

# Contents

Abstract .....	iii
Acknowledgments.....	vi
1.0 Introduction.....	1.1
1.1 What is Visual Sample Plan?.....	1.1
1.2 Installation and System Requirements.....	1.2
1.3 Overview of VSP.....	1.3
1.4 How Do I Use VSP to Provide a Defensible Sampling Plan? .....	1.5
1.5 What’s New in VSP 6.0? .....	1.5
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 .....	2.5
2.2.5 Additional Map Features .....	2.7
2.3 Sample Areas in VSP.....	2.8
2.3.1 Creating a Sample Area .....	2.8
2.3.2 Selecting or Deselecting Sample Areas .....	2.12
2.3.3 Deleting Selected Sample Areas .....	2.12
2.3.4 Sample Area Parameters .....	2.13
2.3.5 Extended Sample Area Topics.....	2.15
2.4 Map Layers and Properties in VSP.....	2.16
2.4.1 Map Lines .....	2.17
2.4.2 Sample Areas .....	2.17
2.4.3 View Settings.....	2.18
2.4.4 Properties Bar .....	2.18
2.5 Individual Samples (Importing, Exporting, Removing, and Labeling Them as Historical) .....	2.19
2.5.1 Data Entry Sub-Page.....	2.20
2.5.2 Other Ways of Importing Samples .....	2.25
2.5.3 Historical Samples .....	2.27
2.5.4 Another Way of Exporting Sampling Locations.....	2.27

2.5.5	Removing Sampling Locations.....	2.27
2.5	Rooms and Buildings in VSP .....	2.28
2.6.1	Drawing a Room.....	2.29
2.6.2	Extended Room Features .....	2.33
2.6.3	Extended Room Features .....	2.34
2.6.4	Furniture and Stairs.....	2.39
2.7	Surface Overlays.....	2.47
2.8	Saving a VSP File .....	2.47
2.9	Help.....	2.47
2.9.1	Expert Mentor.....	2.48
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 .....	3.4
3.2	DQO Inputs and Sample Size .....	3.8
3.2.1	Compare Average to a Fixed Threshold .....	3.9
3.2.2	Compare Average to Reference Average.....	3.19
3.2.3	Estimate the Mean .....	3.26
3.2.4	Construct Confidence Interval on Mean .....	3.36
3.2.5	Locating a Hot Spot .....	3.38
3.2.6	Show That At Least Some High % of the Sampling Area is Acceptable .....	3.41
3.2.7	Discover Unacceptable Areas With High Confidence.....	3.48
3.2.8	Combined Average and Individual Measurement Criteria .....	3.50
3.2.9	Detecting a Trend.....	3.50
3.2.10	Identify Sampling Redundancy.....	3.54
3.2.11	Add Sampling Locations .....	3.66
3.2.12	Compare Proportion to Fixed Threshold .....	3.67
3.2.13	Compare Proportion to Reference Proportion .....	3.68
3.2.14	Construct Confidence Interval on Proportion .....	3.68
3.2.15	Estimate the Proportion .....	3.70
3.2.16	Establish Boundary of Contamination .....	3.70
3.2.17	UXO Guide.....	3.74
3.2.18	Find UXO Target Areas.....	3.74
3.2.19	Post Remediation Verification Sampling.....	3.74
3.2.20	Remedial Investigation .....	3.74
3.2.21	Sampling Within Buildings .....	3.75
3.2.22	Radiological Transect Surveying.....	3.76
3.2.23	Item Sampling.....	3.77
3.2.24	Non-statistical Sampling Approach .....	3.77

