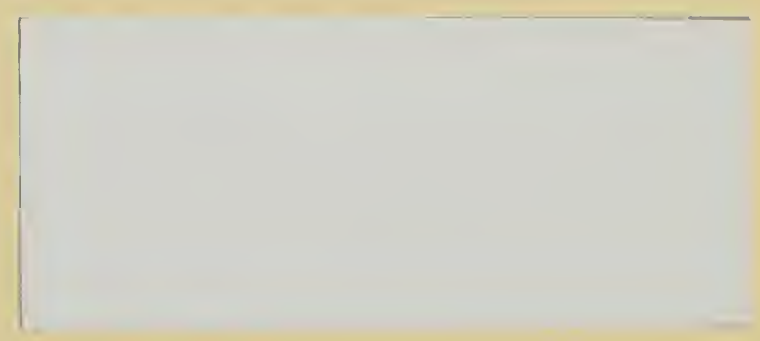
A GEOSTATISTICAL STUDY FOR GEOLOGY - ENERGY - MINERAL RESOURCES IN THE CALIFORNIA DESERT

BRIEFING

TERRADATA



BRIEFING

TERRADATA

B R I E F I N G O U T L I N E

I. INTRODUCTION

II. RESULTS

III. COMPILATION OF OCCURRENCE DATA

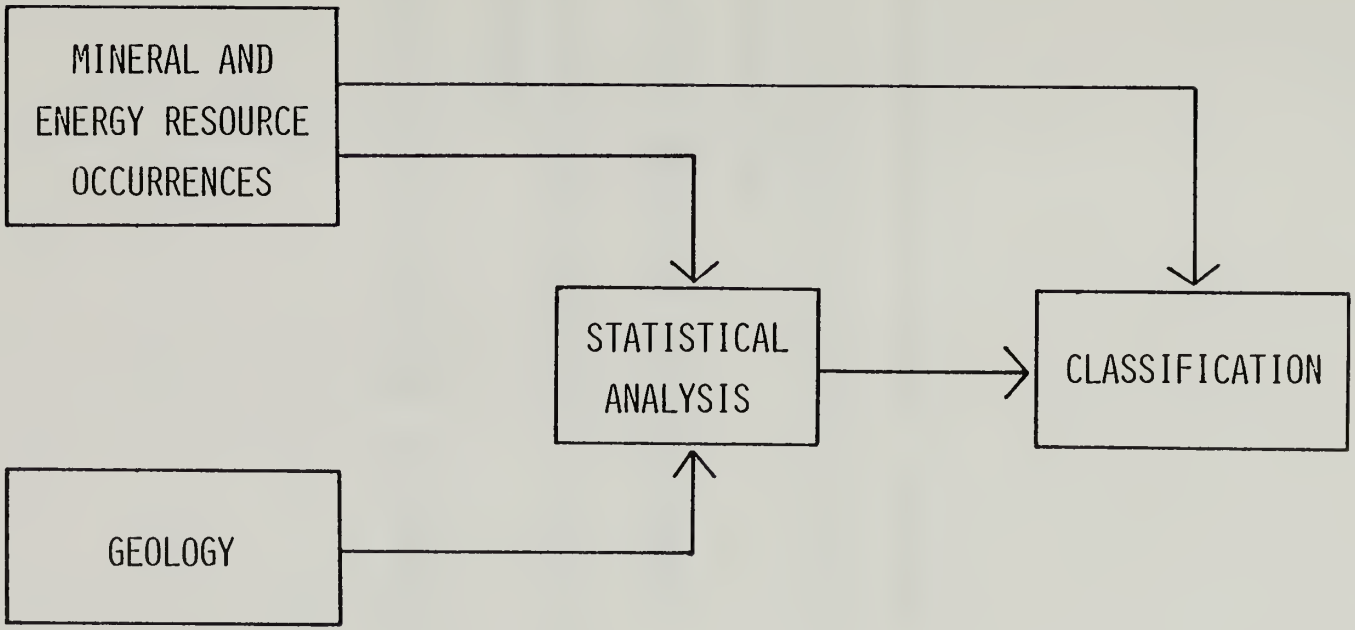
IV. COMPILATION OF GEOLOGIC INFORMATION

V. GEOSTATISTICAL ANALYSIS

VI. RECOMMENDATIONS

T E R R A D A T A ' S A P P R O A C H

1. COMPILE REPORTED MINERAL AND ENERGY OCCURRENCES
2. DIGITIZE GEOLOGY
3. FIND STATISTICAL RELATIONSHIPS BETWEEN OCCURRENCES AND GEOLOGY
4. CLASSIFY ENERGY AND MINERAL RESOURCE POTENTIAL OF THE CDCA


