Micro PAVER Version 5.0

User Manual

Released 06.17.2002

Blank Page

PAVER 5.0
User Manual

US Army Corps of Engineers

Construction Engineering Research Laboratory

Dr. M.Y. Shahin, Principal Investigator

Jeffrey A. Burkhalter, System Development Specialist

Scott J. McDonald, Technical Specialist

Christina Eng, Research Assistant

Craig A. Louden, Research Assistant

Gregory A. Wilken, Research Assistant

Kurt A. Keifer, Research Assistant

http://www.cecer.army.mil

http://www.cecer.army.mil/paver/paver1.html

US Army Corps of Engineers CERL

Acknowledgments

The pavement management research and development of the PAVER system have been in progress since the early 1970's. These efforts have been sponsored and funded by several agencies. Special thanks is due to the following agencies and their representatives who supported and shared in the development efforts over the years:

- **The US Air Force**: Roy Almendarez, Jay Beam, Carl Borgwald, Don Brown, John Duvall, Jim Greene, Wayne Hudson, Charles McCarol, Ed Miller, Michael Myers, Caren Ouellete, William Peacock, Cliff Sanders, Michael Sawyer, Mark Schumaker, Mike Womack, and Charles York.

- **The US Army**: Ali Achmar, Bill Borque, Dan Boyer, Gary Cox, Mike Dean, Mike Flaherty, Ken Gregg, Jack Hinte, Bob Lubbert, Stan Nickell, Leo Price, Paul Styer, Bill Taylor, and Bob Williams.

- **The US Navy**: Greg Cline, Vince Donnally, Mel Hironaka, Charlie Schiavino, Dean Shabeldeen, and Harry Singh.

- **The Federal Aviation Administration (FAA)**: Satish Agrawal, Fred Horn, Michel Hovan, Xiaogong Lee, Aston McLaughlin, Jack Scott, and Dick Worch.

- **The Federal Highway Administration (FHWA)**: Frank Botelho, Sonya Hill, Bob Kelly, Ray McCormick, and Lewis Rodriguez.

- **The American Public Works Association (APWA)**: Jim Ewing, Christine Johnson, John MacMullen, Dennis Ross, and Dick Sullivan.

Special thanks is due to the Micro PAVER users who have participated for many years in the annual Sponsor/User Group meetings and provided significant feedback for the continuous development of the system. These members include Greg Belancio, Mike Black, Chuck Calloway, Paul Clutts, Andy Doll, Judie Greeson, Mark Justice, Sabine Lundgren, Steve McNeely, Rod Oshiro, Justin Rabidoux, Jeffrey Sabiel, Robert Vandertang, and Janpiet Verbeek.

Thanks is due to the CERL research team and University of Illinois Research Assistants who have helped with Micro PAVER over the years: Lisa Beckberger, Margaret Broten, Jeff Burkhalter, Abbas Butt, Mercedes Crovetti, Christina Eng, K. J. Feighan, Jim Hall, John Heflin, Rich Hoffman, Kurt Keifer, Charles Kemper, Starr Kohn, Ruth Lehmann, Craig Louden, Scott McDonald, Jeffrey Morton, Gary Nelson, Dixon O'brien, Mark Owens, B.J. Park, Mark Pitak, Francine Rozanski, Jeff Schmidt, Judie Simpson, Carol Subick, Chad Stock, Chao-Ming Wang, Jeanette Walther, Gregory Wilken, and Katie Zimmerman. Additional thanks are expressed to University of Illinois faculty Sam Carpenter, Tom Chen, Mike Darter, and Ahmed Sameh.

Special thanks are due to the team at Intelligent Information Technologies (IIT) for system design and programming: Arthur Baskin, Bill Nelson, Mark Brown, and Robert Reinke.

Thanks to the City of Champaign, Memphis International Airport, and the Ohio Department of Aviation for allowing us to attach their databases as examples with the release of Micro PAVER.

Finally, and on behalf of the entire PAVER group, I would like express a special thanks in the memory of John MacMullen of APWA whose support, feedback, and encouragement will be greatly missed.

