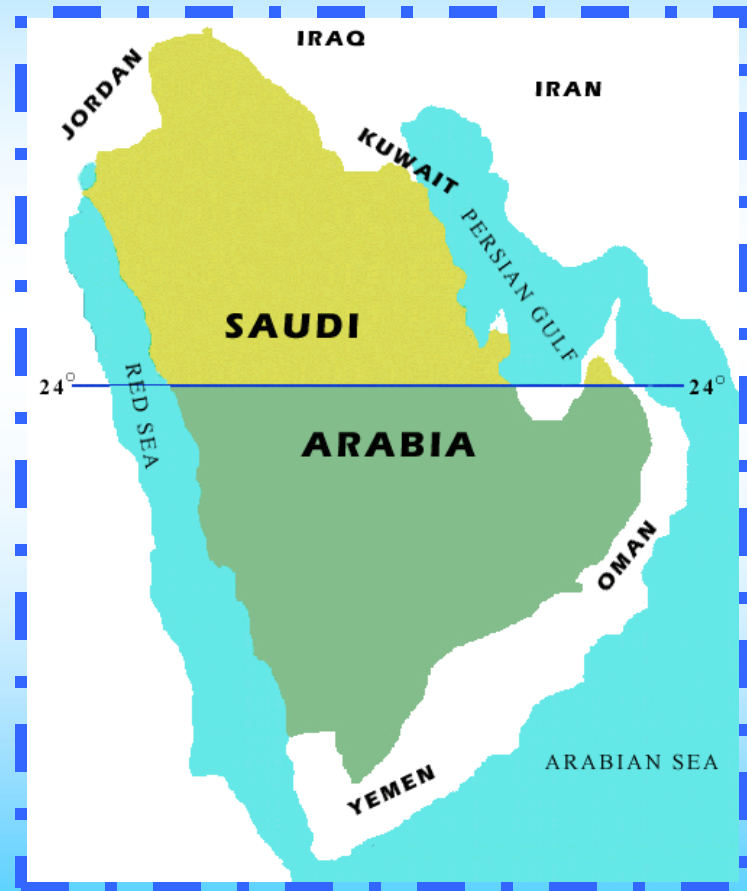


The Distribution of the Gold Mineralization in relation to the Structural Geology, Southern Arabian Shield

CRP (514)

Presented by
Fadhel Al-Khalifah



OUTLINE

- Introduction
- Data Used
- GIS
- Analysis Tool
 - Geology of Gold
- Faults & Intrusions
- Relationship between Gold, Faults and Intrusions

- Relationship between Gold tonnage, Faults and Intrusions
- Conclusion & Remarks

Earth Sciences Department

Introduction

- Most of the primary gold mineralizations were only found in the Proterozoic Arabian Shield in coarse-grained igneous intrusions; associated with dikes; in faults and fractures (veins) and in polymetallic stratiform deposits in volcano sedimentary successions.
- The study mainly aims to manifest the spatial relationships between gold distribution, fractures and fault zones, and igneous intrusions in the southern part of the Arabian Shield, south to the latitude 23°N, using GIS.

Data Used

- **1:1,000,000 scale map, for selected mineral occurrences of the Arabian Shield showing their relationship to major tctonostratigraphic entities prepared by the Ministry of Petroleum & Mineral Resources (Jiddah), was digitized to display the distribution of the gold ores, intrusions and major faults and fractures in the study area.**