3.2.25 Last Design .....	3.78
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.....	4.2
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 .....	4.11
4.3.7 Performance of Design for Sampling Goal of Establish Boundary of Contamination.....	4.13
4.4 Display of the Report.....	4.14
4.5 Display of Coordinates .....	4.21
4.6 Multiple Displays.....	4.22
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.....	5.3
5.1.3 Measure Distance.....	5.3
5.1.4 Make Sample Labels.....	5.3
5.1.4 Make Transect Labels.....	5.4
5.1.6 Analyze Data.....	5.4
5.1.7 Geostatistical Analysis.....	5.5
5.1.8 Correlate Analytes .....	5.5
5.1.9 Group Comparison / ANOVA .....	5.7
5.2 Options.....	5.10
5.2.1 Random Numbers .....	5.10

5.2.2	Sample Placement.....	5.11
5.2.3	Graph .....	5.13
5.2.4	Measurement Quality Objectives (MQOs) .....	5.14
5.2.5	Sensitivity Analysis .....	5.18
5.2.6	Coordinate Digits .....	5.20
5.2.7	Waypoint Distance.....	5.20
5.2.8	Preferences.....	5.20
5.3	View Menu .....	5.22
5.4	The Cost Tab: Setting Up Sampling Costs – Inputs for the General Screen .....	5.23
5.5	Multiple Areas to be Sampled.....	5.24
5.6	Data Analysis .....	5.24
5.6.1	Data Entry .....	5.26
5.6.2	Summary Statistics .....	5.26
5.6.3	Tests .....	5.27
5.6.4	Plots .....	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
6.3.4	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 Target Areas .....	7.1

7.1.1	Survey and Target Area Pattern .....	7.3
7.1.2	Transect Spacing .....	7.5
7.1.3	Costs .....	7.11
7.2	Create Transects to Augment Previous UXO Surveys .....	7.12
7.3	Locate and Mark UXO Target Areas Based on Elevated Anomaly Density .....	7.16
7.3.1	Data Entry – Importing Course-Over-Ground and Anomaly Files into VSP .....	7.17
7.3.2	Find Target Areas .....	7.18
7.4	Geostatistical Mapping of Anomaly Density .....	7.22
7.4.1	Basic Geostatistical Mapping .....	7.23
7.4.2	Advanced Mode Geostatistical Mapping .....	7.24
7.4.3	Display of Kriging Results Within VSP .....	7.30
7.5	Delineating High-Density Areas .....	7.37
7.5.1	Basic Geostatistical Mapping .....	7.38
7.5.2	Delineation from Geostatistical Estimation of Anomaly Density Results .....	7.40
7.5.3	Plotting Results from Delineation.....	7.41
7.6	Assess Probability of Target Traversal Based on Actual Transect Pattern.....	7.42
7.7	Analyze 100% Survey of Sample Areas .....	7.44
7.8	Post Remediation Verification Sampling.....	7.45
7.8.1	Achieve High Confidence That Few Transects Contain UXO .....	7.46
7.8.2	Achieve High Confidence That Few Anomalies are UXO.....	7.47
7.9	Remedial Investigation .....	7.47
7.10	UXO Guide .....	7.50
8.0	References.....	8.1

# Figures

1.1	Screen Capture from VSP Using Quad Window Option (Window > Quad Window).....	1.4
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 .....	2.2
2.4	The Millsite.dxf File Opened in VSP, showing MAP Pull-down Menu .....	2.3
2.5	Map Label Information Dialog Box .....	2.5
2.6	Background Picture (.jpeg image) Loaded into VSP as a Map, with Labels Added .....	2.8
2.7	Color Dialog Box .....	2.9
2.8	Define New Sample Area .....	2.10
2.9	Map with a Single Sample Area .....	2.10
2.10	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).....	2.11
2.11	Select/Deselect Sample Areas .....	2.11
2.12	Map with Multiple Sample Areas Selected .....	2.12
2.13	Information Dialog Box for a Sample Area.....	2.13
2.14	User Defined Area Parameters Dialog Box .....	2.14
2.15	User Defined Area Parameters Dialog Box with Edit List .....	2.14
2.16	Parameter List Values Dialog Box .....	2.14
2.17	Set Parameters Dialog Box .....	2.15
2.18	Dialog Box for Loading Parameter Values in VSP From an External Table .....	2.15
2.19	Layer Control Bar .....	2.16
2.20	Map Lines .....	2.17
2.21	Sample Areas .....	2.17
2.22	Map Lines .....	2.17