M. Y. Shahin
Micro PAVER Principal Investigator
U. S. Army Corps of Engineers
ERDC-CERL

Disclaimer

This user manual is furnished by the United States Government and is accepted and used by the recipient with the express understanding that the United States Government makes no warranties, expressed or implied, concerning the accuracy, completeness, reliability, usability, or suitability of any particular purpose of the information or the data contained in this user manual or furnished in connection therewith, and the United States shall be under no liability whatsoever to any person by reason of any use thereof. The user manual belongs to the United States Government. Therefore, the recipient further agrees not to assert any proprietary rights therein or to represent this user manual to anyone as other than a United States Government user manual.

Table of Contents

Acknowledgments **4**
Disclaimer **6**
Table of Contents **7**
Required/Recommended Hardware **13**
Updating to Micro PAVER 5.0 ..... **14**
Micro PAVER v5.0 Improvements **15**
Overview **17**
Introduction to Micro PAVER 17
PAVER Organization 17
Operating Features **19**
Basic PAVER Features 19
Spreadsheet Forms 19
Index Cards 20
Tab Tables 21
Printing Screen Images 22
Units of Measurement 22
Adjusting Table and Graph Sizes 22
EMS Tools in PAVER 23
Right Button Click on Tables 23
Right Button Click on Graphs 24
EMS Query Tool 24
Using the EMS Query Tool 24
Report Viewer - Summary and Detail Options 25
View Menu - Display Specific Report Information 26
Report Viewer Tables 26
Exiting the Report Viewer 27
Database Tools **29**
Combine/Subset Database 29
Import / Export 30
5.0 Export Procedure 30
5.0 Import Procedure 31
Database Verification Tools 33
Selectors **35**
Navigating the Pavement Inventory 35
The Tree Selector 35
The Tab Selector 36
The GIS Selector 36
The Tree and GIS Selector 37

System Tables 39
Define User Fields 39
NSORT - BSORT - SSORT 39
Additional User Fields 40
Customize Table Headings and Width 40
Inventory Pick Lists 41
M&R Plan Tables 41
Localized M&R 42
Global M&R 42
Major M&R 42
M&R Cost by Condition 43
Budgets 44
Condition Tools 45
Select Condition Types 45
Define Condition and Age Categories 45
Define User Distress Indices 45
Misc. Other Tables 45
Aircraft Type 45
Materials 46
Layer Construct 46
Decimal Settings 46
Unit of Measure (Field) Settings 46
Inventory 47
Definition 47
Managing Pavement Inventory - Basic Operations 47
Creating a Network 48
Creating Branches 49
Creating Sections 50
Conditions/Families 52
EMS Image Viewer 53
Store an Image 53
Viewing Images 54
Edit an Image 54
Other Image File Options 54
Work 54
Traffic 55
NDT and Test 56
Copy and Move Data 56
Inspection 57
PCI and Distress Indices 57
Field Inspection - Basic Operations 57
Entering Inspection Dates and Samples 57
Entering Inspection Information 59
For Maximum Speed - Keyboard Only 60
Batch Inspection Data Entry 60
Calculating the PCI after Inspection 61
Other Conditions 61
Inspection Data Import (PAVER Database) 62

Inspection Schedule **63**
Inspection Schedule Report 63
Open Saved Report 64
Family Assignment **65**
Change Family Assignments 65
Reports **67**
Summary Charts 67
Standard Reports 68
Re-Inspection Report 69
Flexible Report 70
Create New Report 71
Edit Current Report 72
GIS Reports 72
Last PCI 72
General Info 73
Prediction Model **75**
Create and Maintain Prediction Models 75
Building Family Models 75
Using the Prediction Model 75
Collect Model Data 76
Review Model Data 77
Use Boundary/Outlier 77
Options 78
View Equation and Stats 78
Assign Family 79
Other Condition Prediction Model Features 79
Condition Analysis **81**
Condition Analysis Report 81
Overview 81
Configuring the Condition Analysis Report 81
Analyzing Pavements 82
Other Views 83
Open Saved Report 84
M&R **85**
M&R Plan 85
Configuring the M&R Report 85
Tab 1 - Scope 85
Tab 2 - Timing 86
Tab 3 - Plan Mode 86
Tab 4 - Policies and Costs 88
Analyzing M&R Activity 90
Summary View Section 90
Detail View Section 91
Open Saved Report 92

