name, Contract reference, Revision Number, Revision History, and Reference to SRD/SCR requirement(s)?

Yes: ☑ No: ☐ N/A: ☐

Module(s) Reviewed: Prob1Graph.out
ProbMap1.out

Comments: No reference to SCR#. Documentation (on-line) provides overview of changes.

The physical labeling of software medium (tapes, disks, etc.) contains: Program Name, Module/Name/Title, Module Revision, File type (ASCII, OBJ, EXE), Recording Date, and Operating System(s)?

Yes: ☑ No: ☐ N/A: ☐

Comments:

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Code Reviews [TOP-018, Section 5.5.6]

Are code reviews (if implemented) documented in a scientific notebook or in another format that allows others to understand the code review process and results?

Yes: ☐ No: ☐ N/A: ☑

Documented in Scientific Notebook No.: ______

Comments: No code reviews.

Acceptance and Installation Testing [TOP-018, Section 5.6]

Does *acceptance testing* demonstrate whether or not requirements in the SRD and/or SCR(s) have been fulfilled?

Yes: ☑ No: ☐ N/A: ☐

Has *acceptance testing* been conducted for each intended computer platform and operating system?

Yes: ☑ No: ☐ N/A: ☐

Computer Platforms: PC Operating Systems: Windows NT

Location of Acceptance Test Results: GLGP-SCR-407

Comments:

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

Yes: ☑ No: ☐ N/A: ☐

Computer Platforms: PC Operating Systems: Windows NT

Location of Acceptance Test Results: GLGP-SCR-407

Comments:

User Documentation [TOP-018, Section 5.5.7]

Is there a Users' Manual for the software and is it up-to-date?

Yes: ☑ No: ☐ N/A: ☐

User's Manual Version and Date: Version 2.0 July 2002

Comments:
User's Manual is on-line. See attached printout.

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Are there basic instructions for the *installation* and *use* of the software?

Yes: ☑ No: ☐ N/A: ☐

Location of Instructions: On-line User's Manual

Comments: See "Notes on Installing and Running PV HA-YM version 2.0"

Configuration Control [TOP-018, Section 5.7, 5.9.3]

Is the Software Summary Form (Form TOP-4-1) completed and signed?

Yes: ☑ No: ☐ N/A: ☐

Date of Approval: August 19, 2002

Is the list of files attached to the Software Summary Form complete and accurate?

Yes: ☑ No: ☐ N/A: ☐

Comments:

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: Enclosed CD

Comments:

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

Yes: ☑ No: ☐ N/A: ☐

Location of script/make files: Enclosed CD

Comments: User may be required to download Java 2 Runtime environment. Link provided in documentation.

Software Release [TOP-018, Section 5.9]

Upon acceptance of the software as verified above, has a Software Release Notice (SRN), Form TOP-6 been issued and does the version number of the software match the documentation?

Yes: ☑ No: ☐ N/A: ☐

SRN Number: GLGP-SRN-276

Comments:

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
QA VERIFICATION REPORT
FOR
➔DEVELOPED OR ACQUIRED TO BE MODIFIED SOFTWARE⬅

Software Validation [TOP-018, Section 5.10]

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

Yes: ☐ No: ☐ N/A: ☑

Version and Date of SVTP: ____________________

Date Reviewed and Approved via QAP-002: ____________________

Comments: Report issued and approved August 30, 2002 in accordance with TOP-018, Rev. 8, Chg. 1, 5.10.5.

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 and Date of SVTR: Version 2.0, August 2002

Date Reviewed and Approved via QAP-002: August 30, 2002

Comments:

Additional Comments:

[signature] 9/13/02
Software Developer/Date

[signature] Sept. 09, 2002
Software Custodian/Date

Example "Header Documentation".

Program Name: PVHA_YM

Class Name: ProbMap1

Date: September 2002

Release Version: 2.0

Client Name: U. S. Nuclear Regulatory Commission, NRC Office of Nuclear Material Safety and Safeguard, Division of Waste Management

NRC Contract: NRC 02-97-009

NRC Contact: Dr. John Trapp (301) 415-8063

CNWRA Contact: Dr. Brittain Hill, Center For Nuclear Waste Regulatory Analyses, Southwest Research Institute, 6220 Culebra Rd., San Antonio, TX, 78238-5166, USA, bhill@swri.org

Documentation: PVHA_YM version 2.0 - Probabilistic Volcanic Hazard Assessment Methods for a Proposed High-Level Radioactive Waste Repository at Yucca Mountain, Nevada. CNWRA 2002

NUREG-Series Designator: N/A

********* Disclaimer **************

"This computer code / material was prepared as an account of work performed by the Center for Nuclear Waste Regulatory Analyses (CNWRA) for the Division of Waste Management of the Nuclear Regulatory Commission (NRC), an independent agency of the United States Government. Neither the developer(s) of the code nor any of their sponsors make any warranty, expressed or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represent that its use would not infringe on privately-owned rights."

"In no event unless required by applicable law will the sponsors or those who have written or modified this code, be liable for damages, including any loss of profits, lost monies, or other special, incidental or consequential damages arising out of the use or inability to use the program (including but not limited to loss of data or data rendered inaccurate or losses sustained by third parties for failure of the program to operate with other programs), even if you have been advised of the possibility of such damages or for any claim by any other party."

PVPVHA_YM, Version 2.0

```
 Volume in drive R is 020829_1125
 Volume Serial Number is C4C3-7962


 Directory of R:\

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
08/29/02  11:25a        <DIR>          Pvha_ym
               3 File(s)              0 bytes

 Directory of R:\Pvha_ym

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
08/29/02  11:25a        <DIR>          java
08/29/02  11:25a        <DIR>          PVHA_YM_Version2.0
               4 File(s)              0 bytes

 Directory of R:\Pvha_ym\java

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
07/21/02  10:59p             9,389,240 j2re-1_4_0_01-windows-i586.exe
07/21/02  11:00p            37,108,115 j2sdk-1_4_0_01-windows-i586.exe
               4 File(s)     46,497,355 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
08/29/02  11:25a        <DIR>          applets
08/29/02  11:25a        <DIR>          articles
07/21/02  10:58p               141,910 datatable.html
08/26/02  01:05p                   866 locations.html
08/19/02  02:28p               314,327 locations.jpg
07/21/02  10:58p                40,714 pvha.html
               8 File(s)        497,817 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\applets

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
07/21/02  10:58p                 3,116 AboutGraph.html
07/21/02  10:58p                 2,752 AboutMap.html
08/29/02  11:25a        <DIR>          dataFiles
08/29/02  11:25a        <DIR>          graph
07/21/02  10:58p                 6,553 GraphParameters.html
08/26/02  12:55p                 2,248 Graph.html
07/21/02  10:58p                   195 HminHmax.class
07/21/02  10:58p                 1,586 HotKeys.html
07/21/02  10:58p                10,568 MapParameters.html
08/26/02  12:55p                 2,247 Map.html
07/21/02  10:58p                   195 OddRecur.class
07/21/02  10:58p                   194 OddTime.class
```

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07/21/02  10:58p                 509 PopUp$1.class
07/21/02  10:58p               1,729 PopUp$2.class
07/21/02  10:58p                 511 PopUp$3.class
07/21/02  10:58p               2,643 PopUp$4.class
07/21/02  10:58p               4,808 PopUp.class
07/21/02  10:58p              15,437 ProbMap1.class
07/21/02  10:58p               1,198 ProbMap1$7.class
07/21/02  10:58p                 642 ProbMap1$5.class
07/21/02  10:58p                 644 ProbMap1$6.class
07/21/02  10:58p                 487 Prob1Graph$1.class
07/21/02  10:58p               1,719 Prob1Graph.html
07/21/02  10:58p                 980 Prob1Graph$2.class
07/21/02  10:58p               1,200 Prob1Graph$3.class
07/21/02  10:58p               9,202 Prob1Graph.class
07/21/02  10:58p                 477 ProbMap1$1.class
08/19/02  04:32p               1,948 ProbMap1.html
07/21/02  10:58p                 793 ProbMap1$2.class
07/21/02  10:58p               1,201 ProbMap1$3.class
07/21/02  10:58p               1,190 ProbMap1$4.class
08/29/02  11:25a        <DIR>          src
              34 File(s)         76,972 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\applets\dataFiles

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
07/21/02  10:58p               2,897 all_64events.event
08/19/02  04:47p               1,258 CFB_16alignments.event
08/19/02  04:55p               1,765 CFB_mio-quat-Mag.event
08/15/02  11:43a               1,973 CFB_plio-quat-Mag.event
07/21/02  10:58p                 862 crater_flat_alignment_3events.event
07/21/02  10:58p               2,120 miocene-quaternary_47events.event
08/19/02  04:57p               2,513 miocene-quaternary_57events.event
07/21/02  10:58p               1,381 pliocene-quaternary_20events.event
08/19/02  04:59p               1,790 pliocene-quaternary_30events.event
08/20/02  01:46p                 939 quaternary_8events.event
08/19/02  04:26p                 528 Repos_1996.area
08/26/02  11:39a               1,147 Repos_aug02.area
07/21/02  10:58p               1,556 Repos_FEIS.area
07/31/02  11:29a                 678 Repos_tspaSR.area
07/21/02  10:58p          71,309,548 usgs_grav_200.XYZ
              17 File(s)     71,330,955 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\applets\graph