GIS

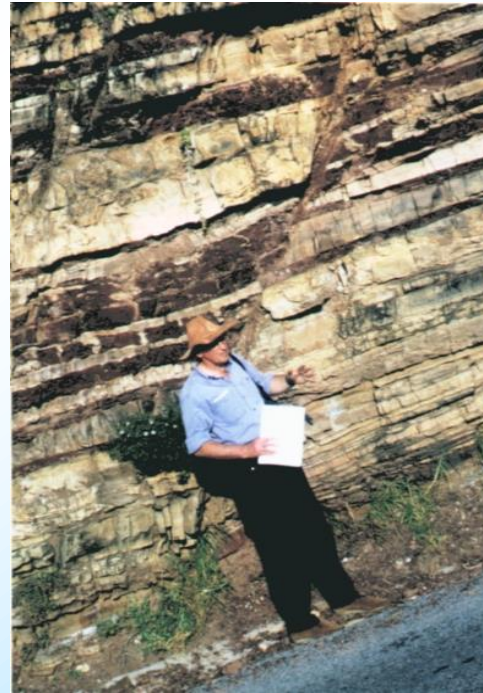
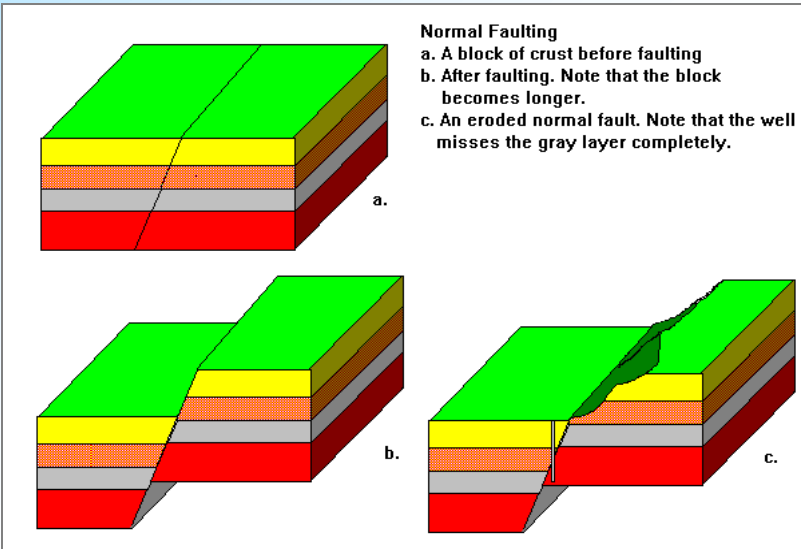
- Geographic Information System can be generally defined as a computer based system, which is used to hold and analyze data about places on the earth surface (Rhind, 1989).
- The subject can also be defined as an organized assemblage of hardware or software used to capture, store, retrieve, and analyze different forms of spatial data

Analysis Tool

- GIS ArcView version 3.2a was used to execute the current project. ArcView is a powerful and dynamic geographic information software that enables the user to present geographic information as maps, charts, tables and layouts. It has the ability to perform different tabular and spatial analyses.

