Spatial and Temporal Tracking of Insurgency Activities with a GIS

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Background and Motivation

- Using a GIS for Modeling Iraqi Insurgency
- Statistical modeling to predict insurgency by reviewing current insurgency trends in Iraq
- Characterizing the Influence of Geography and Terrain on Behavioral Activities Associated with Insurgency in Iraq

Presentation Outline

- Problem Definition
- Significance of GIS Modeling
- Tools
  - Why the current tool
- Methodology
  - Analysis
  - Data Sets
  - Design
  - Examples
- Conclusions/Recommendations
- Future Work

Problem Definition

- How does the geography, terrain, complex urban infrastructure, and population density affect insurgent behavior and their decision-making process?
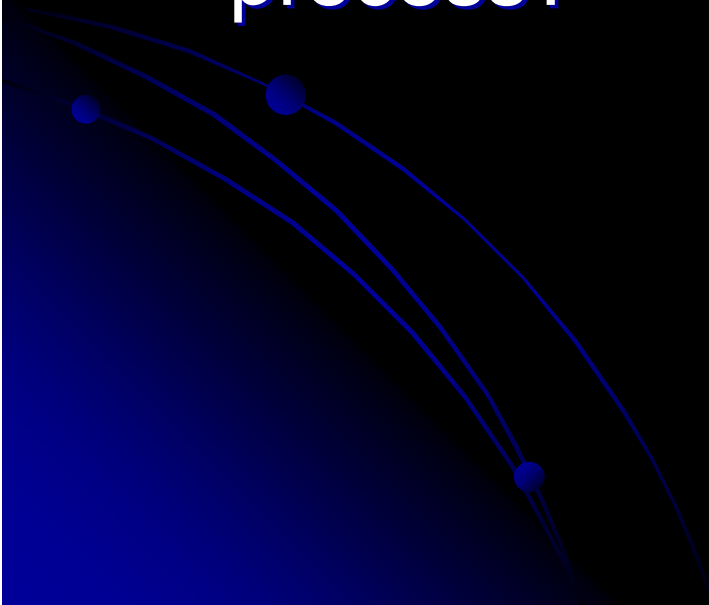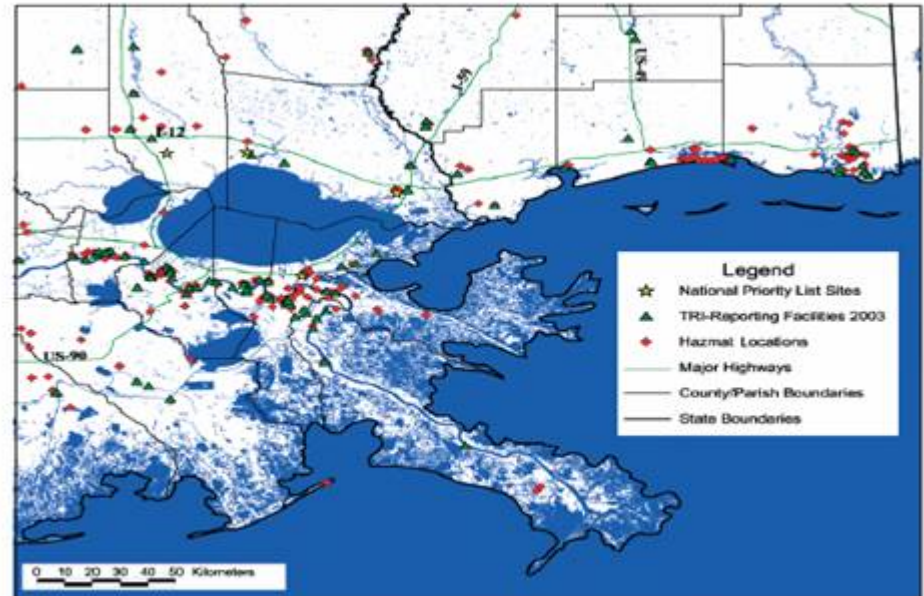
Significance of GIS Modeling