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
07/21/02  10:58p               2,823 Area.class
07/21/02  10:58p              11,905 Axis.class
07/21/02  10:58p               1,242 Bin.class
07/21/02  10:58p              19,441 BuildGraph.class
07/21/02  10:58p                 347 Cell.class
07/21/02  10:58p              10,379 Contour.class
07/21/02  10:58p               3,775 ContourProb.class
07/21/02  10:58p               7,258 DataSet.class
07/21/02  10:58p               2,953 Dike.class
07/21/02  10:58p                 232 FileFormatException.class
```

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07/21/02  10:58p               5,910 G2Dint.class
07/21/02  10:58p               1,482 Gin.class
07/21/02  10:58p               9,447 Graph2D.class
07/21/02  10:58p               3,646 Gravity.class
07/21/02  10:58p                 921 Hestimate.class
07/21/02  10:58p               5,046 IsoCurve.class
07/21/02  10:58p               3,869 LoadData.class
07/21/02  10:58p               2,687 LoadMessage.class
07/21/02  10:58p               2,434 Markers.class
07/21/02  10:58p                 246 MarkerVertex.class
07/21/02  10:58p               1,656 NamedObject.class
07/21/02  10:58p               1,888 Node.class
07/21/02  10:58p              11,377 ParseFunction.class
07/21/02  10:58p                 897 Poly.class
07/21/02  10:58p               3,086 Range.class
07/21/02  10:58p                 892 Restimate.class
07/21/02  10:58p               2,566 RotateTextFilter.class
07/21/02  10:58p               6,419 RTextLine.class
07/21/02  10:58p               2,650 ScanString.class
07/21/02  10:58p               2,397 ScanWord.class
07/21/02  10:58p              12,240 SpecialFunction.class
08/29/02  11:25a      <DIR>          src
07/21/02  10:58p               8,940 TextLine.class
07/21/02  10:58p               1,762 TextState.class
07/21/02  10:58p               5,494 VectorSet.class
07/21/02  10:58p               7,325 Volcano.class
              38 File(s)        165,632 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\applets\graph\src

08/29/02  11:25a      <DIR>          .
08/29/02  11:25a      <DIR>          ..
07/21/02  10:58p               6,458 Area.java
07/21/02  10:58p              33,840 Axis.java
07/21/02  10:58p               1,632 Bin.java
07/21/02  10:58p              61,245 BuildGraph.java
07/21/02  10:58p              27,066 Contour.java
07/21/02  10:58p               9,530 ContourProb.java
07/21/02  10:58p              23,790 DataSet.java
07/21/02  10:58p               6,737 Dike.java
07/21/02  10:58p              21,545 G2Dint.java
07/21/02  10:58p              32,760 Graph2D.java
07/21/02  10:58p              18,128 Grav1Map.java
07/21/02  10:58p               4,170 Gravity.java
07/21/02  10:58p                 395 Gtest.java
07/21/02  10:58p               5,466 Hestimate.java
07/21/02  10:58p              18,382 IsoCurve.java
07/21/02  10:58p              10,164 LoadData.java
07/21/02  10:58p               9,177 Markers.java
07/21/02  10:58p              40,536 ParseFunction.java
07/21/02  10:58p               1,172 Poly.java
07/21/02  10:58p               7,691 Restimate.java
07/21/02  10:58p              23,707 RTextLine.java
07/21/02  10:58p               7,934 ScanString.java
07/21/02  10:58p               5,906 ScanWord.java
07/21/02  10:58p              37,879 SpecialFunction.java
07/21/02  10:58p              24,728 TextLine.java
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07/21/02  10:58p                 15,436 VectorSet.java
07/21/02  10:58p                 17,545 Volcano.java
              29 File(s)         473,019 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\applets\src

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
07/21/02  10:58p                 16,148 Prob1Graph.java
07/21/02  10:58p                 16,044 Prob1Graph.out
07/21/02  10:58p                 39,543 ProbMap1.out
07/21/02  10:58p                 36,482 ProbMap1.java
               6 File(s)         108,217 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\articles

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
08/29/02  11:25a        <DIR>          art1
08/29/02  11:25a        <DIR>          art2
08/29/02  11:25a        <DIR>          art3
08/29/02  11:25a        <DIR>          art4
               6 File(s)               0 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\articles\art1

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
07/21/02  10:58p                 85,684 art1.html
07/21/02  10:58p                 11,759 equation5.jpg
07/21/02  10:58p                 20,528 equationa1.jpg
07/21/02  10:58p                 10,833 equationa2.jpg
07/21/02  10:58p                 13,321 equationa5.jpg
07/21/02  10:58p                 20,796 equationa6.jpg
07/21/02  10:58p                 25,840 equationa3.jpg
07/21/02  10:58p                 20,969 equationa4.jpg
07/21/02  10:58p                 14,923 equationa9.jpg