2.23	View Settings.....	2.18
2.24	Properties Bar .....	2.18
2.25	Sample Information Dialog Box for a Sample in Example2.VSP.....	2.20
2.26	Data Entry Sub-Page.....	2.20
2.27	Columns Setup.....	2.21
2.28	Spreadsheet Data Pasted Into VSP .....	2.22
2.29	Column Names to Select From.....	2.23
2.30	Analyte Data in Multiple Columns .....	2.23
2.31	Enter Analyte Name .....	2.24
2.32	Import Data File.....	2.24
2.33	Manual Data Entry.....	2.24
2.34	The OneAcre.VSP Project with Sampling Locations Added from Windows Clipboard .....	2.26
2.35	Example of Sample Information Box .....	2.26
2.36	Example Sample Area with Sampling Locations .....	2.28
2.37	Example Study Area after Sampling .....	2.28
2.38	Sample Area Information Dialog Box for a Room .....	2.30
2.39	Room with Inserted Point .....	2.30
2.40	Three Perspective Views of a Room.....	2.31
2.41	Room in Map View .....	2.32
2.42	Room in Room View .....	2.33
2.43	Room Drawing Guide.....	2.33
2.44	Door Object Displayed Using Map View.....	2.35
2.45	Door Room Object with Object Information Dialog Box Displayed .....	2.36
2.46	Window Room Object with Object Information Dialog Box Displayed.....	2.37
2.47	Dialog Box for Color Sample Areas by Value .....	2.38

2.48	Furniture Editor .....	2.40
2.49	Example of Two Objects in Extrude Tool .....	2.42
2.50	Natural View.....	2.42
2.51	Continuation of Extrude Tool Example.....	2.43
2.52	Natural View of Two Objects Extruded Together .....	2.44
2.53	One object selected in Extrude Tool.....	2.45
2.54	Natural View of One Object in Extrude Tool.....	2.45
2.55	Edit Surface Types Dialog in VSP .....	2.47
2.56	Expert Mentor dialog.....	2.49
2.57	Systematic Planning dialog.....	2.50
2.58	Setting up VSP Sites and Maps dialog .....	2.51
2.59	Systematic Planning First Screen .....	2.52
2.60	Systematic Planning First Screen .....	2.53
3.1	Dialog in VSP for Compare Average to Fixed Threshold.....	3.3
3.2	Sample Placement for Ordinary Sampling for Selecting Sample Placement Method and Type.....	3.5
3.3	Judgment Sampling in VSP .....	3.7
3.4	Input Boxes for Case 1 with Original Error Rates .....	3.10
3.5	Input Boxes for Case 1 with Increased Error Rates .....	3.11
3.6	Dialog for Sequential Sampling (Standard Deviation Known) and Ten Locations Placed on the Map .....	3.12
3.7	Data Input Dialog for Sequential Probability Ratio Test and Results from First Round of Sampling. Map View is shown in background .....	3.13
3.8	Graph View of Sequential Sampling .....	3.14
3.9	Dialog Box for Collaborative Sampling and Map View of Applied CS Samples .....	3.15
3.10	Dialog Box for Entering CS Data Values and Graph View Showing where Data Values Fall on a Linear Regression Line.....	3.16