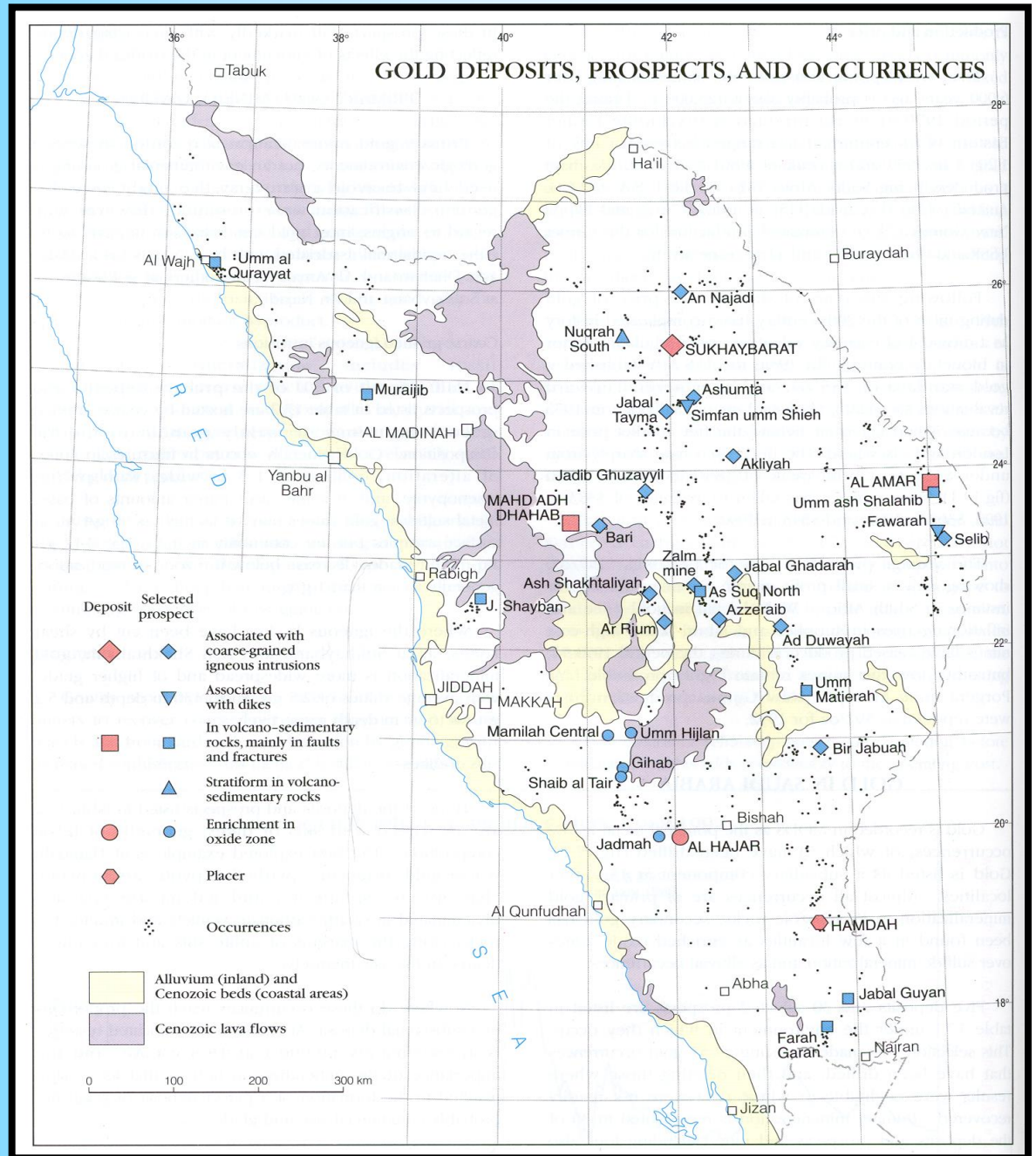
Geology of gold Mineralization

- **The gold generally occurs in hydrothermal quartz fissure veins.**
- **Those veins tend to dip steeply and occupy faults, usually tensional and diagonal shear zones formed as secondary openings in connection with large wrench or strike-slip faults.**
- **Also there are gold-bearing sulphide veins, which are similar to the gold-quartz veins except that the gold occurs to a large extent in association with pyrite and other metallic sulphides, which are present in large quantities in the veins.**
- **The veins can be traced from the auriferous quartz porphyry and pegmatite dikes to the granite and peralkaline granite stocks within hundred meters.**