07/21/02  10:58p                 24,689 equationa7.jpg
07/21/02  10:58p                 23,328 equationa8.jpg
07/21/02  10:58p                 10,716 equation1.jpg
07/21/02  10:58p                 11,759 equation2.jpg
07/21/02  10:58p                 16,194 equation3.jpg
07/21/02  10:58p                  8,429 equation4.jpg
07/21/02  10:58p                  1,079 figure3.html
07/21/02  10:58p                  1,173 figure7.html
07/21/02  10:58p                    927 figure4.html
07/21/02  10:58p                  1,581 figure8.html
07/21/02  10:58p                    800 figure5.html
07/21/02  10:58p                  1,193 figure9.html
07/21/02  10:58p                    781 figure2.html
07/21/02  10:58p                    877 figure6.html
07/21/02  10:58p                    761 figure1b.html
07/21/02  10:58p                 77,432 Figure1.jpg
07/21/02  10:58p                 96,000 Figure10.jpg
07/21/02  10:58p                102,452 Figure11.jpg
07/21/02  10:58p                 98,932 Figure12.jpg
07/21/02  10:58p                132,044 Figure1a.jpg
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07/21/02  10:58p                76,401 Figure1b.jpg
07/21/02  10:58p               399,179 figure3.jpg
07/21/02  10:58p                30,217 figure4a.jpg
07/21/02  10:58p                58,021 figure4b.jpg
07/21/02  10:58p               132,860 figure5.jpg
07/21/02  10:58p               418,663 Figure6.jpg
07/21/02  10:58p                82,425 Figure7.jpg
07/21/02  10:58p                89,602 Figure8.jpg
07/21/02  10:58p                86,709 Figure9.jpg
07/21/02  10:58p                   998 figure10.html
07/21/02  10:58p               119,811 Figure 2.jpg
07/21/02  10:58p                 1,060 figure11.html
07/21/02  10:58p                   705 figure12.html
07/21/02  10:58p                 1,042 figure1a.html
07/21/02  10:58p                10,716 revequation1.jpg
07/21/02  10:58p                68,096 Thumbs.db
                47 File(s)      2,412,305 bytes

 Directory of R:\Pvha_ym\PVHA_YM_Version2.0\articles\art2

08/29/02  11:25a        <DIR>          .
08/29/02  11:25a        <DIR>          ..
07/21/02  10:58p                99,480 Appendix.cc
07/21/02  10:58p               125,607 art2.html
07/21/02  10:58p                   857 figure3.html
07/21/02  10:58p                 1,016 figure7.html
07/21/02  10:58p                   941 figure4.html
07/21/02  10:58p                 1,249 figure8.html
07/21/02  10:58p                 1,688 figure5.html
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07/21/02  10:58p                73,458 Fig11b.jpg
07/21/02  10:58p                57,783 Fig3.jpg
07/21/02  10:58p                49,284 Fig4.jpg
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07/21/02  10:58p                59,898 Fig5b.jpg
07/21/02  10:58p                75,421 Fig6.jpg
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               29 File(s)      3,175,223 bytes

     Total Files Listed:
              317 File(s)    131,691,767 bytes
                                       0 bytes free
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SOFTWARE VALIDATION TEST REPORT FOR PVHA_YM VERSION 2.0

August 2002

Center for Nuclear Waste Regulatory Analyses

Author

Brittain Hill 8/27/02
Date

Element Manager, Geology and Geophysics

H. Lawrence McKague
Larry McKague 8/27/02
Date

SOFTWARE VALIDATION TEST REPORT FOR PVHA_YM VERSION 2.0

The validation test plan and test results are combined for PVHA_YM version 2.0.

The assessment of long-term performance of the proposed high-level radioactive waste repository at Yucca Mountain, Nevada, requires the use of mathematical models to consider the probability of disruptive scenarios. The purpose of the PVHA_YM software is to provide and document mathematical models developed to assist staff in the probabilistic volcanic hazards assessment of the Yucca Mountain site.

1.0 Assumptions and Constraints

PVHA_YM is intended to be launched from a web browser. PVHA_YM includes JAVA applets that can be used to estimate the probability of a volcanic event occurring within an effective area around the repository using kernel density estimators to smooth the point-pattern map distribution of previous volcanic events in the region. Two types of kernel density estimators are included: Gaussian and Epanechnikov. These density estimators are used to calculate the probability of volcanic events at the site, and to plot conditional probability maps of the location of volcanic events, given the occurrence of a volcanic event in the magmatic system. Descriptions of conceptual and numerical models and a user guide for PHVA_YM version 1.0 are contained in Connor (2000). An updated users guide is in preparation as Connor et al. (2002).

PVHA_YM version 1.0 contained JAVA applets that produced graphical estimates of volcanic disruption probability for the proposed Yucca Mountain repository site, using methods discussed in Connor and Hill (1995). PVHA_YM version 2.0 includes the following modifications to version 1.0:

- Data sets are now stored as simple text files. This enables alternative conceptual models of volcanism and repository designs to be tested by simply loading new files.
- Gravity data can be incorporated into the analysis following the methods outlined in Connor et al. (2000).
- Event (e.g. dikes, vent alignments) length and orientation are now included in the analysis.

With these modifications, PVHA_YM now includes all of the major features used in the NRC/CNWRA analysis of probability of volcanism at the Yucca Mountain site.

1.1: System Requirements

Operating system requirements for PVHA_YM are a Windows or UNIX web browser that supports JAVA™ 2 Runtime Environment version 1.4.0. Tests in this report were performed on a Windows NT (build 1381, service pack 6 installed) Pentium III workstation using Microsoft Internet Explorer version 5.00, with JAVA™ 2 Runtime Environment version 1.4.0 installed.

2.0 Scope of the Validation

PVHA_YM version 2.0 is desiged to assist the user in understanding the probability of volcanic disruption of the proposed Yucca Mountain repository site, using the numerical models developed in Connor and Hill (1995) and Connor et al. (2000). Validation of the Gaussian and Epanechnikov kernel functions in PVHA_YM version 1.0 was provided through comparison with calculations in Connor and

Hill (1995), as discussed in Connor (2000). Calculations presented in Connor et al. (2000) provide the technical basis to validate changes to PVHA_YM version 2.0. The calculations in Connor et al. (2000) were performed with TrueBasic computer codes. Development and verification of the numerical methods used in the TrueBasic codes are documented in CNWRA Scientific Notebook 115E.

Two tests are provided herein, which evaluate the accuracy of the probability map (PROBMAP1.HTML) and probability graph (PROBGRAPH1.HTML) functions of PVHA_YM version 2.0.

2.1: Test 1: Gravity-Weighted Probability Map (PROBMAP1.HTML)

1-1) Load file PVHA\applets\PROBMAP1.HTML into Internet Explorer.

1-2) Coordinates were obtained for repository outlines from the 1996 DOE design. These coordinates were formatted into repository file PVHA\applets\datafile\repository96.area, which duplicates the repository coordinates used in Connor et al. (2000). Load this file using "Select Repository Site" function.

1-3) Using the "Select Volcanic Events" function, load the data file PVHA\applets\datafile\quaternary8events.event.

1-4) Establish minimum and maximum map boundaries consistent with Plate 2 (i.e., Figure 1) in Connor et al. (2000).

1-5) Set contour interval for 20, H-smoothing at 8.1, and use default gravity weighing functions established from Connor et al. (2000). Construct a gravity-weighted probability map (Figure 2).

1-6) Compare the resulting probability map (Figure 2) with Plate 2 in Connor et al. (2000). PVHA_YM Version 2.0 created almost identical probability contours as Figure 1. Minor variations are due to

- i) different contouring algorithms used to create Figure 1 (Connor et al., 2000) and Figure 2 (PVHA_YM version 2.0).
- ii) slightly different map areas, due to graphics constraints for a square display map in PVHA_YM. Thus, probability is normalized over slightly different display areas.

Conclusion: PVHA_YM version 2.0 accurately calculates a gravity-weighted probability map using a Gaussian kernel, using data from Connor et al. (2000) as the basis for comparison.

2.2: Test 2: Probability Graph (PROBGRAPH1.HTML)

2-1) Load file PVHA\applets\PROBGRAPH1.HTML into Internet Explorer.

2-2) Load repository file PVHA\applets\datafile\repository96.area and PVHA\applets\datafile\quaternary8events.event.

2-3) Use the Gaussian kernel function, set limits as in Figure 7 of Connor et al. (2000) (i.e., Figure 3). Create probability graphs for recurrence rates of 2, 8, and 12 v/Myr (Figures 4,5,6).

2-4) Plot probability-smoothing factor data from Figure 7 of Connor et al. (2000) on Figures 4–6. Probabilities for smoothing factors less than approximately 10 are indistinguishable from probabilities shown in Figure 7 of Connor et al. (2000).

2-5) For smoothing factors greater than 10, there is an approximately 10 percent higher probability calculated from PVHA_YM than shown in Connor et al. (2000). PVHA_YM version 2.0 uses an explicit definition of repository area, and calculates changes in probability that occur across the repository area. In contrast, Connor et al. (2000) used the centroid of the repository to calculate probability, which was then scaled to the repository area. A 10 percent change in effective probability is not significant, and appears reasonable given the modification to PVHA_YM version 2.0 relative to the TrueBasic codes used for calculations in Connor et al. (2000).

