

Contents

| | |
|--|------|
| Abstract | iii |
| Acknowledgments..... | v |
| 1.0 Introduction..... | 1.1 |
| 1.1 What is Visual Sample Plan?..... | 1.1 |
| 1.2 What's New in VSP4.0? | 1.2 |
| 1.3 Installation and System Requirements..... | 1.3 |
| 1.4 Overview of VSP | 1.4 |
| 1.5 How Do I Use VSP to Provide a Defensible Sampling Plan? | 1.6 |
| 2.0 Mechanics of Running VSP..... | 2.1 |
| 2.1 Getting Started and Navigational Aids | 2.1 |
| 2.2 Setting Up a Map | 2.2 |
| 2.2.1 Importing a Site Map from a File | 2.3 |
| 2.2.2 Importing a Site Map File in the VSP Format | 2.4 |
| 2.2.3 Draw Map Using VSP Drawing Tools | 2.4 |
| 2.2.4 Working with Maps | 2.6 |
| 2.2.5 Additional Map Features | 2.7 |
| 2.3 Sample Areas in VSP..... | 2.9 |
| 2.3.1 Creating a Sample Area | 2.9 |
| 2.3.2 Selecting or Deselecting Sample Areas | 2.12 |
| 2.3.3 Deleting Selected Sample Areas..... | 2.13 |
| 2.3.4 Sample Area Parameters | 2.14 |
| 2.3.5 Extended Sample Area Topics..... | 2.17 |
| 2.4 Individual Samples (Importing, Exporting, Removing, and Labeling Them as Historical) | 2.18 |
| 2.4.1 Importing Samples | 2.19 |
| 2.4.2 Historical Samples | 2.21 |
| 2.4.3 Exporting Sampling Locations | 2.21 |
| 2.4.4 Removing Sampling Locations..... | 2.22 |
| 2.5 Rooms and Buildings in VSP | 2.22 |
| 2.5.1 Drawing a Room..... | 2.23 |
| 2.5.2 Extended Room Features | 2.28 |
| 2.6 Saving a VSP File | 2.32 |

| | |
|--|------|
| 2.7 Help..... | 2.32 |
| 2.7.1 Expert Mentor..... | 2.32 |
| 3.0 Sampling Plan Development Within VSP | 3.1 |
| 3.1 Sampling Plan Type Selection..... | 3.1 |
| 3.1.1 Defining the Purpose/Goal of Sampling | 3.1 |
| 3.1.2 Selecting a Sampling Design | 3.3 |
| 3.2 DQO Inputs and Sample Size | 3.6 |
| 3.2.1 Compare Average to a Fixed Threshold | 3.8 |
| 3.2.2 Compare Average to Reference Average..... | 3.19 |
| 3.2.3 Estimate the Mean | 3.28 |
| 3.2.4 Construct Confidence Interval on Mean | 3.36 |
| 3.2.5 Compare Proportion to Fixed Threshold | 3.37 |
| 3.2.6 Compare Proportion to Reference Proportion | 3.38 |
| 3.2.7 Estimate the Proportion | 3.38 |
| 3.2.8 Locating a Hot Spot | 3.40 |
| 3.2.9 Find UXO Target Areas..... | 3.43 |
| 3.2.10 Access Degree of Confidence in UXO Presence | 3.43 |
| 3.2.11 Non-statistical Sampling Approach | 3.43 |
| 3.2.12 Establish Boundary of Contamination | 3.44 |
| 3.2.13 Sampling Within Buildings | 3.48 |
| 4.0 Assessment of Sampling Plans | 4.1 |
| 4.1 Display of Sampling Design on the Map: MAP VIEW button or View > Map | 4.1 |
| 4.2 Display of Cost of Design..... | 4.1 |
| 4.3 Display of Performance of Design: GRAPH VIEW button or View > Graph | 4.2 |
| 4.3.1 Performance of Design for Sampling Goal: Compare Average to a Fixed Threshold | 4.2 |
| 4.3.2 Performance of Design for Sampling Goal: Construct Confidence Interval on the Mean | 4.6 |
| 4.3.3 Performance of Design for Sampling Goal: Comparing a Proportion to a Fixed Threshold | 4.7 |
| 4.3.4 Performance of Design for Sampling Goal: Compare Average to Reference Average..... | 4.8 |
| 4.3.5 Performance of Design for Sampling Goal for Hot Spot Problem | 4.10 |
| 4.3.6 Performance of Design for Sampling Goal of Compare Proportion to a Reference Proportion | 4.12 |
| 4.3.7 Performance of Design for Sampling Goal of Establish Boundary of Contamination..... | 4.12 |
| 4.4 Display of the Report..... | 4.14 |