Add-Ins 93
PAVERGIS Interface 93
GIS Overview 93
Distinctions between CAD and GIS 93
Polygon and Arc Attribute Tables 93
Software Context 94
Acquiring Computer-Based Graphical Representations 94
Manual Digitization of Preexisting Drawings 94
Scanning Maps or Aerial Photography 94
Modifications to Geographical Representations 95
Build and Clean Operations for Digital Data 97
PAVERGIS Usage 97
First-Time PAVERGIS Setup Summary 97
Steps for Initial Setup 98
Available Data Sources (PAVER & GIS) 98
Preparation of Data 99
Updating Data 100
Exporting PAVER Data (Access/Rbase to dBase) 100
Copying PAVER dBase Data to PAT/AAT 100
Database Editors and Reporting Options 100
Options for Viewing Windows 102
Exiting PAVERGIS 102
Condition Data Import (ASCII) 102
Condition Data Import (Database) 103
Handheld Data Import 103
Micro PAVER Inspection Data Entry Using a Windows CE Handheld Device 103
Hardware/Software Requirements 103
Software Installation 103
Basic Software Operation 104
Process Overview 104
Detailed Process 105
Download Sections to Inspect 105
Inspections Using the Handheld PCI Inspector 106
Backup Inspection Data 107
Import Backup Data into PAVER 108
PAVER Shape File Converter 109
Converting from PAVER 4.x to 5.0 109
Shape File Conversion Procedure 109
Shape File Coordinate Shift 109
Appendix A 111
PAVER/GIS Map Development 111
Overview 111
Developing the CAD Drawing 112
Creating a labeled CAD map of the Coverage area through network definition 112
Terminology 112
Creating a clean CAD drawing for placement in ArcCAD© 113

Creating the Coverage Using ArcCAD© 114
Terminology 114
Defining a THEME 114
Creating the COVERAGE 115
Verify Coverage and fix errors 116
Manual creation of a link table that connects PAVERGIS with the GIS Coverage 118
Preparing the data 119
Viewing Polygon Ids with ArcVIEW© 121
Linking the Polygon IDs to the PAVER database 122
Updating the Link Table 123
Displaying pavement data using ArcVIEW© and checking for errors 124
Creating an ArcVIEW© project 124
Checking the linked Coverage for errors 124
Updating the Coverage and Database with New Information 125
Adding Features 125
Removing Features 128
Viewing Workplans and Condition Analyses in ArcVIEW© 130
Glossary 132
References 133
Appendix B 135
Inspection Information File Format (Standard and Extended Formats) 135
Appendix C-1 137
Video Inspection Import Data Format (ASCII Text) 137
Appendix C-2 141
Video Inspection Import Data Format (Access Database) 141
Appendix D 143
Abbreviations of Surface Types 143
Appendix E 145
Pavement Data Exchange (PDE) Format 145
Appendix F 151
Example Pavement Survey Forms 151
Asphalt Surfaced Roads and Parking Lots 152
Concrete Surfaced Roads and Parking Lots 153
Airfield Asphalt Pavement 154
Airfield Concrete Pavement 155
Unsurfaced Roads 156
Appendix G 157
Load & Climate Distresses 157
Asphalt Surfaced Roads and Parking Lots 157
Concrete Surfaced Roads and Parking Lots 157
Asphalt Surfaced Airfields 158
Concrete Surfaced Airfields 159
Unsurfaced Roads 159
Appendix H 161
Micro PAVER Network Installation 161
Glossary 163
Index 168

Blank Page

Required/Recommended Hardware

Required Hardware

200MHz processor

32MB RAM

Microsoft Windows 95/98/2000 or Windows NT

130MB space needed for installation

Recommended Hardware

Fastest processor available

256MB RAM

MS Windows 98

Updating to Micro PAVER 5.0

For Micro PAVER 4.x users, the conversion to Micro PAVER 5.0 is an easy procedure that can be split into a few simple tasks. These tasks include: importing e40 files into PAVER, updating GIS coverages created in PAVER 4.x, and updating some of the system tables in PAVER 5.0.

Updating the Database

The first step is to import the databases created in PAVER 4.x into PAVER 5.0. This update is done using the same Import/Export tool that was featured in previous versions of PAVER. For information on how to import the e40 files see ***5.0 Import Procedure*** on page 31.