Conclusion: PVHA_YM version 2.0 accurately calculates the probability of volcanic disruption of the proposed repository site for a Gaussian kernel function, using data from Connor et al. (2000) as the basis for comparison.

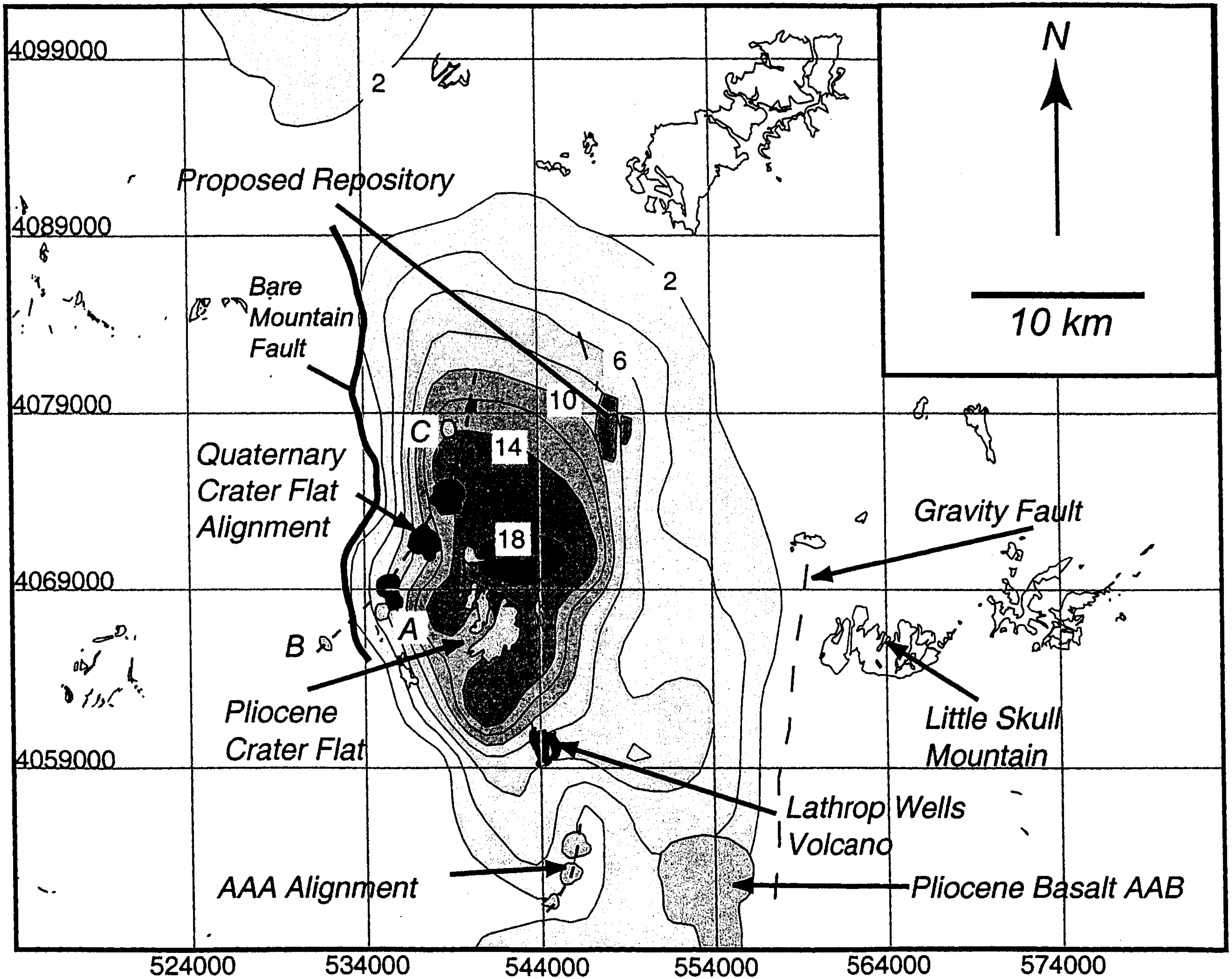
3.0 References

Connor, C.B. PVHA_YM Version 1.0 — Probabilistic Volcanic Hazard Assessment Methods for a Proposed High-Level Radioactive Waste Repository at Yucca Mountain, Nevada. IM 01402.462.050. San Antonio, TX: Center for Nuclear Waste Regulatory Analyses. 2000.

Connor, L., C.B. Connor, and B.E. Hill. PVHA_YM Version 2.0 — Probabilistic Volcanic Hazard Assessment Methods for a Proposed High-Level Radioactive Waste Repository at Yucca Mountain, Nevada. IM 01402.462.260. San Antonio, TX: Center for Nuclear Waste Regulatory Analyses. 2002.

Connor, C.B. and B.E. Hill. "Three Nonhomogeneous Poisson Models for the Probability of Basaltic Volcanism: Application to the Yucca Mountain Region, Nevada, U.S.A." *Journal of Geophysical Research.* Vol. 100, No. B6. pp. 10,107–10,125. 1995.

Connor, C.B., J.A. Stamatakos, D.A. Ferrill, B.E. Hill, G. Ofoegbu, F.M. Conway, B. Sagar, and J.S. Trapp. "Geologic Factors Controlling Patterns of Small-Volume Basaltic Volcanism: Application to a Volcanic Hazards Assessment at Yucca Mountain, Nevada." *Journal of Geophysical Research.* Vol. 105. pp. 417–432. 2000.


4099000
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2
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18
Proposed Repository
Bare Mountain Fault
Quaternary Crater Flat Alignment
C
A
B
Pliocene Crater Flat
Gravity Fault
Little Skull Mountain
Lathrop Wells Volcano
AAA Alignment
Pliocene Basalt AAB

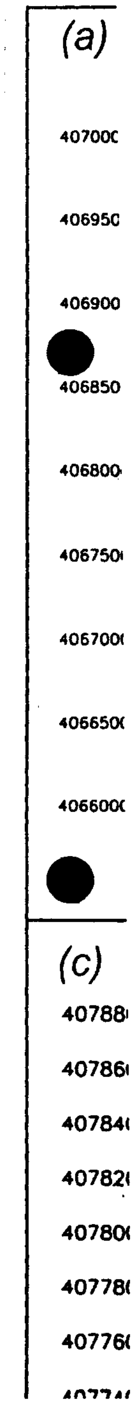

(a)
(c)

Figure 1

PVHA-Map - Microsoft Internet Explorer

File Edit View Favorites Tools Help

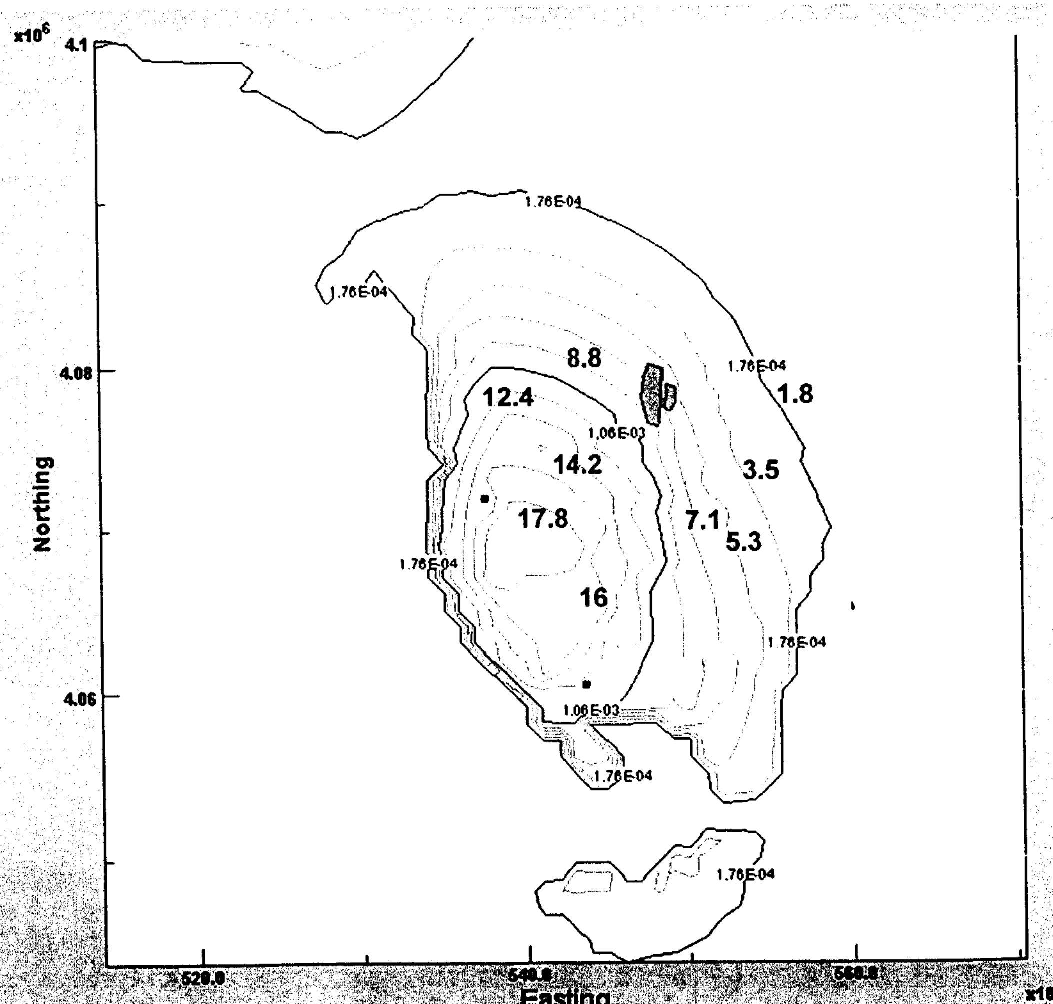
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address D:\PVHV\PVHA_YM_Version2.0\applets\ProbMap1.html Go Links

Spatial Recurrence (Gravity + Gaussian) 8/20/2002, 13:23 PVHA_YM version 2.0

The probability that a volcanic event occurs within the repository is: 1.0191091E-8

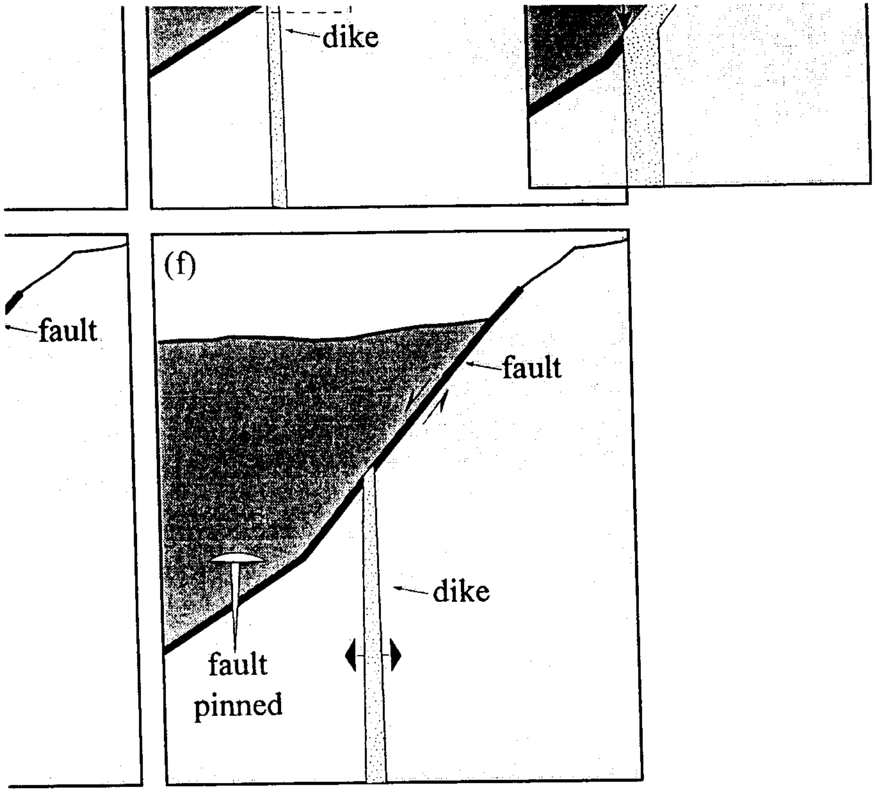
Easting (min):	514000
Easting (max):	584000
Northing (min):	4039000
Northing (max):	4100000
Grid Size (m):	1000
Contours:	10
H - smoothing (km)	9
Time Interval (yrs):	1
Recurrence Rate:	3.0e-6
Kernel Function:	Gaussian + Gravity
Gravity Weight (%):	100



Select Repository Site | Select Volcanic Events | Change Bin Values | Calculate Contours | Include Dike/Vent Intersection | Export Data

Applet Source | About Map | About Parameters | Hot Keys | Documentation | About Code

Plot finished. My Computer



:ault dike interaction. Ascending magma is shown by stippled pattern, and . (a) There are several possible modes of interaction between a vertically akness, such as a fault. (b) The dike may propagate vertically through the d to fracture rock vertically than dilate the dipping fault plane. (c) The dike e it as a conduit if the fault plane represents the low-energy pathway to the :ace, stress changes rapidly due to free surface affects causing the dike to teral offset between the original position of the dike and the position of the of the fault α and depth of dike-fault intersection relative to the depth of ifurcate upon intersecting the fault or (f) terminate at the fault, accommo- low the fault and fault slip above.

$^{-8}$ and 3.5×10^{-8}

ded in the analysis
of alignment length,
abilities of volcanic
ere calculated using

$l_{min} = 100$ m, 5200 m $\leq l_{max} \leq 10{,}200$ m, $20° < \varphi < 35°$, and 5 km $\leq h \leq 7$ km. In this case, the locations (geographic centers) of only three Quaternary volcanic events, Lathrop Wells, Quaternary Crater Flat, and the Sleeping Butte alignment, were used to calculate the expected vent distribution using a Gaussian kernel. Assuming a regional recurrence rate

W 9/6

of 3 v/Myr yields annual probabilities of volcanic eruptions within the repository boundary between 1×10^{-8} and 3×10^{-8}. Thus accounting for the increased area potentially affected by the formation of vent alignments is more or less offset by the decrease in total number of expected events, reflected in the lower recurrence rate.

Annual probability of volcanic eruptions within the repository boundary are next calculated weighting the expected vent distribution using the apparent crustal density map. This greatly reduces the probability of future basaltic eruptions west of the BMF and increases probability east of the BMF. Using the same parameters as previously, probabilities of volcanic eruptions within the repository boundary are 3–5.5 $\times 10^{-8}$,

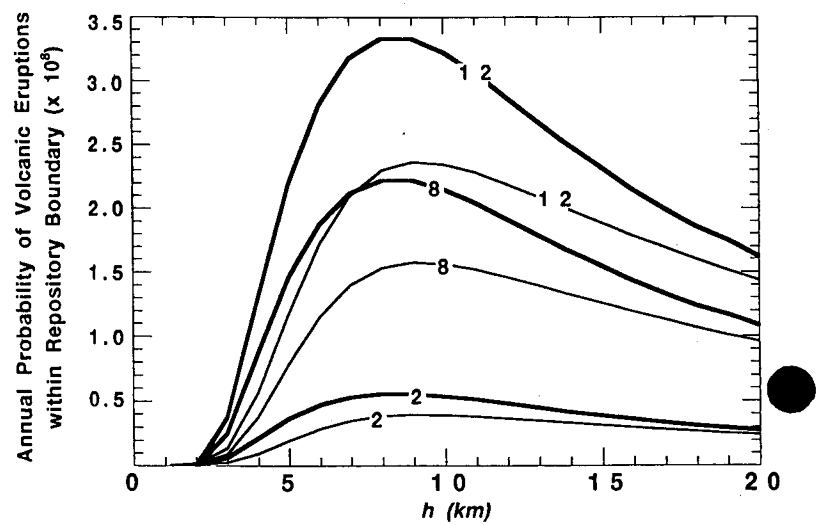


Figure 7. Annual probability of volcanic eruptions within the repository boundary. A Gaussian kernel is used with smoothing parameter h, varying from 0 to 20 km (see appendix). Curves are shown for various regional recurrence rates of volcanic vent formation (2×10^{-6} v/yr, 8×10^{-6} v/yr, and 12×10^{-6} v/yr, where v is volcanic events), based on the distribution of Quaternary volcanoes (thick curves) and Pliocene-Quaternary volcanoes (thin curves).