| | | |
|-------|---|------|
| 4.5 | Display of Coordinates | 4.20 |
| 4.6 | Multiple Displays..... | 4.21 |
| 4.7 | Room View | 4.23 |
| 4.8 | 3D View | 4.23 |
| 5.0 | Extended Features of VSP | 5.1 |
| 5.1 | Tools | 5.1 |
| 5.1.1 | Largest Unsampld Spot..... | 5.1 |
| 5.1.2 | Reset Sampling Design..... | 5.2 |
| 5.1.3 | Measure Distance..... | 5.2 |
| 5.1.4 | Make Sample Labels..... | 5.3 |
| 5.1.5 | Geostatistical Analysis..... | 5.3 |
| 5.1.6 | Correlate Analytes | 5.3 |
| 5.2 | Options..... | 5.6 |
| 5.2.1 | Random Numbers | 5.6 |
| 5.2.2 | Sample Placement..... | 5.7 |
| 5.2.3 | Graph | 5.9 |
| 5.2.4 | Measurement Quality Objectives (MQOs) | 5.10 |
| 5.2.5 | Sensitivity Analysis | 5.12 |
| 5.2.6 | Coordinate Digits..... | 5.15 |
| 5.2.7 | Preferences..... | 5.15 |
| 5.3 | View Menu | 5.16 |
| 5.4 | The Cost Tab: Setting Up Sampling Costs – Inputs for the General Screen | 5.17 |
| 5.5 | Multiple Areas to be Sampled..... | 5.18 |
| 5.6 | Data Analysis..... | 5.18 |
| 5.6.1 | Data Entry | 5.21 |
| 5.6.2 | Summary Statistics | 5.21 |
| 5.6.3 | Tests..... | 5.22 |
| 5.6.4 | Plots | 5.25 |
| 5.6.5 | Analytes | 5.29 |
| 6.0 | Room Features in VSP..... | 6.1 |
| 6.1 | Room Creation and Manipulation..... | 6.1 |
| 6.1.1 | Creating a Room from a Sample Area..... | 6.1 |
| 6.1.2 | Drawing a Room..... | 6.2 |
| 6.1.3 | Room Delineation Method..... | 6.2 |
| 6.1.4 | Room Manipulation | 6.3 |

| | | |
|-------|--|------|
| 6.2 | Room Display Options..... | 6.5 |
| 6.2.1 | Current Room | 6.5 |
| 6.2.2 | Room View Types | 6.5 |
| 6.2.3 | Room North Arrow..... | 6.6 |
| 6.2.4 | Perspective Ceiling | 6.7 |
| 6.3 | Room Objects | 6.7 |
| 6.3.1 | Doors..... | 6.7 |
| 6.3.2 | Windows | 6.7 |
| 6.3.3 | Notes | 6.8 |
| 6.3.3 | Surface Overlays..... | 6.9 |
| 6.4 | Other Room Features | 6.10 |
| 6.4.1 | Surface Labels..... | 6.10 |
| 6.4.2 | Local Coordinates and Room Origin | 6.11 |
| 6.4.3 | Room Label..... | 6.12 |
| 7.0 | Unexploded Ordnance Features Within VSP..... | 7.1 |
| 7.1 | Transect Spacing Needed to Locate a UXO Target Area | 7.1 |
| 7.1.1 | Survey and Target Area Pattern..... | 7.4 |
| 7.1.2 | Transect Spacing..... | 7.5 |
| 7.1.3 | Costs | 7.12 |
| 7.2 | Locate and Mark UXO Target Areas Based on Elevated Anomaly Density | 7.13 |
| 7.2.1 | Data Entry – Importing Course-Over-Ground and Anomaly Files into VSP | 7.14 |
| 7.2.2 | Find Target Areas | 7.15 |
| 7.3 | Geostatistical Mapping of Anomaly Density..... | 7.19 |
| 7.2.1 | Basic Geostatistical Mapping | 7.19 |
| 7.2.2 | Advanced Mode Geostatistical Mapping..... | 7.21 |
| 7.2.1 | Basic Geostatistical Mapping | 7.27 |
| 7.2.2 | Delineating High-Density Areas..... | 7.31 |
| 7.4 | Assess Probability of Target Traversal Based on Actual Transect Pattern..... | 7.37 |
| 7.2 | Assess Degree of Confidence in UXO Presence | 7.38 |
| 7.2.1 | Achieve High Confidence That Few Transects Contain UXO | 7.39 |
| 7.2.2 | Achieve High Confidence That Few Anomalies areUXO..... | 7.40 |
| 8.0 | References..... | 8.1 |