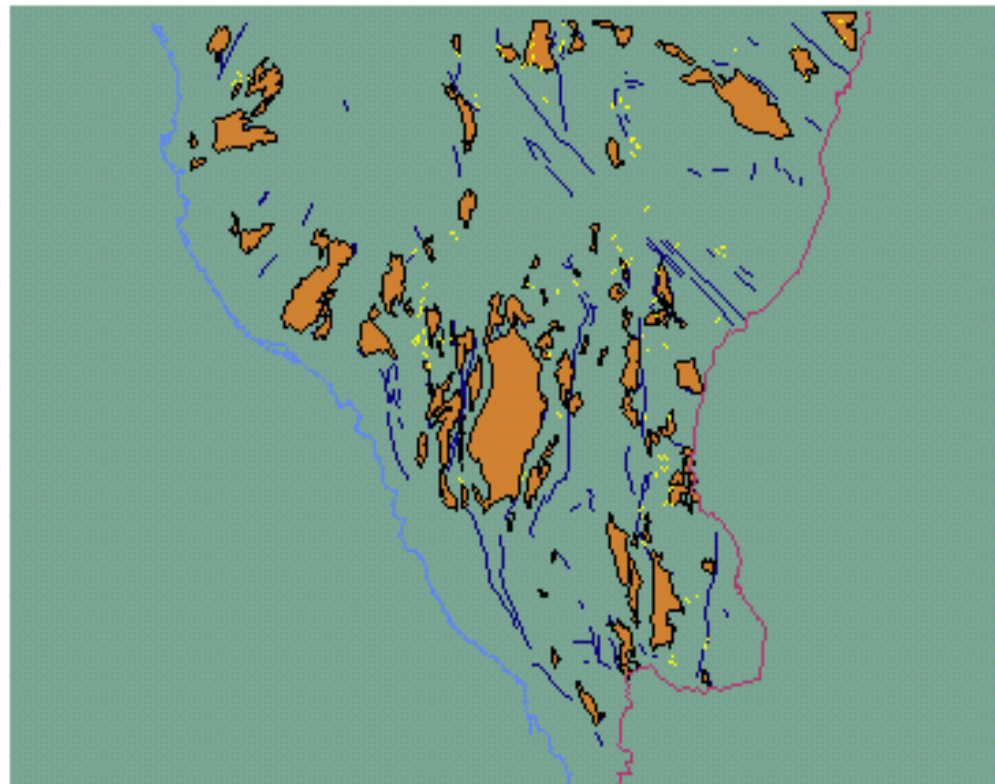


Faults & Intrusions

Gold deposits, prospects, and occurrences (DGMR) in 1994



Distribution of Gold Mineralization, Southern Arabian Shield



- Shieldboundary.shp
- Redseacoast.shp
- Gold.shp
- Intrusions.shp
- Faults.shp

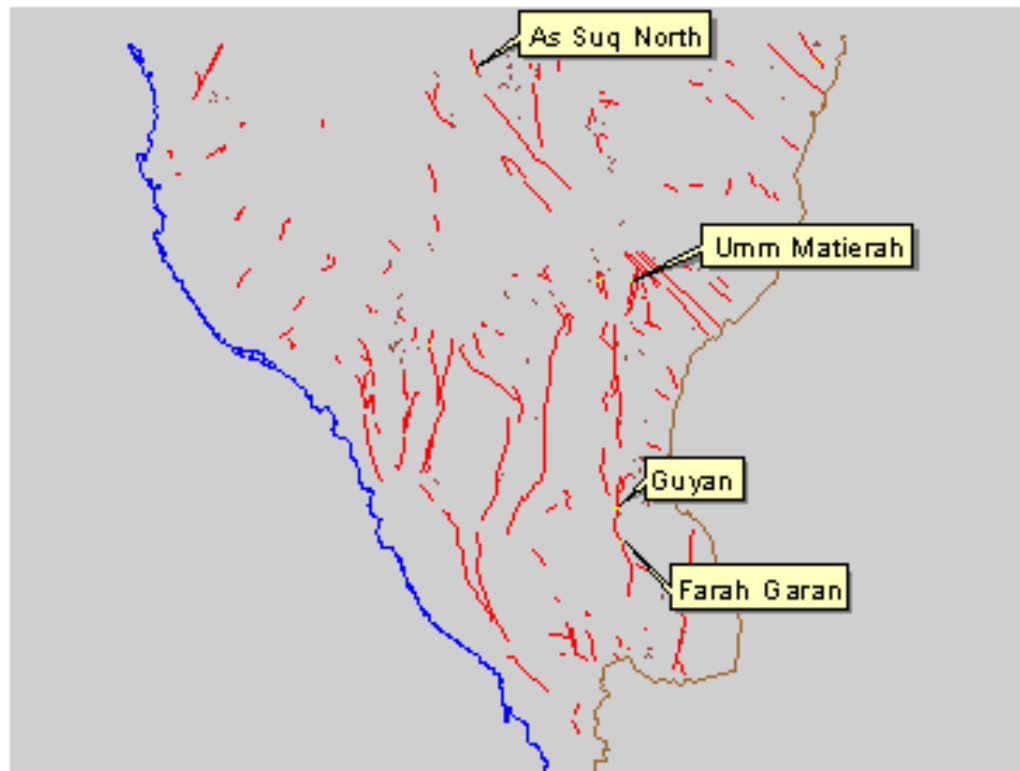


0 1000 2000 Miles

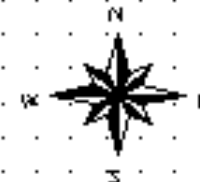
Relationship between gold Mineralization and faults

- **Based on the latest map of gold mineralizations constructed by Peter Collenette and David Grainger (DGMR) in 1994, the primary gold mineralizations are clearly associated with the igneous intrusions and fault zones.**
- **GIS spatial analysis were performed to reveal the influence of the adjacency to major faults and intrusions on the concentration of these mineralizations.**
- **Gold deposits located only one mile or less from the nearest fault were selected using the select by theme option. All gold deposits showing such adjacency to major faults, have high gold potentiality according to the available literature. The selection result also showed an intimate conformity with the result displayed in the latest geologic map.**