- Spatial data modeling and mapping to examine effects of terrain and geographic features on insurgent behavior is possible with a GIS

- Allows you to visualize and explore data, revealing patterns, relationships, and trends that are not readily apparent in databases, spreadsheets, or statistical packages
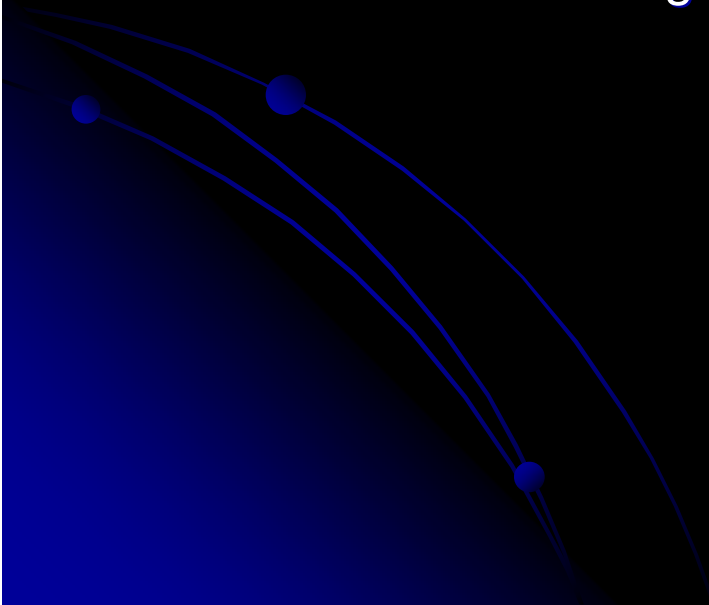

On-the-fly map of New Orleans Superdome area with demo-graphic separations overlaid with potential contaminant and petroleum-related sites

Legend
- ☆ National Priority List Sites
- ▲ TRI-Reporting Facilities 2003
- ◆ Hazmat Locations
- Major Highways
- County/Parish Boundaries
- State Boundaries

0 10 20 30 40 50 Kilometers

Flat map from NIEHS Katrina/Rita Web portal indicates National Priority List, Superfund, Toxic Release Inventory, and hazardous material sites, as well as water intakes, in southeastern Louisiana.

Tools

- ArcView 3.3
- ArcView 9 series
  - has a easy-to-use Merge tool for combining data

- Full-featured GIS software for visualizing, analyzing, creating, and managing data with a geographic component

- Tied to an address, postal code, global positioning system location, census block, city, region, country, or other location

Tools cont.

- ## Uses:

  - Military commanders analyze tactical plans

  - Law enforcement teams track and analyze crime incidents

  - City and county governments manage local zoning
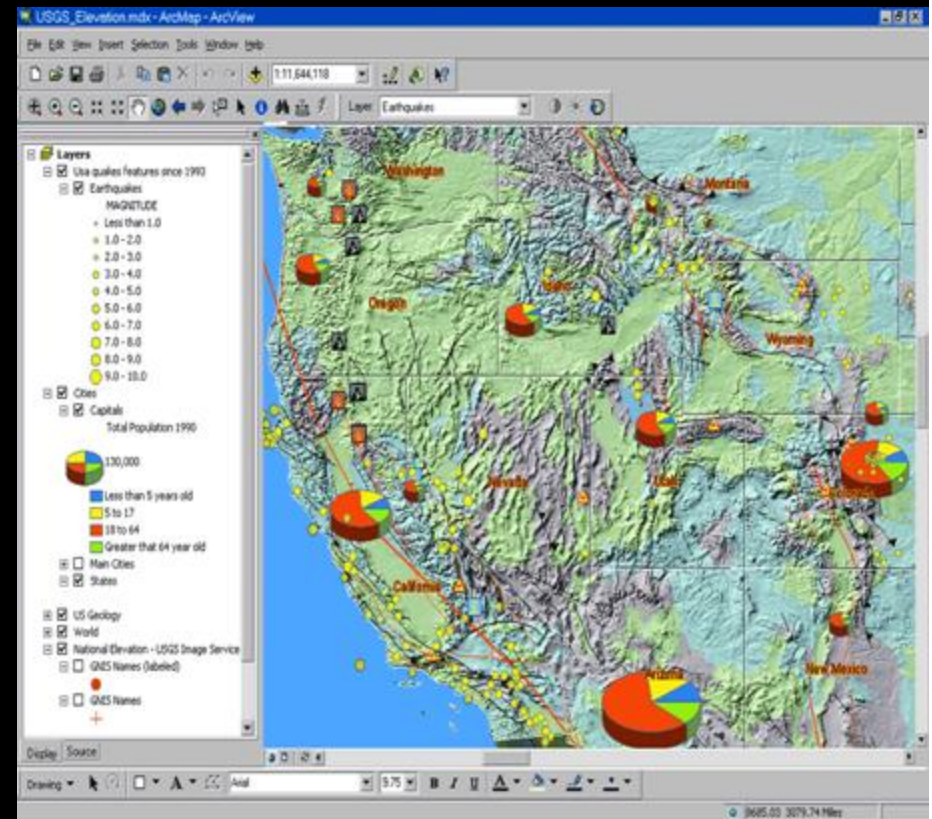
Analysis