Figures

| | | |
|-------|---|------|
| 1.1 | Screen Capture from VSP Using Quad Window Option (Window > Quad Window)..... | 1.6 |
| 2.1 | VSP Welcome Screen with Version Selection Menu | 2.1 |
| 2.2 | Main Menu Items (top row) and Buttons on the Toolbar (bottom row) | 2.2 |
| 2.3 | Pull-Down Menu Items Under File | 2.3 |
| 2.4 | The Millsite.dxf File Opened in VSP, showing MAP Pull-down Menu | 2.4 |
| 2.5 | Map Label Information Dialog Box | 2.6 |
| 2.6 | Background Picture (.jpeg image) Loaded into VSP as a Map, with Labels Added | 2.8 |
| 2.7a | Map with a Single Sample Map..... | 2.9 |
| 2.8 | Example of an Open Boundary with an Arrow to Show the Direction the Soil Contamination would be Expected to Move (note that the arrow points toward the “clean” side)..... | 2.12 |
| 2.9a | Map with Multiple Sample Areas Selected | 2.13 |
| 2.10 | Sample Information Dialog Box for a Sample Area..... | 2.14 |
| 2.11 | User Defined Area Parameters Dialog Box | 2.15 |
| 2.11 | User Defined Area Parameters Dialog Box with Edit List | 2.15 |
| 2.13 | Parameter List Values Dialog Box | 2.15 |
| 2.14a | User-Defined Area Parameters Dialog Box with Edit List..... | 2.16 |
| 2.14b | Dialog Box for Loading Parameter Values in VSP From an External Table | 2.16 |
| 2.15 | Sample Information Dialog Box for a Sample in Example2.VSP | 2.19 |
| 2.16 | The OneAcre.VSP Project with Sampling Locations Added from Windows Clipboard | 2.20 |
| 2.17 | Example of Sample Information Box | 2.21 |
| 2.18 | Example Sample Area with Sampling Locations | 2.22 |
| 2.19 | Example Study Area after Sampling | 2.22 |
| 2.20 | Room Information Dialog Box | 2.24 |
| 2.21 | Room with Inserted Point | 2.24 |

| | | |
|-------|---|------|
| 2.22 | Three Perspective Views of a Room..... | 2.25 |
| 2.23a | Room in Map View | 2.26 |
| 2.23b | Room in Room View | 2.27 |
| 2.24 | Door Object Displayed Using Map View..... | 2.28 |
| 2.25 | Door Room Object with Object Information Dialog Box Displayed | 2.29 |
| 2.26 | Window Room Object with Object Information Dialog Box Displayed..... | 2.30 |
| 2.27 | Dialog Box for Color Sample Areas by Value | 2.31 |
| 2.28 | Expert Mentor dialog | 2.33 |
| 2.29 | Systematic Planning dialog..... | 2.34 |
| 2.30 | Setting up VSP Sites and Maps dialog | 2.35 |
| 3.1 | Menu Options in VSP for Compare Average to Fixed Threshold..... | 3.2 |
| 3.2 | Sample Placement Tab for Ordinary Sampling for Selecting Sample Placement Method and Type | 3.4 |
| 3.3 | Judgment Sampling in VSP | 3.6 |
| 3.4 | Input Boxes for Case 1 with Original Error Rates | 3.9 |
| 3.5 | Input Boxes for Case 1 with Increased Error Rates | 3.10 |
| 3.6 | Dialog for Sequential Sampling (Standard Deviation Known) and Ten Locations Placed on the Map | 3.11 |
| 3.7 | Data Input Dialog for Sequential Probability Ratio Test and Results from First Round of Sampling. Map View is shown in background | 3.12 |
| 3.8 | Graph View of Sequential Sampling | 3.13 |
| 3.9 | Dialog Box for Collaborative Sampling and Map View of Applied CS Samples | 3.14 |
| 3.10a | Dialog Box for Entering CS Data Values and Graph View Showing where Data Values Fall on a Linear Regression Line..... | 3.16 |
| 3.10b | Dialog Box for the MARSSIM Sign Test..... | 3.17 |
| 3.10c | Input Dialog for Wilcoxon Signed Rank Test | 3.18 |
| 3.11 | Input Dialog for Case 4 with Original Error Rates | 3.19 |