**Gold deposits located at one mile or less
away from the nearest major faults**



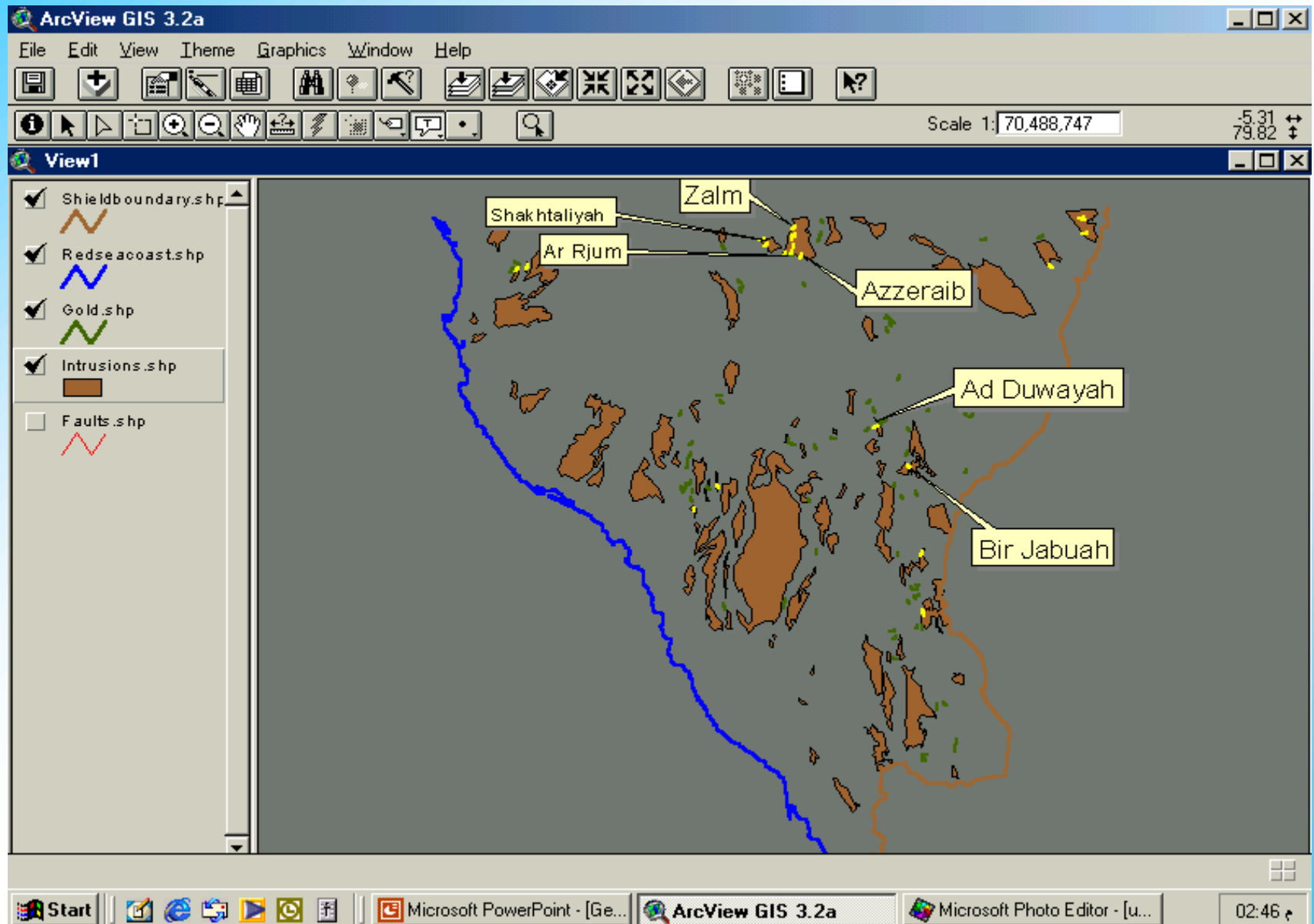
- Shieldboundary.shp
- Redseacoast.shp
- Gold.shp
- Faults.shp



Relationship between gold Mineralization and magmatic intrusions

- **Using the same search criteria, gold deposits adjacent to major intrusions were selected. All of these deposits are high-potential gold mineralizations. They fairly correspond to those associated with the igneous intrusions as described in the DGMR map**
- **According to the various spatial analysis carried out, the number of gold deposits associated with igneous intrusions is much greater than the number of those associated with major faults. This, most probably, is attributed to the association of the gold-bearing magmatic solutions with the intruded igneous stocks, which triggered minor faulting and fracturing responsible for the accommodation of the gold-bearing solutions.**