Updating the GIS coverage

Converting PAVER 4.2 coverages to 5.0 is a simple two step process. The first step is to convert the coverage (*.cov) file to a shape file (*.shp) in ArcView. Once you have the shape file, you must use the **Shape File Converter** located under the **Add-Ins** menu in PAVER 5.0. For more information on the shape file conversion, see ***PAVER Shape File Converter*** and ***Converting from 4.x to 5.0*** on page 109.

Updating System Tables

In the conversion process between PAVER 4.x and 5.0, some of the system tables in version 4.x do not import changes into PAVER 5.0. If changes or additions were made to the tables in version 4.x you must re-enter the values. The tables that do not import are: **Materials**, **Unit of Measure (Field) Settings**, and **Inventory Pick Lists**. These tables can all be found under the Tables menu in PAVER 5.0. It is recommended that you print out the tables in PAVER 4.x to make the data re-entry process faster. For more information about the ***Inventory Pick List*** see page 41, and for more information about the ***Materials*** and ***Unit of Measure (Field) Settings*** tables see page 46. All the information is located in the ***System Tables*** chapter, pages 39-46.

Micro PAVER v5.0 Improvements

Micro PAVER 5.0 has numerous improvements over its predecessor. The first area of improvement is in the **System Tables**, which are used throughout Micro PAVER regardless of database. The second area of improvements is in the **Visual Menu** components, which, when used, are particular to specific databases. The following list outlines many of the important improvements made to the program.

System Tables

Define User Fields > **Additional User Fields**: Allows the user to define user-specific fields.

M&R Plan Tables > **Major M&R** > **Tab 5**: This is a **Priority Table** that is a function of branch use and section rank. Branch use priority and section rank priority are defined by tabs 3 and 4, respectively.

Condition Tools >

- **Define Condition And Age Categories**: This allows the user to define ranges for conditions and ages to be used in all reports including summary charts and condition analysis.
- **Select Condition Types**: The user selects conditions that will be shown throughout Paver, i.e. summary charts, condition analysis, etc…
- **Define User Distress Indices**: The user defines any distress index for any selected groups of pavements. It is important to calculate the index for all sections--this can be a long process that may take up to an hour.

Visual Menu

Selectors: Various selector functions are now available. The combination of **Tree** and **GIS** is used in the **Selection** button on the **PAVER Button Bar**. Making a selection using any of the tools is reflected throughout the system. The selection tools serve as a broadcast system.

Inventory > **Copy and Move Data**: Allows the user to move work history and inspection data among inventory items.

Inventory > Definition > 3. Section Tab > Conditions/Families: Allows user to view the condition and family assignment for any given section. This function is also available as a new tab on the Inventory\Sections tab.

Reports: There are two new options for reports.

- **Flexible Report**: Allows the user to select what columns are used in the report. Select **Create New Report** to select what columns are included in the report. To choose the columns, highlight the table from the tree with the desired columns. Then select the desired column from the left-hand-side window and move it to the right-hand-side window.
- **GIS Reports**: These provide inventory and PCI data reports.

Condition Analysis > **Condition Analysis Report**: Part of the output includes GIS views.

M&R >

- **M&R Plan**: On the **Plan Mode** tab, the user selects either **Determine Budget Consequence** (identical to Micro PAVER v4.2) or **Determine Budget Requirements** (new feature).
  - The budget requirement feature allows the user to eliminate backlog in the number of years specified for the plan. The number of years is specified under the **Timing** tab. This is used by clicking the **Backlog elimination in X years** option.
  - The budget requirement feature can also determine the budget required to maintain the current PCI or achieve a desirable PCI in the number of years for the plan. This is used by clicking the **Condition Stabilization** option.
- **Policies and Costs**
  - The user can apply localized policies in the first year as in Micro PAVER v4.2
  - Or you can simply use M&R cost by condition for all years (new). The user may select the major M&R start year and when the user selects a date for major M&R later than the plan start year, you can also select to show the backlog during the time as well. This feature is useful in determining the consequence of no major M&R for a specified time period.

There are also many reporting improvements located throughout the system. Some final things to note: For added convenience, Micro PAVER v5.0 allows the docking of windows. This is accomplished by right clicking the diamond icon on the window desired to be docked. Another added feature is on the **PCI Inspection** form. When you right click on a distress, the distress manual and a description of the distress along with images appear.