| | | |
|-------|--|------|
| 3.12a | Input Boxes for Case 4 with Increased Error Rates | 3.20 |
| 3.12b | Input Dialog for Case 4 with Unequal Sample Sizes and Unequal Standard Deviations | 3.22 |
| 3.13 | Input Boxes for Case 5 Using Nonparametric Wilcoxon Rank Sum Test | 3.23 |
| 3.14 | Input Boxes for Case 6 Using Nonparametric Wilcoxon Rank Sum Test | 3.24 |
| 3.15 | Input Boxes for Case 7 Using Nonparametric Wilcoxon Rank Sum Test | 3.25 |
| 3.16a | Input Boxes for Case 8 with Larger Standard Deviation | 3.26 |
| 3.16b | Input Box for Case 9 Using the MARSSIM WRS Test | 3.27 |
| 3.17 | Dialog Box for Stratified Sampling for Estimating a Mean | 3.28 |
| 3.18 | Dialog Boxes for Ranked Set Sampling Design | 3.30 |
| 3.19 | Map of RSS Field Sample Locations for All Sets in Cycle 3, Along with RSS Toolbar | 3.31 |
| 3.20 | Map of RSS Field Sampling Locations Along with Their Labels | 3.31 |
| 3.21 | Input Dialog Box for Collaborative Sampling for Estimating the Mean | 3.32 |
| 3.22 | Map of Sample Area with Initial Samples for Adaptive Cluster Sampling Shown as Yellow Squares, Along with Dialog Box | 3.34 |
| 3.23 | Dialog Input Box for Entering Sample Measurement Values and Labels for Initial Samples in Adaptive Cluster Sampling | 3.35 |
| 3.24a | Dialog Input Box for Entering Grid Size and Follow-up Samples | 3.35 |
| 3.24b | Examples of Combinations of Initial and Follow-up Samples from Adaptive Cluster Sampling | 3.36 |
| 3.25 | Dialog Input Box for Calculating a Confidence Interval on the Mean using Ordinary Sampling | 3.37 |
| 3.26 | Design Dialog for Comparing a Proportion to a Fixed Threshold | 3.38 |
| 3.27 | Design Dialog for Comparing a Production to a Reference Proportion | 3.38 |
| 3.28 | Dialog Box for Estimating a Proportion using Stratified Sampling | 3.39 |
| 3.29 | Input Boxes for Case 9 for Locating a Hot Spot | 3.41 |
| 3.30 | Judgment Sampling with 6 Sampling Locations Added Manually | 3.43 |
| 3.31 | Judgment Sampling with Six Sampling Locations Added Manually | 3.44 |