- Focus on different sections of Baghdad for the GIS modeling

- integrate the Insurgency Database with the GIS map of Baghdad (both 2D and 3D)

- Different GIS layers of data will have to be superimposed

  - Types of data needed:

    - Road Network and Building Data that shows Urban Density (Integration of 2D and 3D data)

    - Population Data

      - Household income, number of working households
      - Ethnic mix

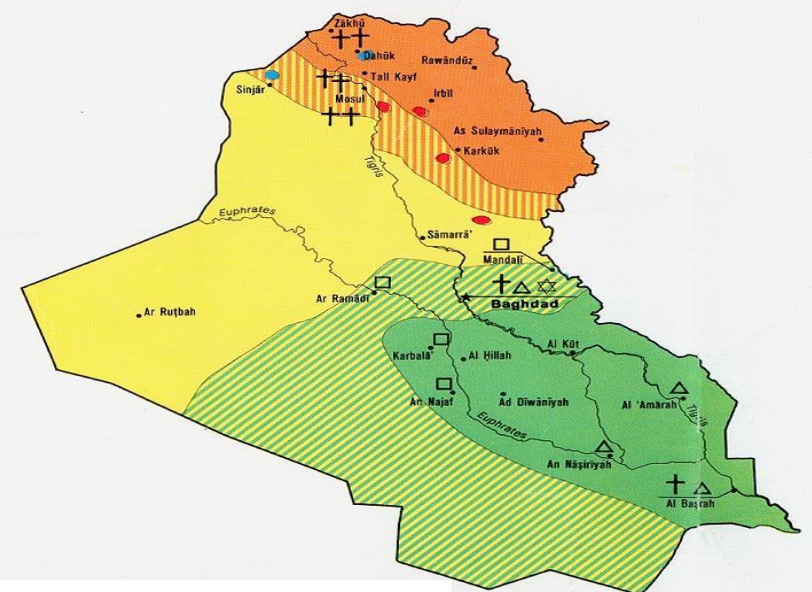 - Spatial and temporal data

Data Sets

- Iraq precision maps

- Spatially accurate maps and landmark in Baghdad
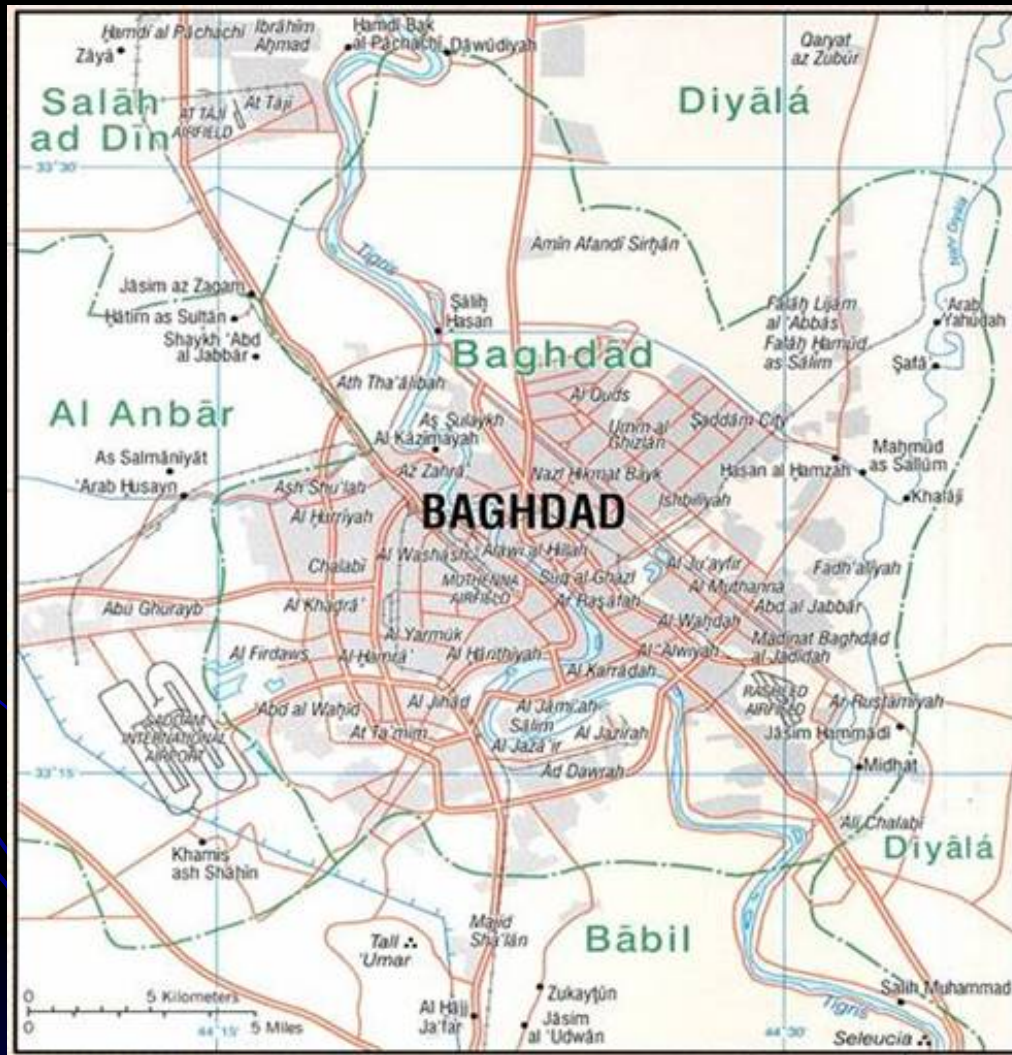 - Roadways
  - Airports
  - Rivers
  - Railroads
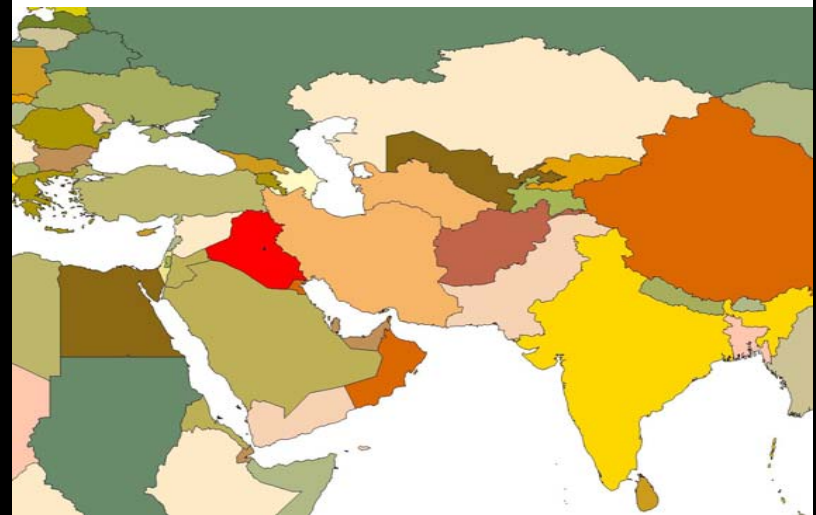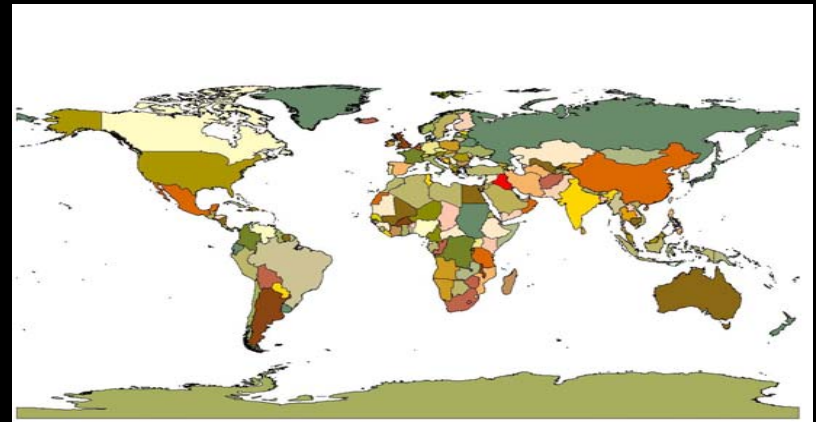
Design

