

## **PREFACE**

### **1) OVERVIEW**

The Commonwealth of Puerto Rico has been investigated over a very long period of time by earth scientists from many disciplines and with diverse objectives in the studies. This publication attempts to apply much of the geologic, geochemical, geophysical, and mineral occurrence information to a single objective focused on producing a mineral resource assessment for the Commonwealth of Puerto Rico. However, the value of this publication lies not within the results of the mineral resource assessment nor within the interactive PDF files which can be viewed on the screen, but within the geologic, geochemical, geophysical, and mineral occurrence digital map coverages and databases which can be used for their own unique applications.

The mineral resource assessment of Puerto Rico represents compilation of several decades of mineral investigations and studies. These investigations have been the joint efforts of the U.S. Geological Survey, the Puerto Rico Department of Natural Resources, and the University of Puerto Rico. This report contains not only the mineral-resource assessment, but also much of the scientific evidence upon which the assessment was based. The user may view, navigate, and print on demand any page of the Adobe Portable Document File (PDF) which is included on the CD-ROM. A search tool provided with this file also allows the user to find information anywhere in the database easily.

## 2) TITLES AND AUTHORS

**Introduction** by Sherman P. Marsh

**Acknowledgments**

**History of Previous Activities of the U.S. Geological Survey in Puerto Rico**

by Robert E. Learned

**Geology of Puerto Rico** by Richard D. Krushensky and Johannes H. Schellekens

**Geologic Map of Puerto Rico With Correlation Chart and Map Unit Descriptions**

by Richard D. Krushensky

**Associated Thematic Data for the Geologic Map of Puerto Rico** by Walter J. Bawiec

**Geologic Terranes of Puerto Rico** by Walter J. Bawiec

**Stream-Sediment Geochemistry of Puerto Rico, Isla de Vieques, and Isla de**

**Culebra** by Sherman P. Marsh

**Geophysical Maps of Puerto Rico** by Andrew Griscom and Nami E. Kitchen

**Metallic and Industrial Mineral Mines, Prospects, and Occurrences in Puerto Rico**

by W.J. Bawiec, D.P. Cox, G.E. McKelvey, M.E. Paidakovich, A. Handler,  
and J.H. Schellekens

**Mineral Resource Assessment of Puerto Rico** by W.J. Bawiec, D.P. Cox,

A. Griscom, R. Alonzo, B.R. Lipin, S.P. Marsh, G.E. McKelvey, N.J. Page, and  
J.H. Schellekens

**Mineral Deposit Summary Sheets** by W.J. Bawiec, D.C. Cox, G.E. McKelvey,

A. Griscom, and S.P. Marsh

**Quantitative Mineral Resource Assessment of Puerto Rico** by W.J. Bawiec

## **TOPICAL STUDIES**

**Gold Deposits of Puerto Rico** by G.E. McKelvey

**Distribution of Platinum-Group Elements in Nickel-Bearing Laterites in Puerto Rico** by B.R. Lipin, J.H. Schellekens, and A.L. Meier

**Offshore Sediments and Sand and Gravel Resources of the Insular Shelf of Puerto Rico** by K.M. Scanlon, J.L. Trias, R.W. Rodriguez, and C.M. Delorey

**Silt Heavy-Mineral Distributions in the Rio Cibuco system and Adjacent Rivers of North-central Puerto Rico** by L.J. Poppe, J.A. Commeau, and G. Luepke

**Side-Looking Airborne Radar Mosaic of Puerto Rico** by K.M. Scanlon

**Lignite and Peat in Northwestern Puerto Rico** by Jean N. Weaver

**Bibliography of Puerto Rico** by G.E. McKelvey

### **3) SYSTEM REQUIREMENTS**

A color display monitor is strongly recommended with all platforms.

#### Macintosh:

Mac OS 7.0 or later

Macintosh 68020-040: 2Mb of application RAM

Power Macintosh: 4.5Mb of application RAM

5 MB hard disk space

#### Windows:

386, 486, or Pentium (R) processor-based personal computer

Microsoft(R) Windows 3.1, Windows 95, Windows NT(TM) 3.5 or later

4 MB of RAM

5 MB hard disk space

#### DOS:

386- or 486-based personal computer (486 recommended)

DOS version 3.3 or later

2 MB of application RAM (4 MB recommended)

5 MB hard disk space

#### Unix:

Sun(TM) SPARCstation(R) workstation

SunOS(TM) version 4.1.3 or later, Solaris(R) 2.3 or 2.4

OpenWindows(TM) (3.0 or later) or the Motif(TM) window manager  
(version 1.2.3 or later)