| | | |
|-------|---|------|
| 3.32 | Dialog Box for Entering Design Inputs for Sampling an Enclosing Boundary | 3.45 |
| 3.33 | List of Default Contaminants of Concern and their Action Levels | 3.45 |
| 3.34 | An Enclosing Boundary Showing the Five Primary Sampling Locations for Each of the 17 Segments..... | 3.46 |
| 3.35 | Sample Information Box for Entering Data into VSP, Duplicate Samples Required..... | 3.47 |
| 3.36 | Enclosed Boundary with Two Bumped-Out Segments | 3.47 |
| 3.37 | Menu Structure of Options Under Sampling Goal of Sampling Within a Building | 3.49 |
| 3.38a | Dialog Input Box for Comparing Percentile of Normal Distribution to Action Level | 3.51 |
| 3.38b | Samples Placed on Floor and Ceiling Within a Room | 3.52 |
| 3.39 | Dialog Input Box for Comparing Percentile of Unknown Distribution to Action Level..... | 3.53 |
| 3.40a | Dialog Input Box for Compliance Sampling | 3.54 |
| 3.40b | Room with Samples Placed on Floor, Ceiling, Walls, and Windows..... | 3.55 |
| 3.41 | Dialog Input Box for Acceptance Sampling for $C > 0$ | 3.56 |
| 3.42 | Dialog Input Box for High Confidence No Grids Contain Contamination | 3.57 |
| 3.43 | Dialog Box for Selecting Combined Designs..... | 3.57 |
| 3.44 | Sampling Design Options in VSP for Design 1: Compare Average to a Threshold..... | 3.58 |
| 3.45 | Sampling Design Options in VSP for Design 2: Compare Individual Measurements to a Threshold | 3.58 |
| 4.1 | Display of Sampling Locations on Map | 4.1 |
| 4.2 | Decision Performance Goal Diagram for Null Hypothesis: True Mean \geq Action Level for Comparing Mean vs. Action Level..... | 4.3 |
| 4.3 | Graph of Probability of Making Correct Decision | 4.5 |
| 4.4 | Decision Performance Goal Diagram for Null Hypothesis: True Mean \leq Action Level for Comparing Mean vs. Action Level | 4.6 |
| 4.5 | Decision Performance Graph for One-Sided 95% Confidence Interval..... | 4.7 |
| 4.6 | Decision Performance Goal Diagram for Comparing a Proportion to a Fixed Threshold..... | 4.8 |

| | | |
|-------|---|------|
| 4.7 | Decision Performance Goal Diagram for Comparing a Sample Area Mean to a Reference Area Mean..... | 4.9 |
| 4.8 | Decision Performance Graph for Comparing a Sample Area Mean to a Reference Area Mean (Nonparametric Version, MARSSIM WRS) | 4.10 |
| 4.9 | Probability of Hitting a Hot Spot vs. Number of Samples..... | 4.11 |
| 4.10 | Decision Performance Goal Diagram for Comparing a Sample Area Proportion to a Reference Area Proportion | 4.13 |
| 4.11 | Curve of Trade-off Between Primary Sampling Locations and Size of Hot Spot that can be Detected | 4.13 |
| 4.12 | Report View of the Sampling Goal: Compare Average to a Fixed Threshold, Normality Assumed, Ordinary Sampling | 4.15 |
| 4.13a | Dialog Box for Changing Variables Displayed, and Range for Variables Shown, in Sensitivity Table in Report View..... | 4.16 |
| 4.13b | Sensitivity Table for Sampling Goal: Compare Average to a Fixed Threshold, Normality Assumed, Ordinary Sampling..... | 4.17 |
| 4.14 | Report View for Sampling within a Building..... | 4.18 |
| 4.15 | Report View for Sampling within a Building | 4.19 |
| 4.16 | Coordinates Display of Sampling Locations | 4.21 |
| 4.17 | Quad Display of Map, Graph, Report, and Coordinates on Same Screen | 4.22 |
| 4.18 | Combined Display of VSP Inputs and Outputs | 4.23 |
| 4.19 | 3D View with many rooms..... | 4.24 |
| 5.1 | Largest Unsampled Spot Displayed on Map | 5.2 |
| 5.2 | Information Box for Largest Circle That Would Fit Within an Unsampled Area..... | 5.2 |
| 5.3 | Information Box Showing Percentage of Circle Within the Sample Area | 5.2 |
| 5.4 | Measuring Tool in VSP | 5.3 |
| 5.5 | Dialog Box for Creating Sample Labels..... | 5.3 |
| 5.6 | Correlate Analytes dialog | 5.4 |
| 5.6 | Analyte Pair Plot..... | 5.6 |