3.11	Dialog Box for the MARSSIM Sign Test.....	3.17
3.12	Input Dialog for Wilcoxon Signed Rank Test .....	3.18
3.13	Input Dialog for Case 4 with Original Error Rates .....	3.20
3.14	Input Boxes for Case 4 with Increased Error Rates .....	3.21
3.15	Input Dialog for Case 4 with Unequal Sample Sizes and Unequal Standard Deviations .....	3.22
3.16	Input Boxes for Case 5 Using Nonparametric Wilcoxon Rank Sum Test.....	3.23
3.17	Input Boxes for Case 6 Using Nonparametric Wilcoxon Rank Sum Test.....	3.24
3.18	Input Boxes for Case 7 Using Nonparametric Wilcoxon Rank Sum Test.....	3.25
3.19	Input Boxes for Case 8 with Larger Standard Deviation .....	3.26
3.20	Dialog Box for Stratified Sampling for Estimating a Mean .....	3.27
3.21	Sample Placement for Stratified Sampling for Estimating a Mean .....	3.28
3.22	Dialog Boxes for Ranked Set Sampling Design .....	3.30
3.23	Map of RSS Field Sample Locations for All Sets in Cycle 3, Along with RSS Toolbar .....	3.30
3.24	Map of RSS Field Sampling Locations Along with Their Labels .....	3.31
3.25	Input Dialog Box for Collaborative Sampling for Estimating the Mean .....	3.32
3.26	Map of Sample Area with Initial Samples for Adaptive Cluster Sampling Shown as Yellow Squares, Along with Dialog Box .....	3.33
3.27	Dialog Input Box for Entering Sample Measurement Values and Labels for Initial Samples in Adaptive Cluster Sampling.....	3.34
3.28	Dialog Input Box for Entering Grid Size and Follow-up Samples .....	3.35
3.29	Examples of Combinations of Initial and Follow-up Samples from Adaptive Cluster Sampling .....	3.35
3.30	Dialog Input Box for Calculating a Confidence Interval on the Mean using Ordinary Sampling .....	3.36
3.31	Dialog Input Box for Calculating a Non-Parametric Confidence Interval on the Mean using Ordinary Sampling .....	3.37
3.32	Input Boxes for Case 9 for Locating a Hot Spot.....	3.40

3.33	Parameter Inputs for Case 10.....	3.42
3.34	Parameter Inputs for Case 11.....	3.43
3.35	Parameter Inputs for Case 12.....	3.44
3.36	Dialog Input Box for Comparing Percentile of Normal Distribution to Action Level .....	3.46
3.37	Samples Placed on Floor and Ceiling Within a Room .....	3.47
3.38	Dialog Input Box for Comparing Percentile of Unknown Distribution to Action Level.....	3.48
3.39	Samples Placed on Floor and Ceiling Within a Room .....	3.49
3.40	Sampling Design Options in VSP for Design 2: Compare Individual Measurements to a Threshold .....	3.50
3.41	Mann Kendall Design Dialog .....	3.51
3.42	Data Analysis for Seasonal Kendall Test .....	3.52
3.43	Time Vs. Data Plot in VSP .....	3.53
3.44	Variogram Example.....	3.56
3.45	Semivariogram and Fitted Model and VSP .....	3.57
3.46	Kriging Options .....	3.59
3.47	Redundant Well Analysis .....	3.60
3.48	Analyze Wells for Temporal Redundancy Dialog.....	3.63
3.49	View of Smoothed Curve Fit to a Well's Data.....	3.64
3.50	Add Sampling Locations .....	3.67
3.51	Design Dialog for Comparing a Proportion to a Fixed Threshold.....	3.68
3.52	Design Dialog for Comparing a Production to a Reference Proportion .....	3.68
3.53	Construct Confidence Interval on a Proportion .....	3.69
3.54	Construct Confidence Interval on a Proportion .....	3.70
3.55	Dialog Box for Entering Design Inputs for Sampling an Enclosing Boundary .....	3.71
3.56	List of Default Contaminants of Concern and their Action Levels .....	3.72