32 MB of RAM

8 MB of disk space

HP Series 9000 workstation, model 700 or higher

HP-UX 9.0.3 or later

HPVUE desktop environment

32 MB of RAM

6 MB of disk space

### **4) DISC ORGANIZATION AND CONTENTS**

The computer files are stored in a variety of formats, such as Microsoft Excel 97.0, Adobe Illustrator 7.0, Microsoft Word 97.0a, Adobe Acrobat 3.0 and 4.0, and Arc/Info 7.1.1 Export. An Acrobat Reader is included on the disc that allows the user to view the Acrobat PDF files.

The following section contains brief descriptions of the files and formats on the CD-ROM and the way they can be used.

#### Text.PDF Portable Document File

There are six separate PDF files present to allow multiple files/windows to be open simultaneously. This ability allows the user to read descriptive text from the manuscript.PDF, and have maps, tables, appendices, and figures 'open and viewable' at the same time. PDF files included are:

1. Manuscript.PDF - includes all text and serves as the main body of the manuscript;
2. Graphics.PDF - includes all maps and figures referred to in Text.PDF;
3. Legends.PDF - includes all legends necessary for understanding colors and patterns used on maps. Most maps are linked to legends. (Links are obvious when a 'blue border' surrounds the map and a pointed finger icon appears.);
4. Geochem.PDF - contains all the tables and figures referred to in geochemistry text;
5. Models.PDF - includes digital copies of mineral deposit descriptive models and grade and tonnage models for deposits of Puerto Rico;
6. Appendix.PDF - includes all appendices referred to in the text. These include:
  - Appendix A. - Geologic Map Unit Descriptions
  - Appendix B. - Metallic Mineral Occurrences
  - Appendix C. - Nonmetallic Mineral Occurrences
  - Appendix D. - Geochemical Databases (dBase format)
  - Appendix E. - Complete Puerto Rico MRDS records and GSSEARCH retrieval software.

Descriptions of other computer folders found on the CD-ROM follow in alphabetical order:

Acrobat (folders) - contains Acrobat executable and 'Help' files for Windows 98 and Mac

The format used is Adobe Portable Document File (PDF), which is readable by means of the freeware program, Acrobat Reader 4.0, included on the CD-ROM.

Instructions below describe how to install Acrobat Reader, as well as launch, view, navigate, and search the Word file. (Word 97)

AML (folder) - contains copies of all aml's used to produce map coverages. Many of the map coverages are compilations and overlays of individual thematic layers, also provided on this CD-ROM. This information can be quite useful in understanding the thematic layers used and in recreating the plot file on the users own system. (Word 97)

EPS (folder) - contains Encapsulated PostScript plot files for those users who can use them. They are in an ASCII file format. These EPS files are provided to allow the user to produce their own plots or PDF files. File root names ending in 'hp' use color sets preferred by HP plotters.

EXPORT (folder) Contains all map coverages provided in ARC/INFO export format. (ARC/INFO 7.1.1)

GRA (folder) - contains GRA graphic plot files for map coverages and legends. These files

are used to produce plots on Versatec electrostatic plotters.

TIFF (folder) - Tagged Image File Format. These files, which are mostly geophysical maps, were scanned in order to provide a raster image to users.

APPENDIX D (folder) - USGS Open-File Report 92-353 text is contained in this folder as a PDF file and geochemical sample analysis as dbase format. These include sample analysis for the main island of Puerto Rico, and Culebra and Vieques.

APPENDIX E (folder) - Contains complete Puerto Rico MRDS mineral occurrence data

and GSSEARCH retrieval software. In order to execute GSSEARCH, Appendix E must be copied from the cd-rom to a hard disk and the 'RUN.BAT' file must be changed to conform to your computer system. The syntax for the 'RUN.BAT' command is:

```
GSSEARCH F:\MRDS\ PR F
```

Where F represents the hard disk to which the files were copied, and MRDS represents the name of the 'folder' to which the files were copied. After changing the 'RUN.BAT' command in a word processor, simply double clicking on 'RUN.BAT'. Do not change 'GSSEARCH' or 'PR'.

## **5) ACROBAT READER INSTALLATION**

Installation procedures vary slightly among the platforms, but,

Generically, the procedure is as follows:

1. Double click on appropriate Installation folder for your platform; follow instructions
2. Install appropriate Acrobat Reader 4.0 on your hard drive.
3. Launch Acrobat Reader and then open Manuscript.pdf file.

