
Contents

Preface.....	xi
Acknowledgments	xv
Author	xvii
1. General Overview of GIS	1
What Is GIS?	1
GIS Data.....	2
Freeware/Shareware Metadata Tools	4
Commercial Metadata Tools.....	5
Coordinate Systems and Projections	10
Spatial Data and Metadata Standards and Relevant Guidelines.....	18
GIS History	18
Major GIS Software Products.....	27
Major Open-Source GIS Software Products.....	27
Major Commercial GIS Software Vendors and Products.....	45
GIS Technology Widely Used in Environmental and Earth Sciences....	47
2. Collecting Field Data More Efficiently with GIS and GPS	
Technologies	57
Trimble GPS Pathfinder Office and TerraSync Software Packages	57
Garmin Handheld GPS Navigators and GPS Utility Software.....	60
ESRI ArcPad Software.....	61
Case Study 2.1: Field Data Collecting, Processing and Mapping for Former Camp Sibert	66
Case Study 2.2: Data Collecting, Processing, Managing and Mapping for Three Large-Scale Regional and Nationwide MMRP Site Inspections (SI) Related Projects (Total: 1063 Sites)	72
Project 1: FUDS MMRP Site Inspections (SI), SE and SW Regions (Total: 625 Sites)	74
Project 2: U.S. Army National Guard Bureau NDNODS Site Inspections (SI), Eastern Region (247 Sites)	75
Project 3: Nationwide Chemical Warfare Materiel (CWM) Scoping and Security Study (Total: 91 Sites)	77
Case Study 2.3: Locating and Destroying Final Two Caches of Chemical Weapons in Libya.....	86
3. Processing and Analyzing Data to Extract Useful and Meaningful Information.....	91
Case Study 3.1: Statistically Analyzing Existing Geophysical Survey Data to Predict Possible Anomalies in Adjacent Unknown Areas	92

Case Studies 3.2, 3.3, 3.4, 3.5: Analyzing Recent, Historical Aerial Photos/Drawings and LiDAR to Identify and Delineate Environmentally Impacted Areas	96
Case Study 3.2: Recent Aerial Photo Analysis	96
Case Study 3.3 (Site 2A of Former Camp Sibert) and 3.4 (Tanapag Fuel Farm): Analyzing Historical Aerial Photos and Drawings	98
Case Study 3.5: Analyzing High-Resolution LiDAR Data	102
Case Study 3.6: Topographic Slope Analysis	103
Case Study 3.7: Geophysical Anomaly Density Analysis	107
Case Study 3.8: Chemical Concentration Analysis	113
Case Study 3.9: Analyzing Groundwater Elevations and Flow Directions with GIS	116
Case Study 3.10: Virgin Islands National Park General Management Plan/Environmental Impact Statement	121
Alternative A	125
Alternative B	131
4. Mapping and Analyzing Geology Data with GIS	133
Case Study 4.1: Geologic Mapping	133
Case Study 4.2: Creating 3D Maps and Studying Them with Virtual Reality (VR) Technology	144
Case Study 4.3: Processing and Mapping Geologic Data More Efficiently with GIS	147
5. Data Modeling and Visualization	151
EquiS	152
Groundwater Modeling System (GMS)	154
Environmental Visualization System (EVS Pro)	157
RockWorks	159
Case Study 5.1: Modeling and Visualizing a Contaminated Groundwater Plume in NASB	161
Case Study 5.2: Modeling and Visualizing a Contaminated Groundwater Plume at an Industrial Site in Bloomfield, Connecticut	172
Case Study 5.3: Modeling and Visualizing the Contaminated Soil at Site 2A, Inside the Former Camp Sibert	182
Case Study 5.4: Modeling and Visualizing the Contaminated Soil in Bronx Criminal Court Complex, New York City	189
Other Data Displaying and Visualizing Techniques	203
Using Tags, Pie Charts, and Color-Shaded Contours to Display Chemical and Geologic Data	203
Linking Pictures, Water Well Diagrams, Geologic Cross Sections, Graphics and Other Information to Spatial Features in a GIS Map	209

6. Sharing GIS Data and Maps through the Internet.....	215
Examples of Some Popular Geospatial Data and Mapping Websites and FTP Sites of the UN, EU, National and Local Government Agencies, Industries and Institutions.....	216
Case Study 6.1: A GIS Web-Based Application Developed for the Environmental Investigations at the Former Camp Sibert.....	223
Commonly Used Acronyms in GIS and Environmental Science	233
Bibliography.....	243
Index	245