3.57	An Enclosing Boundary Showing the Five Primary Sampling Locations for Each of the 17 Segments.....	3.72
3.58	Sample Information Box for Entering Data into VSP, Duplicate Samples Required.....	3.73
3.59	Enclosed Boundary with Two Bumped-Out Segments .....	3.74
3.60	Example of Item Sampling .....	3.77
3.61	Judgment Sampling with Six Sampling Locations Added Manually .....	3.78
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 .....	4.12
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.....	4.16
4.13	Dialog Box for Changing Variables Displayed, and Range for Variables Shown, in Sensitivity Table in Report View.....	4.17
4.14	Sensitivity Table for Sampling Goal: Compare Average to a Fixed Threshold, Normality Assumed, Ordinary Sampling.....	4.18
4.15	Report View for Sampling within a Building .....	4.19

4.16	Report View for Sampling within a Building .....	4.20
4.17	Coordinates Display of Sampling Locations .....	4.21
4.18	Quad Display of Map, Graph, Report, and Coordinates on Same Screen .....	4.22
4.19	Combined Display of VSP Inputs and Outputs .....	4.23
4.20	3D View with many rooms.....	4.24
5.1	Largest Unsampled Spot Displayed on Map .....	5.2
5.2	Information Box Showing Percentage of Circle Within the Sample Area .....	5.2
5.3	Measuring Tool in VSP .....	5.3
5.4	Dialog Box for Creating Sample Labels.....	5.3
5.5	Make Transect Labels.....	5.4
5.6	Correlate Analytes dialog .....	5.5
5.7	Analyte Pair Plot.....	5.7
5.8	Group Comparison / ANOVA dialog .....	5.8
5.9	Control Chart Example .....	5.9
5.10	Interpolated Spatial Maps .....	5.10
5.11	Menu for Selecting Type of Random Number Generator .....	5.11
5.12	Adaptive-Fill Option for Sample Placement (Shown Here with Sample Area from Millsite Map) .....	5.12
5.13	Sample Information Window Displayed When the User Right-Clicks on Selected Sample Points on Map .....	5.12
5.14	Sample Exported Text File of Sampling Locations.....	5.14
5.15	Graph Options.....	5.13
5.16	MQO Input Dialog Box with Default Values Displayed.....	5.14
5.17	MQO Input Dialog Box Showing Positive Value for Estimated Analytical Standard Deviation with 1 Analysis per Sample .....	5.15
5.18	MQO Input Dialog Showing Positive Value for Estimated Analytical Standard Deviation with Multiple Analyses per Sample .....	5.16

5.19	Cost Input Dialog Box for MQO Option .....	5.17
5.20	Display of Cost Comparison for Method A and Method B from MQO Module.....	5.17
5.21	MQO Method Comparison Chart .....	5.18
5.22	Sensitivity Analysis for 3 DQO Input Parameters .....	5.19
5.23	Sensitivity Analysis for 4 DQO Input Parameters .....	5.20
5.24	Preferences Available in VSP.....	5.21
5.25	Screen for Entering Sampling Costs for a Sampling Design – Accessed through the Cost Tab .....	5.23
5.26	Proportional Allocation of Samples to Multiple Sample Areas.....	5.24
5.27	Data Analysis Tab for the One-Sample t-Test, Data Entry Dialog Box .....	5.25
5.28	Summary Statistics for Data Values Entered on Data Entry Screen.....	5.27
5.29a	Tests for Comparing the True Mean vs. Action Level .....	5.28
5.29b	Tests for Making Confidence Statements on a Percentile of a Population .....	5.29
5.30	Histogram of the Data.....	5.30
5.31	Box-and-Whiskers Plot.....	5.31
5.32	Quantile-Quantile (or Q-Q) Plot .....	5.32
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.....	7.3
7.2	Transect Patterns: Parallel (left), Square (middle), and Rectangular (right).....	7.4
7.3	Semi-Major Axis and Semi-Minor Axis on an Ellipse.....	7.4
7.4	Having VSP Calculate the Size/Shape of the Target Area .....	7.5
7.5	Transect Spacing Tab for Design Objective “Ensure High Probability of Traversal and Detection” and “Transect Spacing Evaluation Range” .....	7.5
7.6	Transect Spacing Tab for Design Objective “Ensure High Probability of Traversal and Detection” and “TA Density (above background) Range” .....	7.6
7.7	Graph Options.....	7.8
7.8	Example of Windows Moving Along the Center Transect Shown.....	7.8
7.9	Power Curve with Transect Spacing as the X-Axis and Additional Curves Displayed.....	7.9
7.10	Transect Spacing Tab for Design Objective “Ensure High Probability of Traversal Only” .....	7.10
7.11	Transect Spacing Tab for Design Objective “Manual Transect Spacing” .....	7.11
7.12	Costs Tab for Transect Spacing Needed to Locate a UXO Target Area .....	7.12
7.13	Example Site that Contains Surveys Along Existing Roads and Paths .....	7.13
7.14	Survey & Target Area Pattern Tab .....	7.14
7.15	Gaps Left by Putting a Buffer Around the Existing Paths.....	7.15
7.16	Parallel Transects Placed on the Gaps, Connected Together and Attached to Existing Paths.....	7.16
7.17	Data Entry Tab Found Within the “Find UXO Target Areas” Dialog and “Geostatistical Mapping of Anomaly Density” Dialog.....	7.18