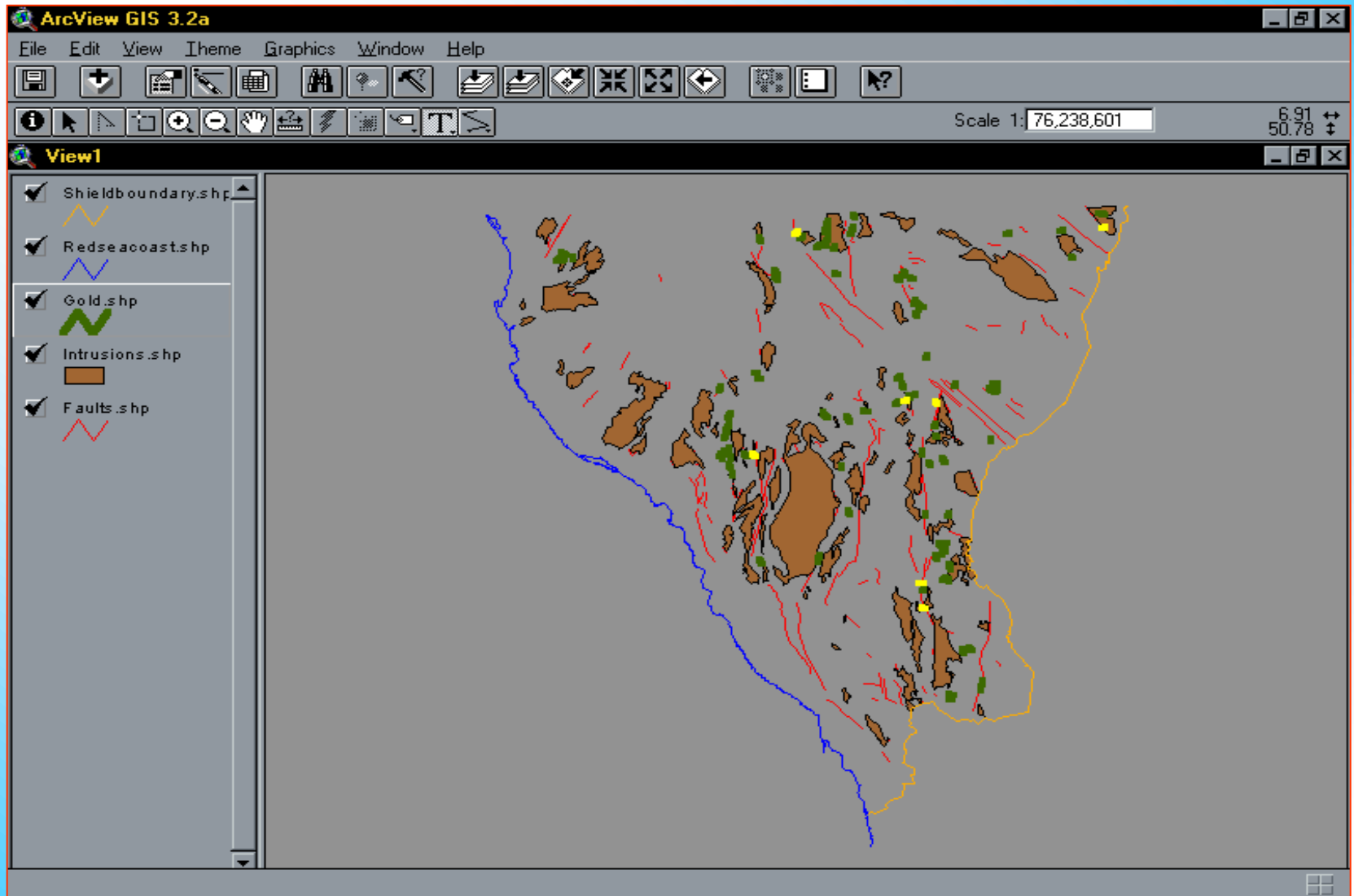
Gold deposits located at one mile or less away from the nearest intrusions



Relationship between gold Mineralization, faults and magmatic intrusions

- **Another obviously observed relationship is the adjacency of gold deposits associated with faults to the intrusions. The analysis proved that most of these deposits are located within the vicinity of the major intrusions, which represents the source of the rich-gold magmatic solutions. Nevertheless, faults are crucial to the passage and accommodation of these solutions.**