| | | |
|-------|--|------|
| 5.8 | Menu for Selecting Type of Random Number Generator | 5.7 |
| 5.9 | Adaptive-Fill Option for Sample Placement (Shown Here with Sample Area from Millsite Map) | 5.8 |
| 5.10 | Sample Information Window Displayed When the User Right-Clicks on Selected Sample Points on Map | 5.8 |
| 5.11 | Sample Exported Text File of Sampling Locations | 5.9 |
| 5.12 | Graph Options..... | 5.9 |
| 5.13 | MQO Input Dialog Box with Default Values Displayed..... | 5.10 |
| 5.14 | MQO Input Dialog Box Showing Positive Value for Estimated Analytical Standard Deviation with 1 Analysis per Sample | 5.11 |
| 5.15 | MQO Input Dialog Showing Positive Value for Estimated Analytical Standard Deviation with Multiple Analyses per Sample | 5.12 |
| 5.16 | Cost Input Dialog Box for MQO Option | 5.12 |
| 5.17 | Display of Cost Comparison for Method A and Method B from MQO Module..... | 5.13 |
| 5.18 | MQO Method Comparison Chart | 5.13 |
| 5.19 | Sensitivity Analysis for 3 DQO Input Parameters | 5.14 |
| 5.20 | Sensitivity Analysis for 4 DQO Input Parameters | 5.15 |
| 5.21 | Preferences Available in VSP..... | 5.15 |
| 5.22 | Screen for Entering Sampling Costs for a Sampling Design – Accessed through the Cost Tab | 5.17 |
| 5.23 | Proportional Allocation of Samples to Multiple Sample Areas..... | 5.18 |
| 5.24 | Data Analysis Tab for the One-Sample t-Test, Data Entry Dialog Box | 5.20 |
| 5.25 | Summary Statistics for Data Values Entered on Data Entry Screen..... | 5.22 |
| 5.26a | Tests for Comparing the True Mean vs. Action Level | 5.23 |
| 5.26b | Tests for Making Confidence Statements on a Percentile of a Population | 5.25 |
| 5.27 | Histogram of the Data..... | 5.26 |

| | | |
|------|--|------|
| 5.28 | Box-and-Whiskers Plot..... | 5.27 |
| 5.29 | Quantile-Quantile (or Q-Q) Plot | 5.28 |
| 6.1 | Sample Area Information Dialog..... | 6.2 |
| 6.2a | Room Delineation Mode..... | 6.4 |
| 6.2b | Room Delineation Mode..... | 6.4 |
| 6.3 | Room Manipulation | 6.4 |
| 6.4 | Changing Segment Length..... | 6.4 |
| 6.5 | Current Room | 6.5 |
| 6.6 | Room View Types | 6.5 |
| 6.7 | Room North Arrows | 6.7 |
| 6.8 | Room Objects | 6.7 |
| 6.9 | Object Information Dialog Box | 6.8 |
| 6.10 | Surface Overlay Dialog | 6.9 |
| 6.11 | Surface Overlay | 6.10 |
| 6.12 | Room Surface Labels..... | 6.10 |
| 6.13 | Room Surface Labels..... | 6.11 |
| 7.1 | Survey and Target Area Pattern Tab..... | 7.5 |
| 7.2 | Transect Patterns: Parallel (left), Square (middle), and Rectangular (right)..... | 7.6 |
| 7.3 | Semi-Major Axis and Semi-Minor Axis on an Ellipse..... | 7.6 |
| 7.4 | Transect Spacing Tab for Design Objective “Ensure High Probability of Traversal and Detection” and “Transect Spacing Evaluation Range” | 7.7 |
| 7.5 | Transect Spacing Tab for Design Objective “Ensure High Probability of Traversal and Detection” and “TA Density (above background) Range” | 7.8 |
| 7.6 | Graph Options..... | 7.10 |
| 7.7 | Example of Windows Moving Along the Center Transect Shown..... | 7.10 |
| 7.8 | Power Curve with Transect Spacing as the X-Axis and Additional Curves Displayed..... | 7.11 |