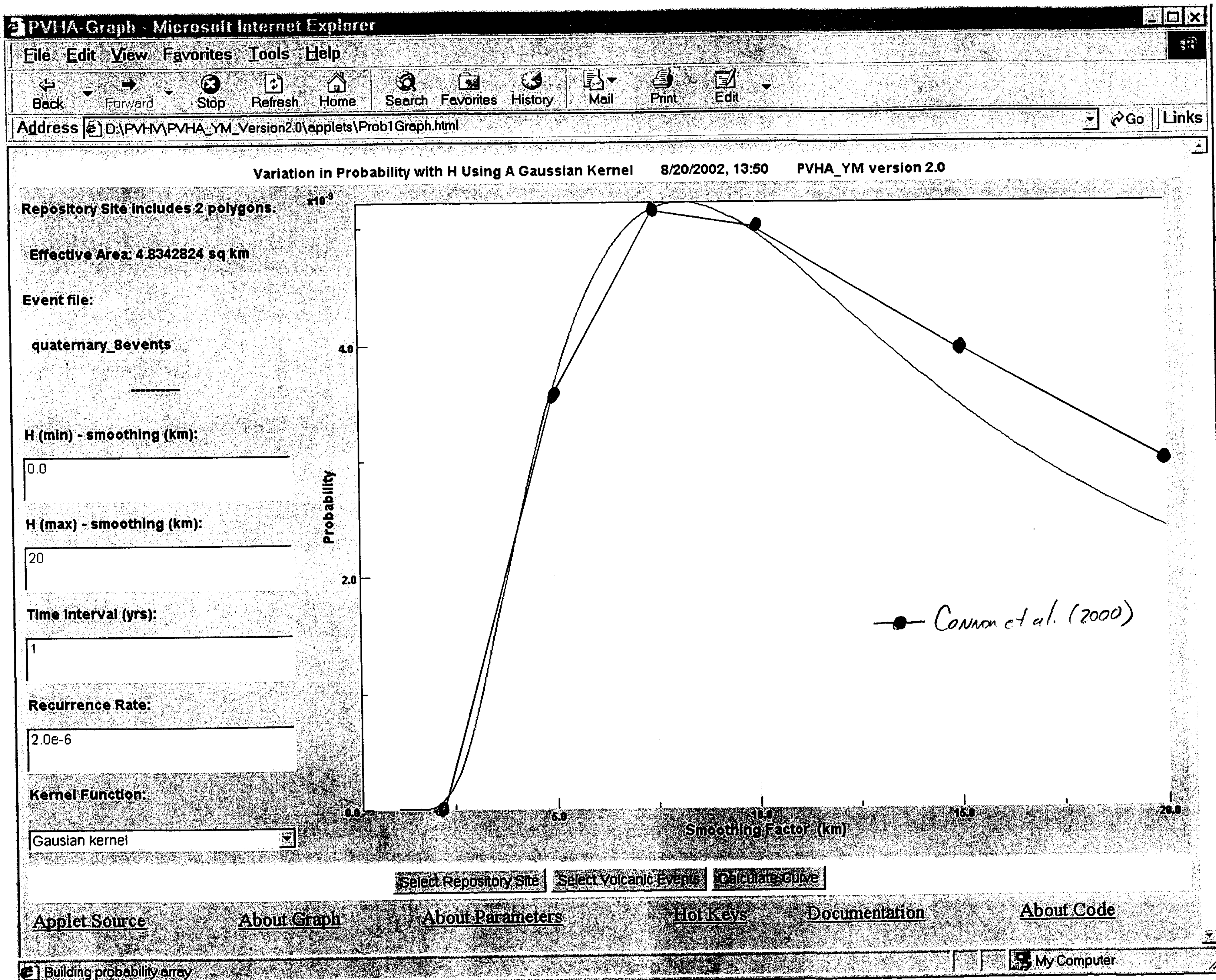

PVHA-Graph - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address D:\PVHV\PVHA_YM_Version2.0\applets\Prob1Graph.html
Go Links
Variation in Probability with H Using A Gaussian Kernel 8/20/2002, 13:50 PVHA_YM version 2.0
Repository Site includes 2 polygons.
Effective Area: 4.8342824 sq km
Event file:
quaternary_8events
H (min) - smoothing (km):
0.0
H (max) - smoothing (km):
20
Time interval (yrs):
1
Recurrence Rate:
2.0e-6
Kernel Function:
Gausian kernel
x10^-9
Probability
4.0
2.0
0.0
5.0
10.0
15.0
20.0
Smoothing Factor (km)
Connor et al. (2000)
Select Repository Site
Select Volcanic Events
Calculate Curve
Applet Source
About Graph
About Parameters
Hot Keys
Documentation
About Code
Building probability array
My Computer

Fig. 4

PVHA-Graph - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address D:\PVHV\PVHA_YM_Version2.0\applets\Prob1Graph.html Go Links

Variation in Probability with H Using A Gaussian Kernel 8/20/2002, 13:52 PVHA_YM version 2.0

Repository Site includes 2 polygons.

Effective Area: 4.8342824 sq km

Event file:

quaternary_8events

H (min) - smoothing (km):

0.0

H (max) - smoothing (km):

20

Time Interval (yrs):

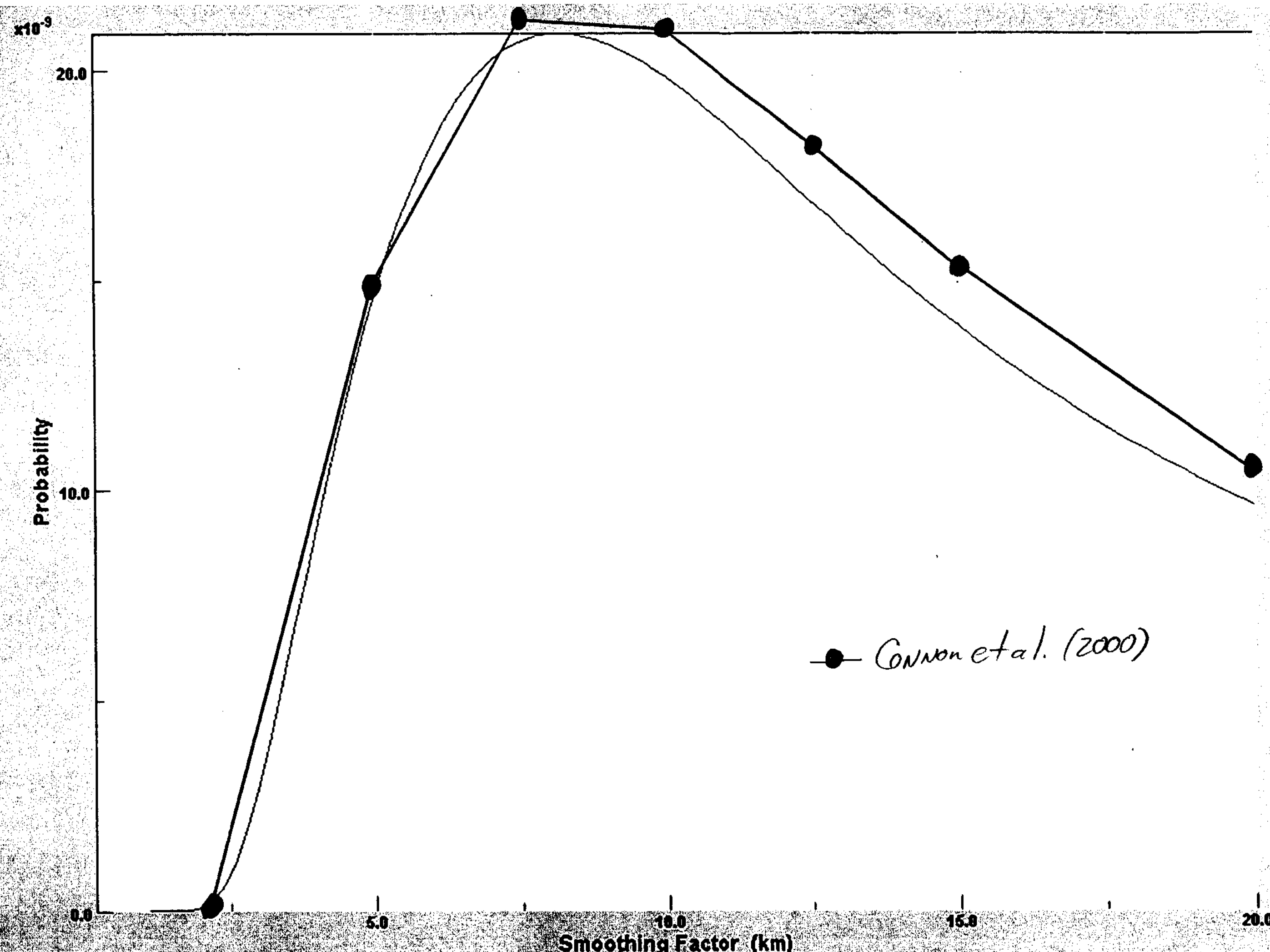
1

Recurrence Rate:

8.0e-6

Kernel Function:

Gausian kernel



Select Repository Site | Select Volcanic Events | Calculate Curve

Applet Source | About Graph | About Parameters | Hot Keys | Documentation | About Code

Building probability array | My Computer

Fig 5

PVHA-Graph - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address D:\PVHV\PVHA_YM_Version2.0\applets\Prob1Graph.html Go Links

Variation in Probability with H Using A Gaussian Kernel 8/20/2002, 13:47 PVHA_YM version 2.0

Repository Site includes 2 polygons.

Effective Area: 4.8342824 sq km

Event file:

quaternary_8events

H (min) - smoothing (km):

0.0

H (max) - smoothing (km):

20

Time Interval (yrs):

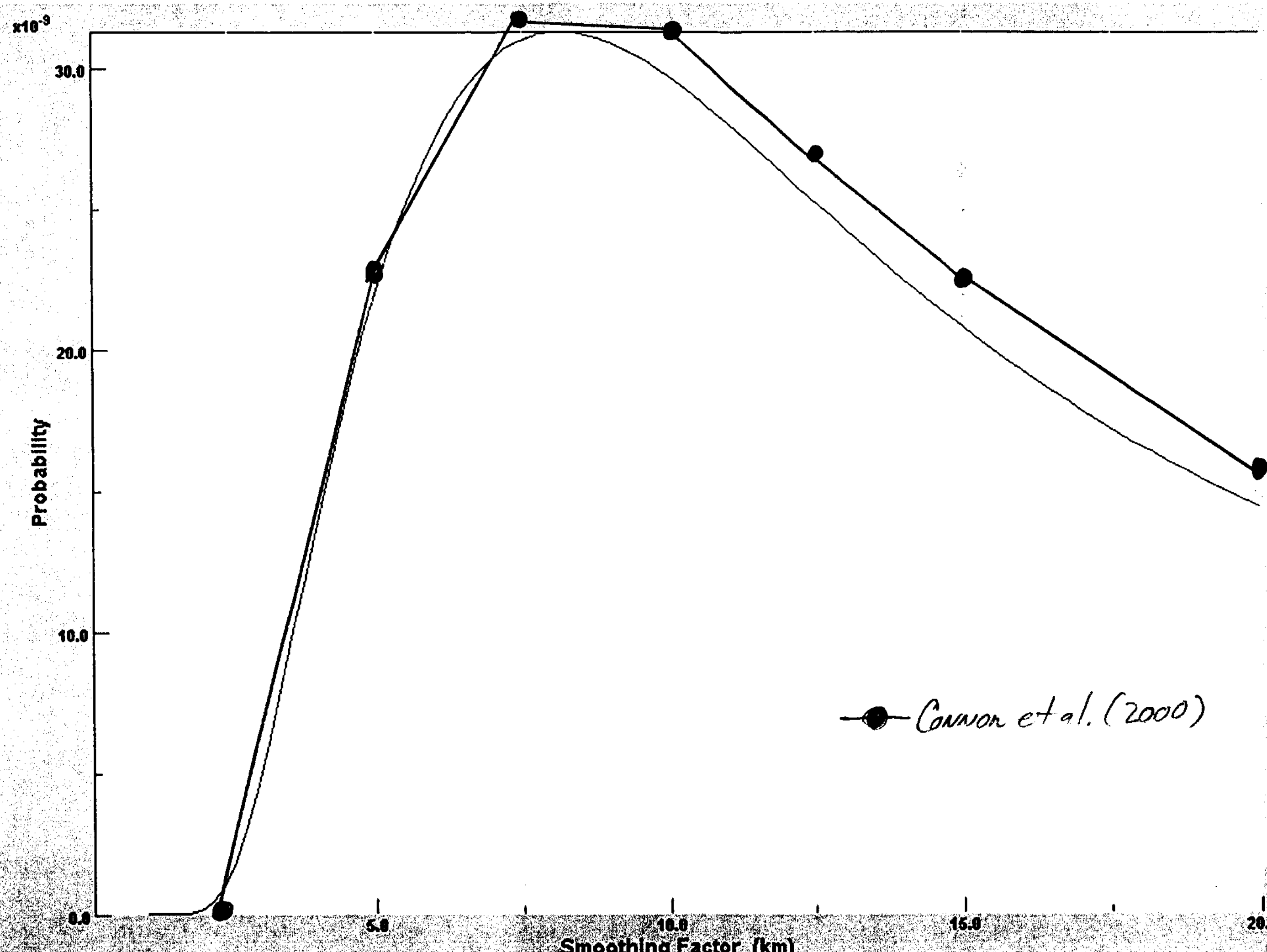
1

Recurrence Rate:

12.0e-6

Kernel Function:

Gausian kernel



Select Repository Site | Select Volcanic Events | Calculate Curve

Applet Source About Graph About Parameters Hot Keys Documentation About Code

Building probability array My Computer

Fig 6

SOFTWARE CHANGE REPORT (SCR)

1. SCR No. (*Software Developer Assigns*): GLGP-SCR-~~215~~ 407 8/30/02 BH	2. Software Title and Version: PVHA_YM, Version 2.0	3. Project No: 20.01402.462

4. Affected Software Module(s), Description of Problem(s):
Update PVHA_YM Version 1.0 to include geologic models of volcano probability presented in Connor et al. (2000). Add interactive capability to use additional data sets for volcano location and repository outlines.

5. Change Requested by: Brittain Hill Date: February 4, 2002	6. Change Authorized by (*Software Developer*): Brittain Hill Date: February 1, 2002

7. Description of Change(s) or Problem Resolution (*If changes not implemented, please justify*):
1) PVHA_YM updated to Version 2.0, which includes geologic models of volcano probability that are presented in Connor et al. (2002). A normalized probability density function is calculated by the code from the gravity data using equations A6–A9 in Connor et al. (2000). The code contours this probability density function and displays the result.
2) Gravity data from the YMR is displayed as a Java applet.
3) New repository locations and dimensions are updated in user modified files, consistent with the DOE FEIS design options.
4) Volcano locations and ages are contained in a user-accessible table, and the code is modified to permit the addition or subtraction of volcano locations and ages.
5) PVHA_YM hypertext has been revised to include these code changes.

8. Implemented by: Laura Connor	Date: April 29, 2002

9. Description of Acceptance Tests:
1) Install on Windows NT workstation with Java(TM) 2 Runtime Environment version 1.4.0
2) Created repository file PVHA\applets\datafile\repository96.area for the repository outline used in Connor et al. (2000).
3) Establish map boundaries consistent with Plate 2 in Connor et al. (2000).
4) Using the same parameters as in Connor et al. (2000), construct a gravity-weighted probability map as shown in Plate 2 (Figure 1) using PROBMAP1.HTLM
5) Compare resulting probability map (Figure 2) with Plate 2 in Connor et al. (2000). PVHA_YM created almost identical probability contours as Figure 1, with minor variations readily explained due to different contouring algorithms used between Figure1 and Figure 2, and slightly different map areas in PVHA_YM due to graphics constraints for a square display map.
6) With PROBGRAPH1.HTML, select PVHA\applets\datafile\repository96.area and PVHA\applets\datafile\quaternary8events.event. Use Gaussian kernel, set limits as in Figure 7 of Connor et al. (2000) (i.e., Figure 3). Create probability graphs for recurrence rates of 2, 8, and 12 v/my (Figures 4,5,6).