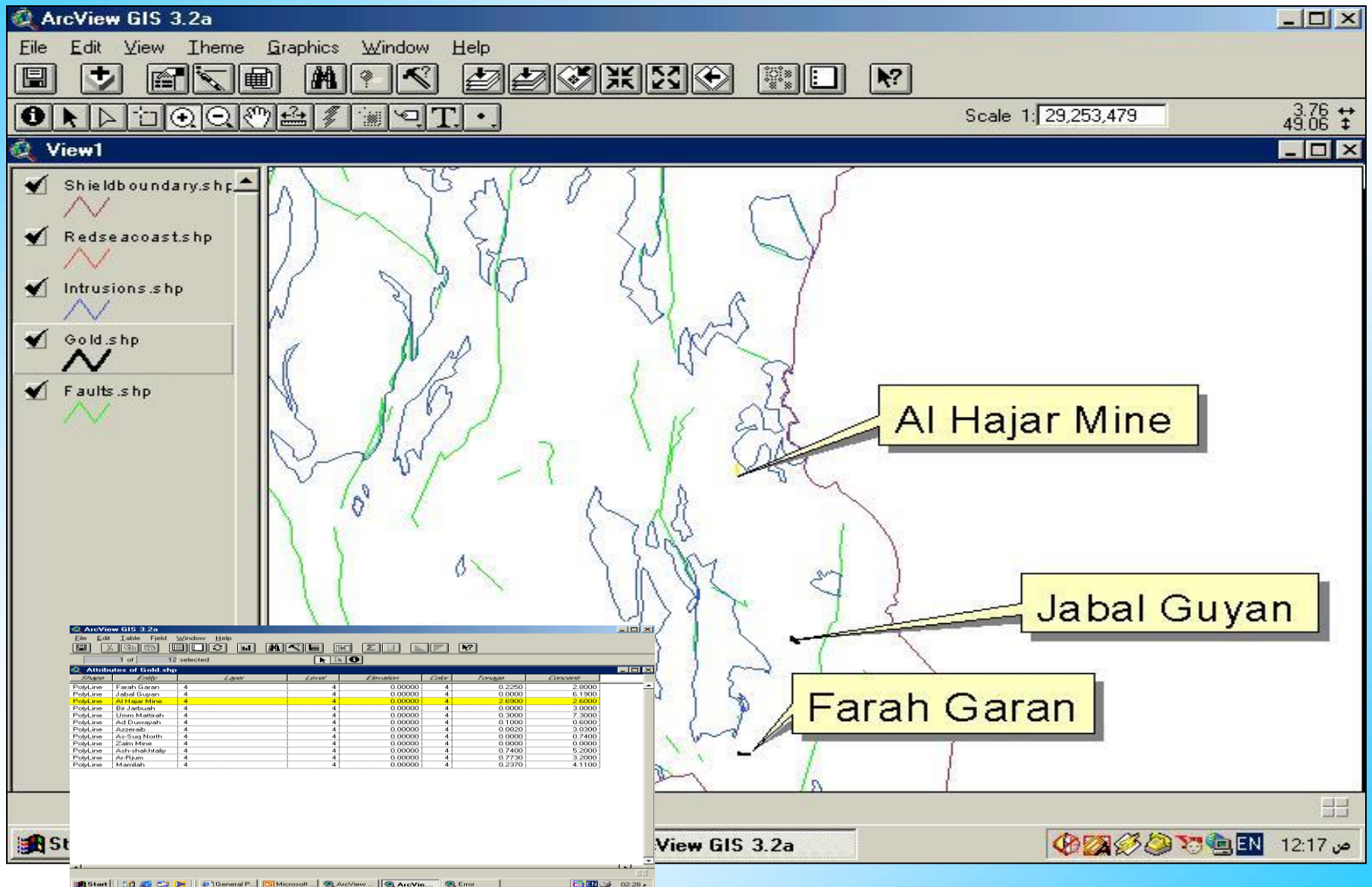
Most of the gold deposits associated with faults are adjacent to major intrusions