- Creating a detailed map of Baghdad

- Quality and precision of maps and data is a key to developing realistic models
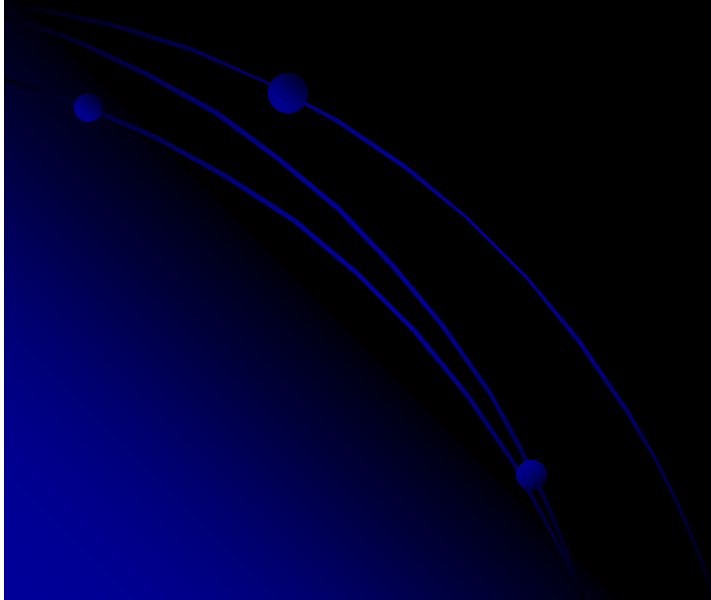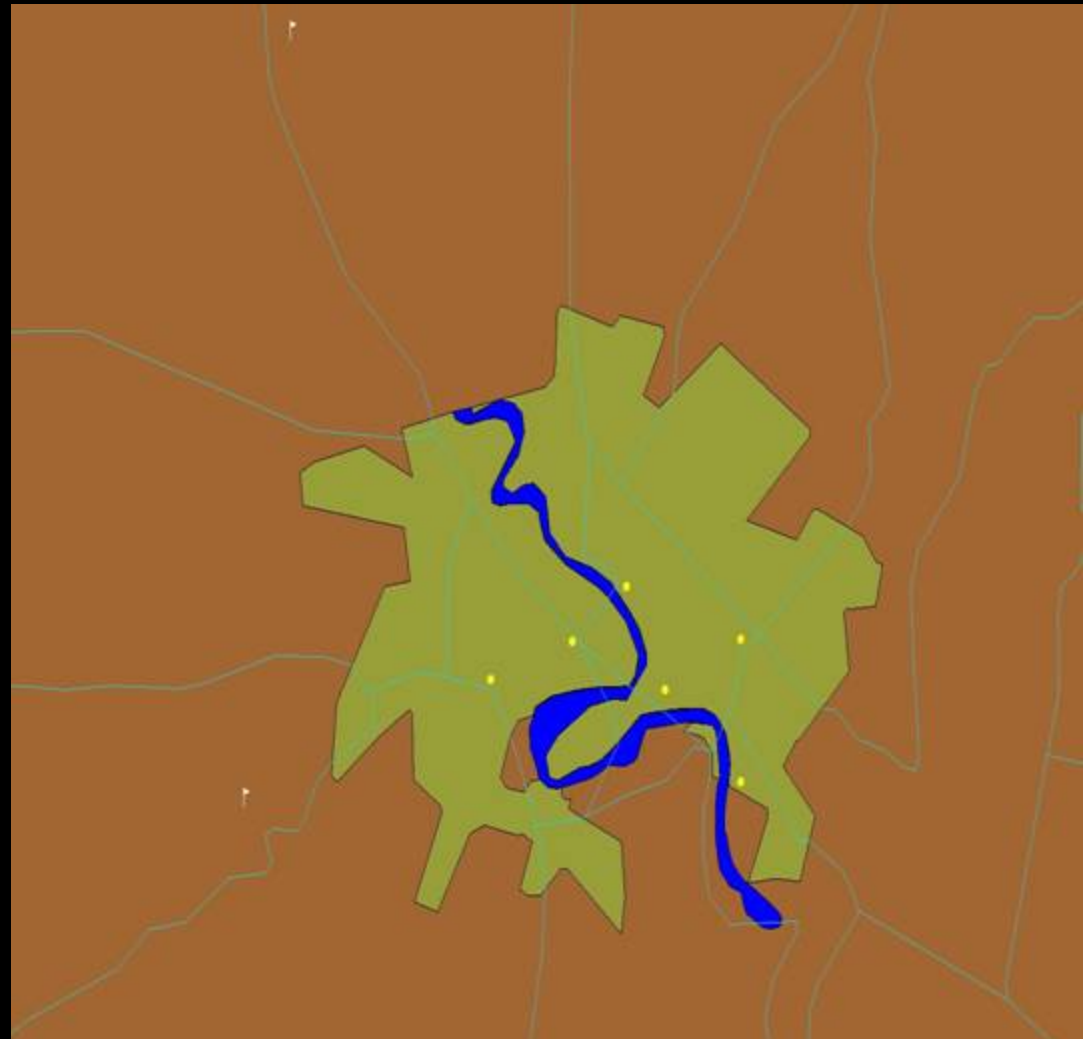
Microscopic GIS Modeling of Baghdad

Macroscopic GIS Modeling of Baghdad

- This map contains the main roads of Baghdad, major rivers, airports, and insurgent attacks