7) PROBGRAPH1.HTML produces same probability charts as in Connor et al. (2000).

10. Tested by: Brittain Hill	Date: 8/19/2002

CNWRA Form TOP-5 (05/2000)

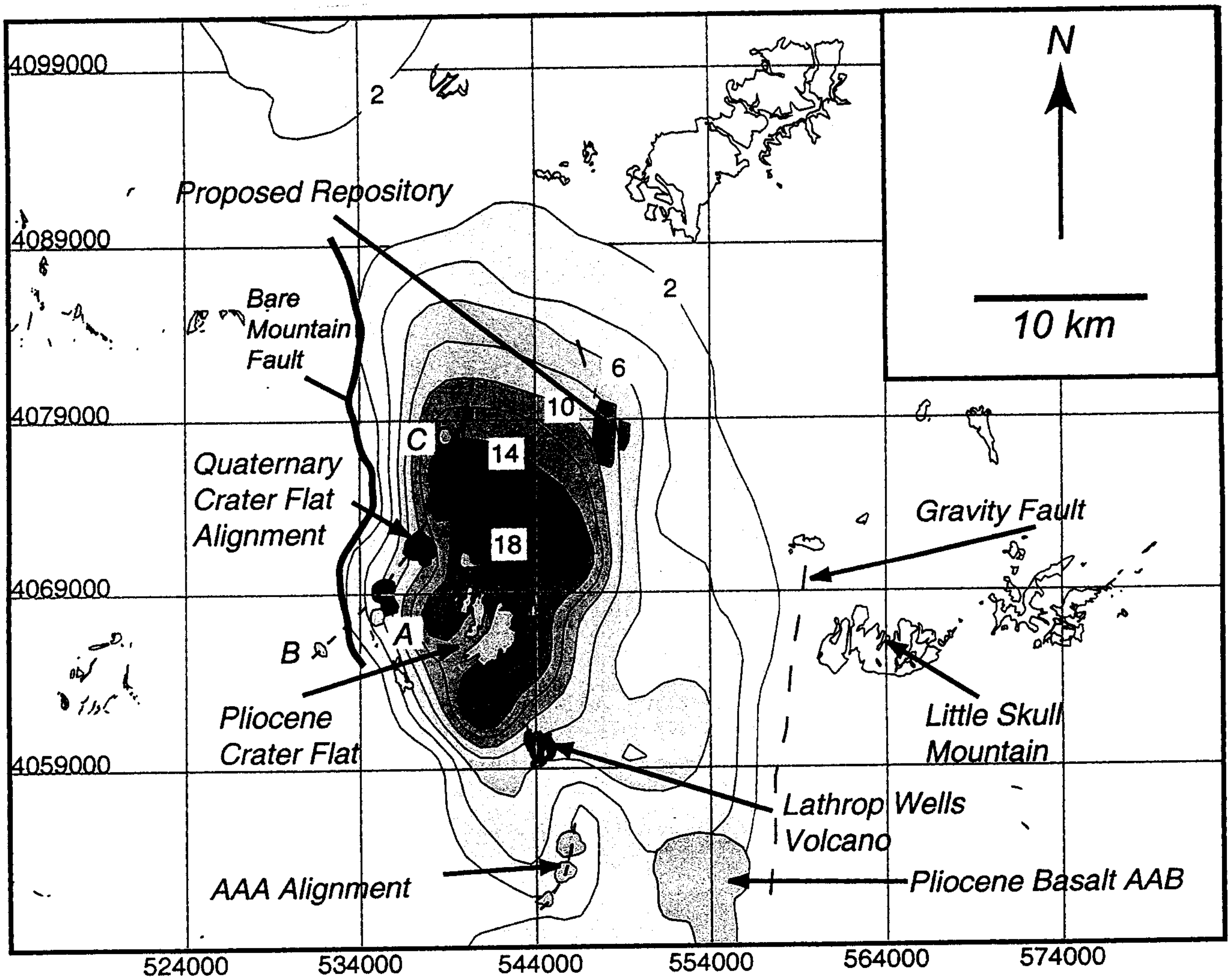


Plate 2. The spatial recurrence rate (volcanic events/km^2) contoured for the YMR, based on the distribution of Quaternary volcanism and its relationship to the BMF (see appendix). The contour interval is 2×10^{-4} volcanic events/km^2.

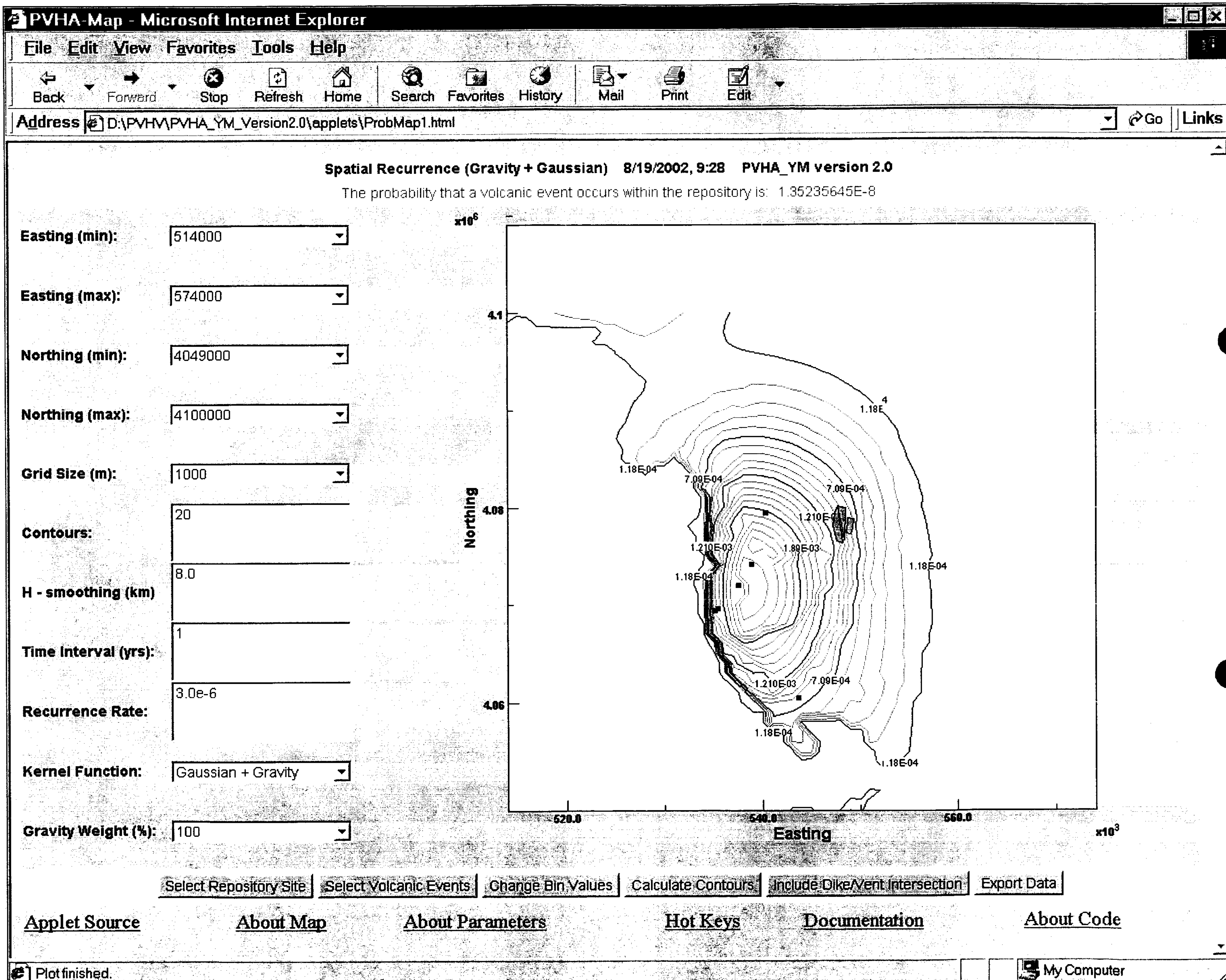
1–3 GPa pressures [e.g., *Jaques and Green*, 1980]. Small pressure changes of 2–7 MPa would be unlikely to induce partial melting unless these peridotites were at the solidus. In contrast, solidi for volatile-bearing peridotites appear relatively more sensitive to small variations in pressure than anhydrous peridotites [*Mysen and Boettcher*, 1975; *Eggler*, 1978; *Green et al.*, 1987; *Harry and Leeman*, 1995]. Some <5 Ma basalts of the YMR contain phenocrysts of pargasitic amphibole, and most have geochemical characteristics consistent with phlogopite or amphibole as a residual or fractionating mineral phase [*Vaniman et al.*, 1982]. These features indicate partial melting that occurred under hydrous conditions. Isotopic data also are consistent with a source for YMR basalt in metasomatized lithospheric mantle [*Farmer et al.*, 1989; *Yogodzinski and Smith*, 1995]. Provided the metasomatized peridotites are very near the solidus, 2–7 MPa variations in pressure may be sufficient to induce small-volume partial melts by isothermal decompression.

Basaltic volcanism within the Amargosa Trough thus can be explained by the juxtaposition of crustal extension associated with the BMF onto a more regionally extensive zone of metasomatized mantle lithosphere. Although this zone of metasomatized mantle may extend for at least 50 km away from the Amargosa Trough [e.g., *Yogodzinski and Smith*, 1995], compositionally similar basalt is concentrated in areas of relatively large-scale crustal extension, such as the Funeral Formation of the Greenwater range [*Asmerom et al.*, 1994]. With these observations (Figure 2 and Plate 1a) and model in mind, the apparent density map was normalized to be a probability density function that effectively weights the expected distribution of future volcanic eruptions in favor of areas east of the BMF. This information, together with vent cluster models [*Connor and Hill*, 1995; *Condit and Connor*, 1996; *Conway et al.*, 1998] (see appendix, equations (A7)–(A9)), is used to estimate the expected location of basaltic vents and vent alignments in the YMR (Plate 2).

3. Subregional Scale: Volcano Alignments and Faults

Within the Amargosa Trough, stress orientation, strain rate, and fault distribution influence the development of vent alignments. Issues related to vent alignments that arise in hazard assessment include their likelihood to develop, orientation, length [*Nakamura*, 1977; *Zoback*, 1989; *Connor*, 1990; *Smith et al.*, 1990], and potential to reactivate after comparatively long periods of quiescence [*Conway et al.*, 1997].

FIGURE 1


PVHA-Map - Microsoft Internet Explorer
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Address D:\PVHV\PVHA_YM_Version2.0\applets\ProbMap1.html
Go Links
Spatial Recurrence (Gravity + Gaussian) 8/19/2002, 9:28 PVHA_YM version 2.0
The probability that a volcanic event occurs within the repository is: 1.35235645E-8
Easting (min): 514000
Easting (max): 574000
Northing (min): 4049000
Northing (max): 4100000
Grid Size (m): 1000
Contours: 20
H - smoothing (km) 8.0
Time Interval (yrs): 1
Recurrence Rate: 3.0e-6
Kernel Function: Gaussian + Gravity
Gravity Weight (%): 100
x10^6
4.1
4.08
4.06
Northing
1.18E-04
7.09E-04
1.210E-03
1.89E-03
520.0
540.0
560.0
Easting
x10^3
Select Repository Site
Select Volcanic Events
Change Bin Values
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Applet Source
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About Parameters
Hot Keys
Documentation
About Code
Plot finished.
My Computer

Figure 2

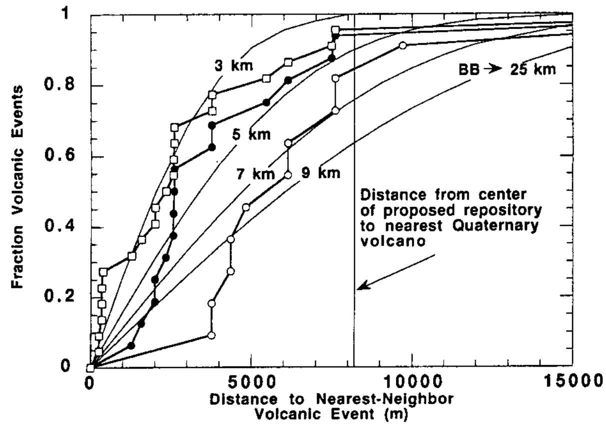

Figure 6. Comparison of observed fraction of Pliocene-Quaternary volcanoes within a given distance of their nearest-neighbor volcano with Gaussian kernel and smoothing parameter h = 3, 5, and 7 km. Observed curves include all vents (open squares), all vents or vent pairs more closely spaced then 1 km (solid circles), and vents and vent alignments (open circles). Buckboard Mesa (BB) is an outlier in the distribution as it is ~25 km from its nearest neighbor. The center of the repository site is located 8.2 km from Northern Cone, the nearest Quaternary volcano (see Figure 1b for vent locations).

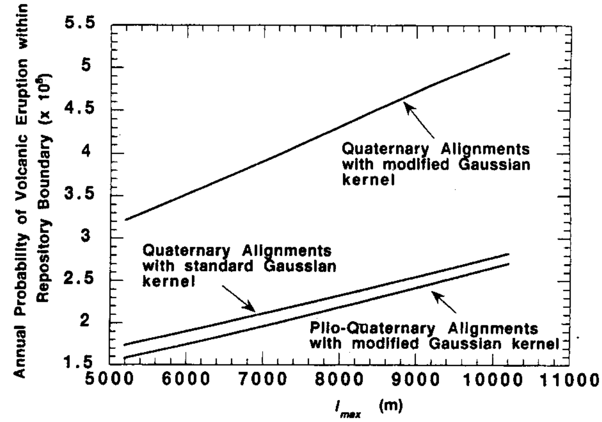