7.18	Find Target Areas tab when “Flag Areas with Density Significantly > critical density” is selected (left) and the results from using the “Window Size Sensitivity” dialog (right) that appears when pressing the button Help me choose window size. ....	7.19
7.19	Depiction of the Window Density Calculation Process Used To Identify High-Density Regions Within a Site .....	7.20
7.20	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.....	7.21
7.21	“Geostatistical Mapping of Anomaly Density” Dialog. This view shows the basic mode without the advanced operations screen box displayed. ....	7.23
7.22	Advanced Mode for Geostatistical Anomaly Density Mapping.....	7.25
7.23	Aspects of the GAM/GAMV Interface Screen.....	7.26
7.24	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.....	7.26
7.25	Variogram Model Parameters Settings Within the GAM/GAMV Graphical Interface.....	7.28
7.26	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.....	7.29
7.27	KT3D Interface Screen.....	7.30
7.28	Results of Kriging Estimation Displayed in VSP.....	7.31
7.29	Results of Kriging Estimation Displayed in VSP Along with Course-over-Ground Traces and Anomaly Locations. ....	7.33
7.30	Kriging Results Displayed in VSP Using an Alternative Color Scheme.....	7.34
7.31	Kriging Variance Displayed in VSP Along with Course-over-Ground Traces. The highest variance values are shown in red, the lowest values in green.....	7.36
7.32	Delineation Window.....	7.37
7.33	Target area delineation parameters .....	7.38

7.34	Results from high density area delineation tool.....	7.39
7.35	Delineated target areas shown in map view.....	7.39
7.36	Parameters for target area delineation using geostatistical anomaly density estimates .....	7.41
7.37	Box and whisker plot showing result from target area delineation.....	7.42
7.38	“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) .....	7.43
7.39	Example of the Map View After Clicking on the “Simulate” Button on the “Detection Simulation” Tab of the “Post-Survey Probability of Traversal” Dialog.....	7.43
7.40	Data Entry for Anomaly Data.....	7.44
7.41	Anomaly Density Map.....	7.45
7.42	Dialog Input Box for Verification Sampling of TOI for the <i>Transect Verification Sampling</i> (left) and <i>Transect Placement</i> (right) tabs. ....	7.46
7.43	Dialog Input Box for Anomaly Sampling for UXO and Map of Sample Area with Anomalies Selected.....	7.47
7.44	Remedial Investigation (UXO) Dialogue .....	7.48
7.45	Remedial Investigation Target of Interest (TOI) Estimation / Comparison .....	7.49
7.46	Presumptively Clean Site.....	7.50
7.47	UXO Guide.....	7.51



## 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.....	5.21
5.2	View Menu Items .....	5.22
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.....	7.17
7.3	Plotting options .....	7.41