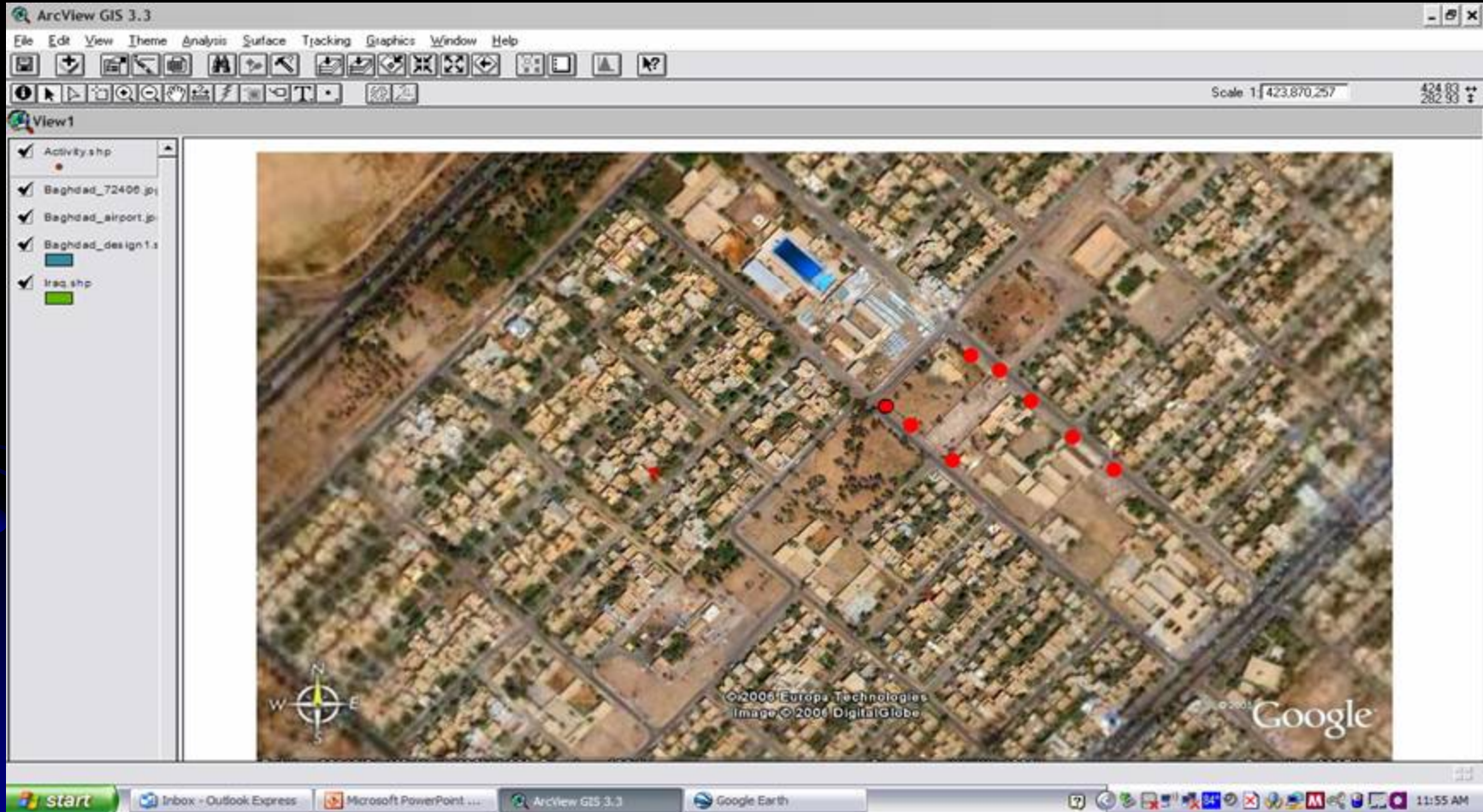- Items from this map are available for graphing and analyzing

Examples

Examples (contd.)

BAGHDAD

Palace
Hotel
Government Building
Transportation Building
Hospital
Church
Mosque
Monument
Museums
Police

Transportation
Major Road
Secondary Road
Loose/Unpaved Road
Railroad

Built-Up Area
Dense
Sparse to Moderate
Major Buildings
Airfield

Hydrographic Features
River, Lake, Canal
Water Reservoir
Stream/Ditch

Other
Orchard

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0.5 0 0.5 1 1.5 2 Miles
0.5 0 0.5 1 1.5 2 2.5 3 Kilometers

MAP SCALE: 1:40,000

N
W   E
S

LOCATION MAP

IRAQ

Conclusions and Recommendations

- GIS is an efficient tool to analyze and visualize statistical data of insurgent's attacks.

- By having precise GIS data effects of terrain and urban density on pattern of insurgent activities can be examined.

- A historical perspective of insurgent activities within specified time range in specific urban areas can be examined.

Future Work

- Obtain additional GIS data

- Examination of the social structure of some Iraqi neighborhoods and map it; specifically the comparison of before (the U.S. troops went in Iraq) and after

- Investigate if living conditions (such as poverty) in Iraqi communities play a role in promoting insurgency

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