| | | |
|------|---|------|
| 7.9 | Transect Spacing Tab for Design Objective “Ensure High Probability of Traversal Only” | 7.12 |
| 7.10 | Transect Spacing Tab for Design Objective “Manual Transect Spacing” | 7.13 |
| 7.11 | Costs Tab for Transect Spacing Needed to Locate a UXO Target Area | 7.14 |
| 7.12 | Data Entry Tab Found Within the “Find UXO Target Areas” Dialog and “Geostatistical Mapping of Anomaly Density” Dialog..... | 7.16 |
| 7.13 | Find Target Areas Dialog When “Flag Areas with Density Significantly > Background” Is Selected | 7.17 |
| 7.14 | Depiction of the Window Density Calculation Process Used To Identify High-Density Regions Within a Site | 7.18 |
| 7.15 | Distribution of Background Densities with Average Density of 15 ApA (anomalies per acre) and Standard Deviation of 15 ApA (top); (middle) Distribution of Target Area densities with Average Density of 50 ApA and Standard Deviation of 10 ApA; (bottom) Sample Distribution of Combined Density Distribution. The green line at 27 ApA is the point at which 99 percent of the target area densities are larger. The red line at 70 ApA is the point at which 99 percent of the background densities are smaller..... | 7.19 |
| 7.16 | “Geostatistical Mapping of Anomaly Density” Dialog. This view shows the basic mode without the advanced operations screen box displayed. | 7.21 |
| 7.17 | Advanced Mode for Geostatistical Anomaly Density Mapping..... | 7.23 |
| 7.18 | Aspects of the GAM/GAMV Interface Screen..... | 7.24 |
| 7.19 | Variogram Fitting Screen from the GAM/GAMV Window. Dots show computed variogram values, and the solid green line shows the model fitted to variogram values. Parameters for this model are listed along the left side of the window..... | 7.24 |
| 7.20 | Variogram Model Parameters Settings Within the GAM/GAMV Graphical Interface..... | 7.26 |
| 7.21 | Effects of Changing Sill and Range Values for Variogram Model. Left column of plots shows effects of altering range value; right column shows effects of altering sill value. In each plot, dots represent empirical variogram values, and the green line shows model variogram..... | 7.27 |
| 7.22 | KT3D Interface Screen | 7.28 |
| 7.23 | Results of Kriging Estimation Displayed in VSP | 7.29 |
| 7.24 | Results of Kriging Estimation Displayed in VSP Along with Course-over-Ground Traces and Anomaly Locations. | 7.30 |

| | | |
|------|---|------|
| 7.25 | Kriging Results Displayed in VSP Using an Alternative Color Scheme..... | 7.31 |
| 7.26 | Kriging Variance Displayed in VSP Along with Course-over-Ground Traces. The highest variance values are shown in red, the lowest values in green..... | 7.33 |
| 7.27 | Anomaly Density Display for the Pueblo Precision Bombing Range WAA Site Resulting from Selection of a Too-Low Critical Density Cutoff Level. Areas of highest anomaly density are shown in red; lowest-density areas are shown in green. Gray indicates areas in which the anomaly density is below the critical density | 7.34 |
| 7.28 | Anomaly Density Display for the Pueblo Precision Bombing Range WAA Site Resulting from Selection of a Too-High Critical Density Cutoff Level. Areas of highest anomaly density are shown in red; the lowest-density areas are shown in green. Gray indicates areas in which the anomaly density is below the critical density | 7.36 |
| 7.29 | Anomaly Density Display for the Pueblo Precision Bombing Range WAA Site Resulting from Selection of an Appropriate Critical Density Cutoff Level. Areas of highest anomaly density are shown in red; green indicates lowest-density areas. Gray indicates areas in which the anomaly density is below the critical density | 7.37 |
| 7.30 | “Post-Survey Probability of Traversal” Dialog Used To Assess the Probability of Traversal Based on the Actual Transect Survey. This dialog has the “Detection Simulation” tab (left) and the “Target Zone” tab (right) | 7.38 |
| 7.31 | Example of the Map View After Clicking on the “Simulate” Button on the “Detection Simulation” Tab of the “Post-Survey Probability of Traversal” Dialog..... | 7.39 |
| 7.32 | Dialog Input Box for Compliance Sampling for UXO and Map of Sample Area with Transects Selected..... | 7.41 |
| 7.33 | Dialog Input Box for Anomaly Sampling for UXO and Map of Sample Area with Anomalies Selected..... | 7.42 |

Tables

| | | |
|-----|--|------|
| 1.1 | List of Sampling Goals | 1.1 |
| 4.1 | Interactive Graph Features | 4.4 |
| 4.2 | Graph Options Menu Commands | 4.4 |
| 4.3 | Window Menu Commands | 4.22 |
| 5.1 | Preferences Menu Items..... | 5.16 |
| 7.1 | Variables That Can Be Adjusted in the “Transect Spacing Needed to Locate a UXO Target Area” Design Dialog with Selected Additional Information About the Variable and If the Variable Is Used in One of the Three Transect Design Methods..... | 7.2 |
| 7.2 | Example of ASCII Files That Can Be Imported into VSP for the Course-Over-Ground Transect Data and the Associated Anomaly Location Data..... | 7.13 |