## **6) HINTS FOR USING ACROBAT**

The Acrobat toolbar is located along the top of the Acrobat screen. Most of the tools are self-explanatory when the cursor is placed over them. The arrow-head keys move forward and back one page at a time. The bar-arrow tools go to the first or last page in the file. The thick-arrow tool allows the user to go forward and backward to retrace previous views. This is important because most documents lack a "back" button.

The power of using the Acrobat Reader is contained in the ability to view more than one window at a time. This allows the simultaneous viewing of text, maps, tables, and legends. To insure that Acrobat Reader is configured for viewing multiple windows, go to; File, Preferences, General, and insure that 'Open Cross-Doc Links in Same Window' is not checked.

The maps, spreadsheets, legends, appendices and text files, which provide additional information, are available through 'RED' hypertext links for the MANUSCRIPT.PDF and 'BLUE' hypertext links for maps and legends. The cursor changes to a pointing hand over links. After clicking on a link, in most cases, a new figure, table, legend, or map will appear as another window. The user can accommodate this new window by using the command sequence 'Window; Tile Horizontally' However, it must be remembered that a map coverage which is hypertext linked to a text, legend, etc. (has a blue border) CANNOT use the 'zoom' button. 'Up' and 'Down' scroll arrows and the 'magnification' button at the bottom of the window must be used to zoom into a specific area.

The bookmarks in the left-hand column allow direct access to all pages. Clicking on the '+' symbols at the extreme left expand individual bookmark chapter headings into sub-headings.

In the Acrobat file, the words that include those in the maps are searchable with the binocular tool. The second and third tools from the left allow switching between bookmark and thumbnail views in the left-side scrollable area.



Owners of older computers may wish to interrupt a slow drawing map. In this situation, simply select another destination in the bookmarks. This stops the current map drawing and displays the next document. On the Macintosh, hold down the Command and period keys to interrupt the current map draw.

## **7) ACROBAT TUTORIAL**

The following Acrobat Tutorial demonstrates viewing of several types of data. The user can open the MANUSCRIPT.PDF document twice to keep these instructions available in another window, or print out this Tutorial.

Select the "MANUSCRIPT.PDF" and adjust window to fit screen.

If Bookmarks are not already visible, click on 'Show/Hide Navigation Pane', the sixth icon from the left.

Select the 'Bookmarks' tab

The chapter 'Geology of Puerto Rico' should be visible, with four subheadings below it. Click on the subheading 'Geology of Puerto Rico'. This is page 25 of 337 pages.

Click on the 'Next Page' icon four time until 'Geology of Southwestern Puerto Rico' is found.

Click on 'Geology of Southwestern Puerto Rico'. A geologic map appears in a separate window.

Select 'Window, Tile, Horizontally' to see both windows simultaneously. If you cannot see both windows, refer to previous section of this CD-ROM : 6. Hints for using Acrobat

The cursor on the geologic map appears as a 'pointed finger', indicating that the map is hypertext linked.

Click on the geologic map. A new window appears displaying Puerto Rico map units.

Select 'Window, Tile, Horizontally' to see all three windows simultaneously. These windows are Manuscript.PDF, Graphics.PDF, and Legends.PDF.

In the Legends.PDF window, select a scale of 400% to view map unit patterns and mnemonics. You can now read the manuscript text, examine the geologic map, and use the legend to identify units.

Click on Legends.PDF to view descriptions of map units.

Select 'Window, Tile, Horizontally' to view four separate windows and themes.

This example shows capabilities of this Previewing Software which can also be used with the geochemistry, geophysics, mineral occurrences, and resource assessment.

## **8) DISCLAIMER**

This Compact Disc-Read Only Memory (CD-ROM) publication was prepared by an agency of the U. S. Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed in this report, or represents that its use would not infringe privately owned rights. Reference therein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the Government or any agency thereof. Any views and opinions of the authors expressed herein do not necessarily state or reflect those of the Government or any agency thereof.

Although all data and software published on this CD-ROM have been used by the USGS, no warranty, expressed or implied, is made by that agency as to the accuracy of the data and related materials and/(or) the functioning of the software. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by the USGS in the use of these data, software, or related materials.

Graphical map depictions on this disc are intended to be used within the map scale limits applicable to the source data. Although software enables the user to show images on the disc at various scales, the user is cautioned that enlarging the maps beyond a scale of 1:100,000 is not warranted.