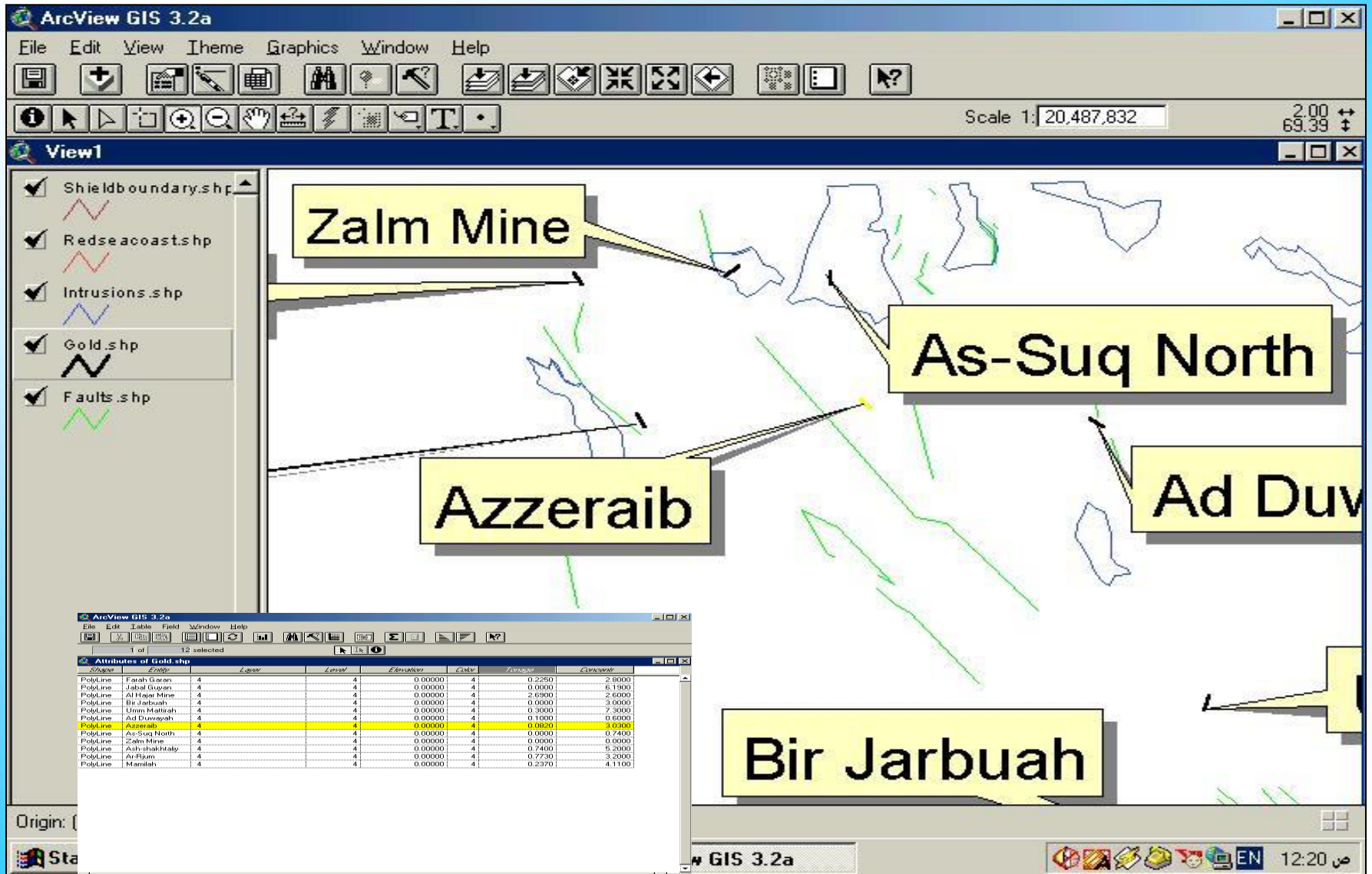
Relationship between gold tonnage, faults and intrusions

- Tabular data containing the tonnage of major mines in the area have been analyzed to determine the maximum and minimum value of tonnage, using the statistics option of the Field menu. The mines with maximum and minimum tonnage were selected by the Select tool.
- It's found that the highest-tonnage mine is located very close to an igneous intrusion. Whereas, the minimum-tonnage mine is still obviously far from the nearest intrusions and faults.

Adjacency of the highest-tonnage mine to the intrusion



The lowest-tonnage mine is far from the nearest intrusion and fault



Conclusion and Recommendations

- **Most of gold deposits are associated with igneous intrusions rather than faults due to the association of the gold-bearing magmatic solutions with the intruded igneous stocks.**
- **Faults are crucial to the passage and accommodation of these solutions & the Gold deposits associated with them are located within the vicinity of the major intrusions since they are the source of the rich-gold magmatic solutions.**
- **Mines with high tonnage are always located close to intrusions and faults.**
- **Complete tabular dataset for the tonnage is recommended to quantify more precisely the spatial relationship between gold ore, intrusions and faults.**