Figure 8. Annual probability of volcanic eruptions within the repository boundary as a function of maximum vent alignment half-length l_{max}. Probabilities are calculated using a regional recurrence rate of 3×10^{-6}/yr. The three separate curves show probability estimates that do not incorporate regional structure (standard Gaussian kernel) and that do incorporate regional structure (modified Gaussian kernel), based on the distribution of Quaternary volcanism and Pliocene-Quaternary volcanism.

of 3 v/Myr yields annual probabilities of volcanic eruptions within the repository boundary between 1×10^{-8} and 3×10^{-8}. Thus accounting for the increased area potentially affected by the formation of vent alignments is more or less offset by the decrease in total number of expected events, reflected in the lower recurrence rate.

Annual probability of volcanic eruptions within the repository boundary are next calculated weighting the expected vent distribution using the apparent crustal density map. This greatly reduces the probability of future basaltic eruptions west of the BMF and increases probability east of the BMF. Using the same parameters as previously, probabilities of volcanic eruptions within the repository boundary are 3–5.5 $\times 10^{-8}$, assuming a regional recurrence rate of 3 v/Myr (Figure 8). This range of probability estimates is roughly double those that do not consider crustal structure. Including Pliocene volcanoes in the estimate of the kernel function decreases the annual probability to 1.5–3 $\times 10^{-8}$, because many Pliocene volcanoes are comparatively far from the repository. Varying regional recurrence rate of volcanic events (including alignment formation) between 1 and 5 v/Myr, annual probability of volcanic eruptions within the repository is between 1×10^{-8} and 9×10^{-8} (Figure 9).

6. Discussion

The geological and geophysical evidence suggests that neotectonic setting influences patterns of basaltic volcanic activity on a number of scales. In their analysis of vent distribution in the YMR, *Connor and Hill* [1995] identified three major features that affect probabilistic volcanic hazard estimates: shifts in the locus of basaltic volcanism over long time periods, vent

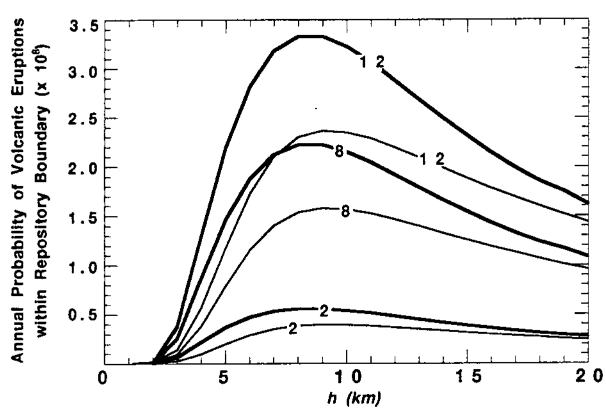

Figure 7. Annual probability of volcanic eruptions within the repository boundary. A Gaussian kernel is used with smoothing parameter h, varying from 0 to 20 km (see appendix). Curves are shown for various regional recurrence rates of volcanic vent formation (2×10^{-6} v/yr, 8×10^{-6} v/yr, and 12×10^{-6} v/yr, where v is volcanic events), based on the distribution of Quaternary volcanoes (thick curves) and Pliocene-Quaternary volcanoes (thin curves).

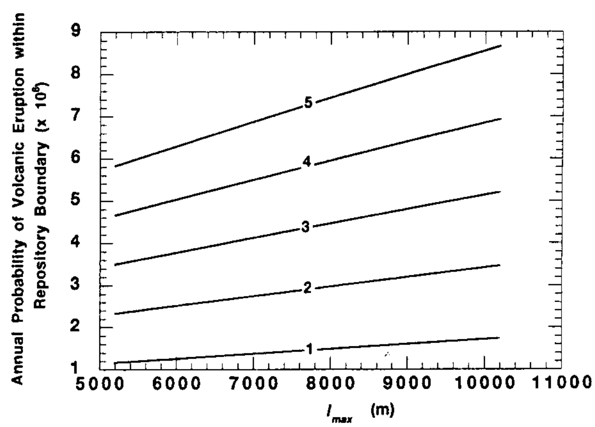

Figure 9. Annual probability of volcanic eruptions within the repository boundary using regional recurrence rates of 1×10^{-6}/yr to 5×10^{-6}/yr.

Figure 3

PVHA-Graph - Microsoft Internet Explorer

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Variation in Probability with H Using A Gaussian Kernel 8/19/2002, 9:34 PVHA_YM version 2.0

Repository Site includes 5 polygons.

Effective Area: 4.45549 sq km

Event file:

quaternary_8events

H (min) - smoothing (km):

0.0

H (max) - smoothing (km):

20.0

Time Interval (yrs):

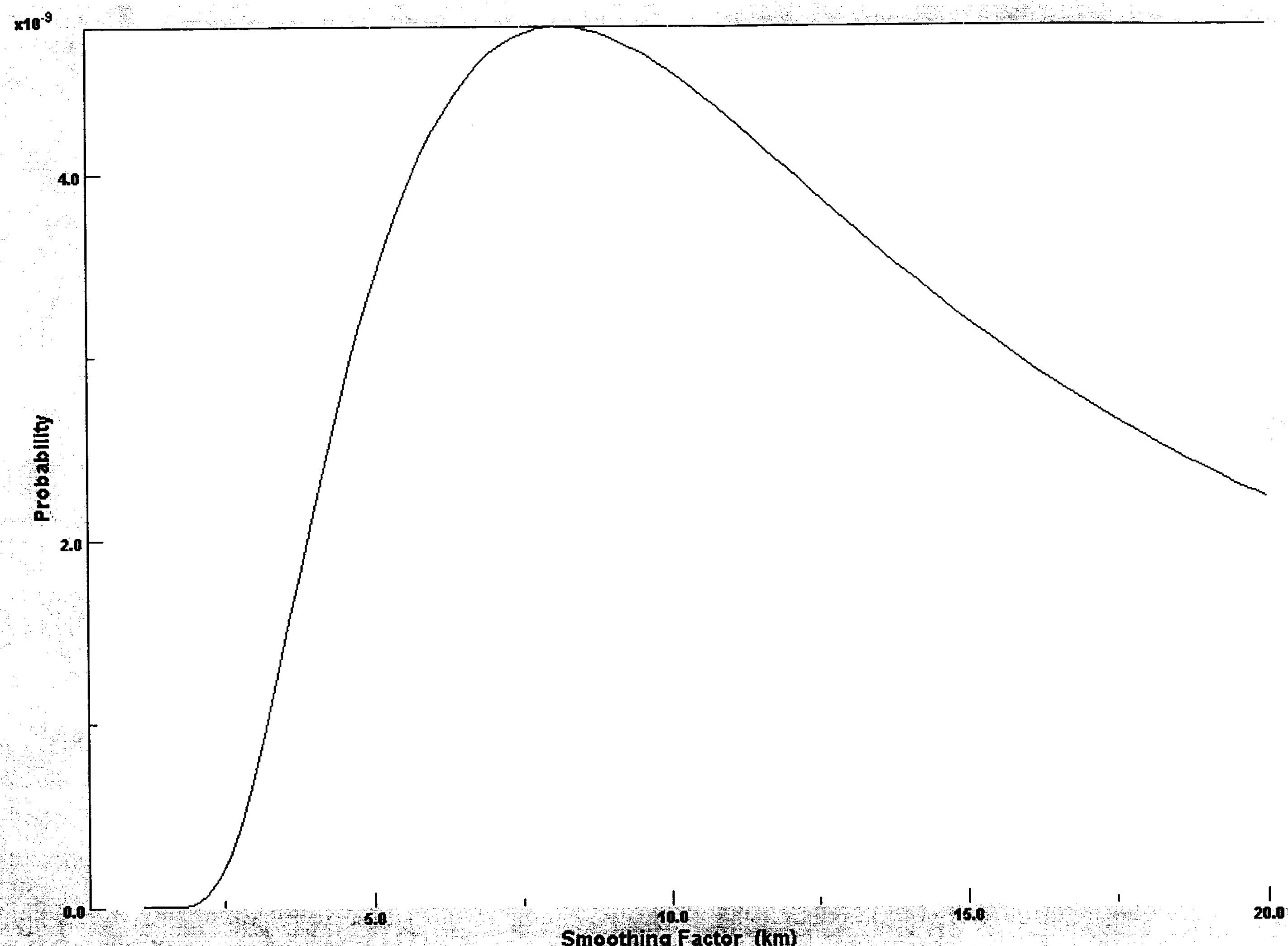
1

Recurrence Rate:

2.0e-6

Kernel Function:

Gausian kernel



Select Repository Site | Select Volcanic Events | Calculate Curve

Applet Source | About Graph | About Parameters | Hot Keys | Documentation | About Code

Building probability array | My Computer

Figure 4

PVHA-Graph - Microsoft Internet Explorer

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Variation in Probability with H Using A Gaussian Kernel 8/19/2002, 9:35 PVHA_YM version 2.0

Repository Site includes 5 polygons.

Effective Area: 4.45549 sq km

Event file:

quaternary_8events

H (min) - smoothing (km):

0.0

H (max) - smoothing (km):

20.0

Time Interval (yrs):

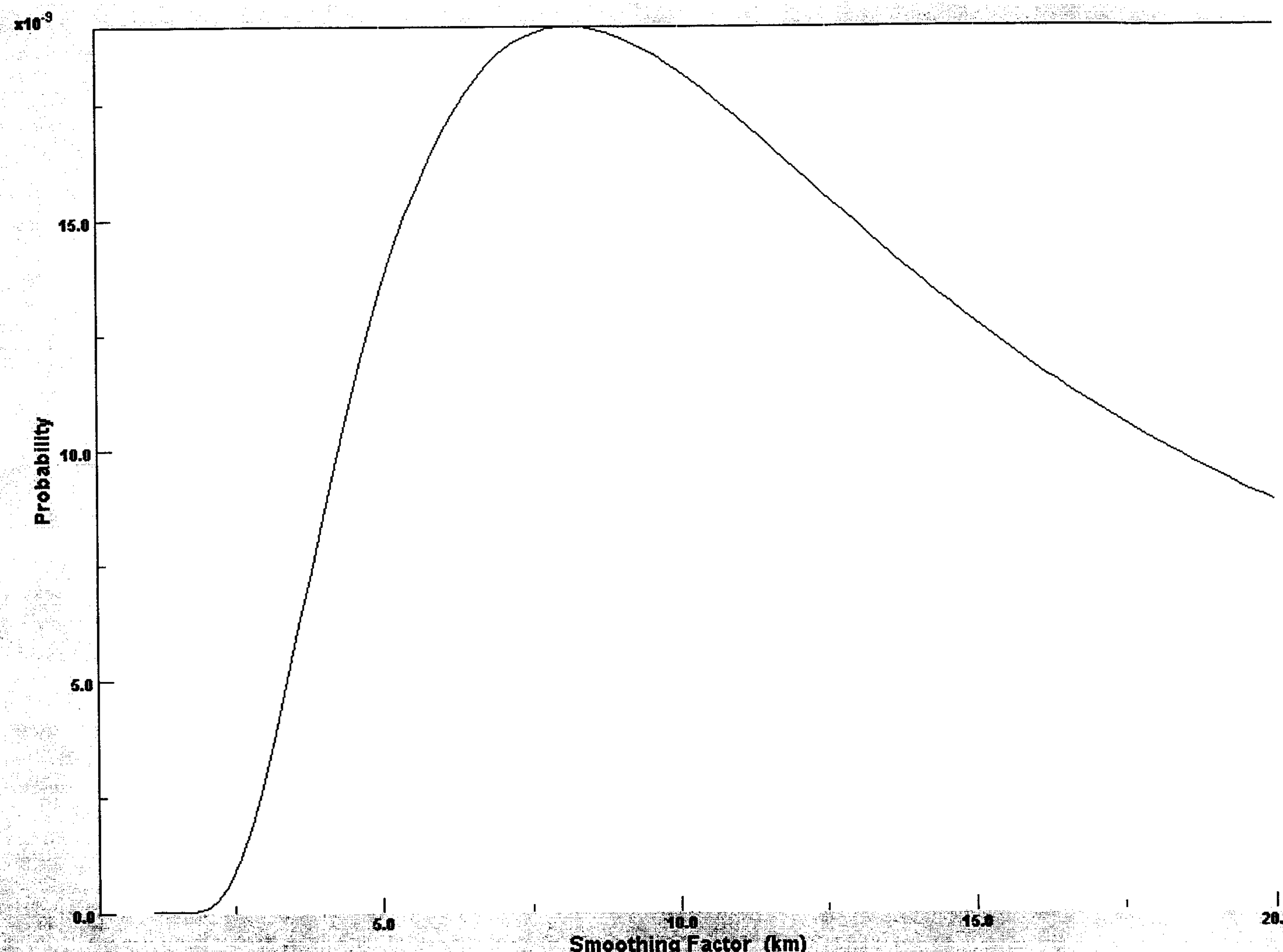
1

Recurrence Rate:

8.0e-6

Kernel Function:

Gausian kernel



Select Repository Site | Select Volcanic Events | Calculate Curve

Applet Source | About Graph | About Parameters | Hot Keys | Documentation | About Code

Building probability array | My Computer

FIGURE 5

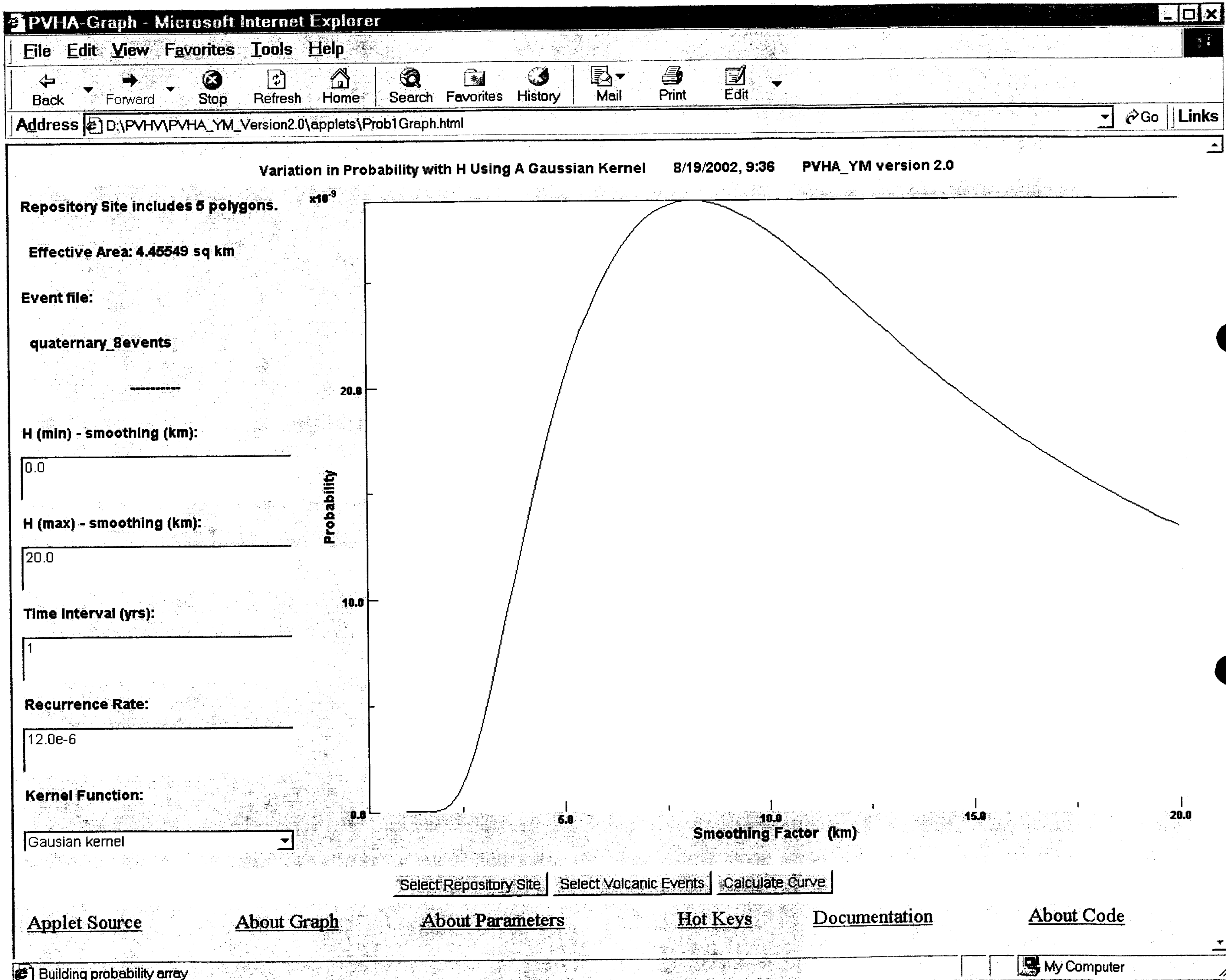

PVHA-Graph - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address D:\PVHV\PVHA_YM_Version2.0\applets\Prob1Graph.html
Go Links
Variation in Probability with H Using A Gaussian Kernel 8/19/2002, 9:36 PVHA_YM version 2.0
Repository Site includes 5 polygons.
Effective Area: 4.45549 sq km
Event file:
quaternary_8events
H (min) - smoothing (km):
0.0
H (max) - smoothing (km):
20.0
Time Interval (yrs):
1
Recurrence Rate:
12.0e-6
Kernel Function:
Gausian kernel
x10^-9
Probability
20.0
10.0
0.0
5.0
10.0
15.0
20.0
Smoothing Factor (km)
Select Repository Site
Select Volcanic Events
Calculate Curve
Applet Source
About Graph
About Parameters
Hot Keys
Documentation
About Code
Building probability array
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Figure 6