MINERAL AND ENERGY RESOURCE OCCURRENCES
STATISTICAL ANALYSIS
CLASSIFICATION
GEOLOGY

II. RESULTS

A. Location Of Reported Mineral Occurrences

B. Location Of Wells Drilled For Oil And Gas, CO_2 Or Geothermal Fluids

C. Reported And Predicted Gold Occurrences

D. Reported And Predicted Lead, Silver, Zinc Or Copper Occurrences

E. Reported And Predicted Iron Or Manganese Occurrences

MINERAL OCCURRENCES IN THE CDCA[a]
BY COMMODITY AND PRODUCTION CATEGORY

Commodity	Symbol	Production Category[b] 0	1	2	3	4	Total All Categories
Metals							
Antimony	A	3	5	8	0	0	16
Copper	Cu	86	146	80	12	0	324
Gold	Au	166	400	172	46	22	806
Iron	Fe	29	27	19	1	0	75
Lead	Pb	69	87	46	16	5	223
Manganese	Mn	26	49	21	3	3	102
Mercury	Hg	5	3	1	0	0	9
Nickel	Ni	1	2	0	0	0	3
Molybdenum	Mo	1	1	1	0	0	3
Rare earths	RE	5	7	0	0	1	13
Silver	Ag	5	47	22	2	4	80
Tin	Sn	1	1	0	0	0	2
Titanium	Ti	0	1	0	0	0	1
Thorium	Th	0	1	0	0	0	1
Tungsten	W	30	70	45	3	3	151
Uranium	U	115	15	14	0	0	144
Vanadium	Va	0	1	0	0	0	1
Non-Metals							
Asbestos	As	3	0	1	0	0	4
Barium	Ba	10	7	6	0	0	23
Clay	Cl	13	28	25	5	2	73
Dimension stone	Ds	7	9	18	0	0	34
Feldspar	Fd	8	4	4	0	0	16
Fluorspar	Fl	6	9	3	0	0	18
Gemstones	Gs	22	13	3	0	0	38
Limestone	Ls	48	20	23	2	3	96
Magnesite	Mg	1	9	4	0	0	14
Mica	Mi	3	3	6	0	0	12
Roofing granules	RG	0	1	9	0	0	10
Sand and gravel	SG	39	20	43	12	0	114
Silica	Si	10	1	10	1	1	23
Sulfur	S	1	2	2	0	0	5
Talc	Tc	24	20	11	12	7	74
Volcanic cinders	VC	29	18	18	0	0	65
Wollastonite	Ws	1	1	1	0	0	3
Miscellaneous	Ms	2	2	2	0	0	6
Salines							
Borates	B	35	2	15	2	2	56
Calcium chloride	CC	1	1	3	0	0	5
Gypsum	G	19	7	11	0	1	38
Magnesium salts	MC	1	0	0	0	0	1
Potasium salts	KS	1	1	5	0	0	7
Salt	NC	5	3	10	0	0	18
Sodium carbonate	SC	0	0	4	0	0	4
Sodium sulfate	SS	5	0	2	0	0	7
Strontium	Sr	3	0	4	0	0	7
Total All Commodities		838	1,044	672	117	54	2,725
Wells							
Oil and gas (all cre dry holes)							188
Carbon dioxide							8
Geothermal							88
Total Wells							284

[a] Data on hot springs (HS) is included in the data base but has not been tabulated.

[b]
0 = Occurrence or claim
1 = Worked, but no production reported
2 = Small Producer (less than $50,000)
3 = Moderate Producer ($50,000 to $500,000)
4 = Major Producer (over $500,000)

DATA COLLECTION AND PREPARATION

III. COMPILATION OF OCCURRENCE DATA

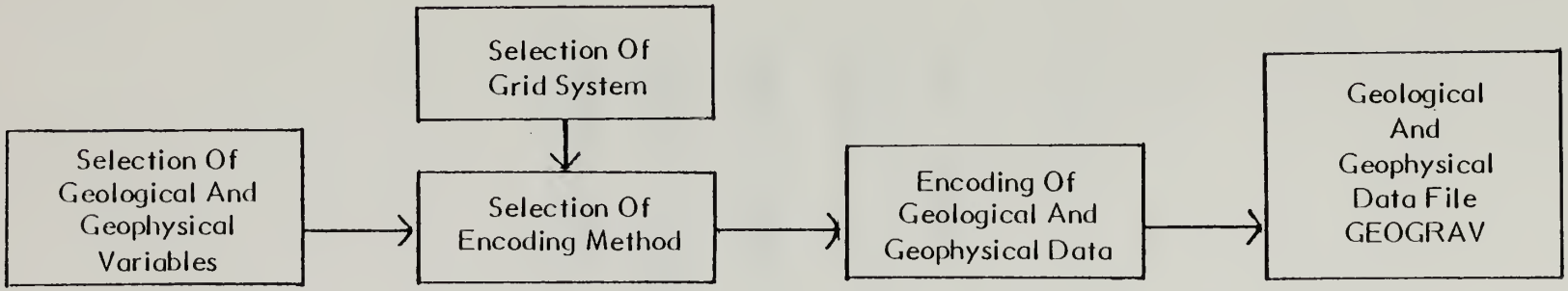
- A. Literature Search
  - 1. Personal Contacts
  - 2. Identify And Collect All Known Sources
  - 3. Establish Original Sources
- B. Encode Data
  - 1. Select Parameters To Be Entered
  - 2. Plot Occurrences On Topographic Maps
- C. Edit Data

IV. COMPILATION OF GEOLOGIC INFORMATION

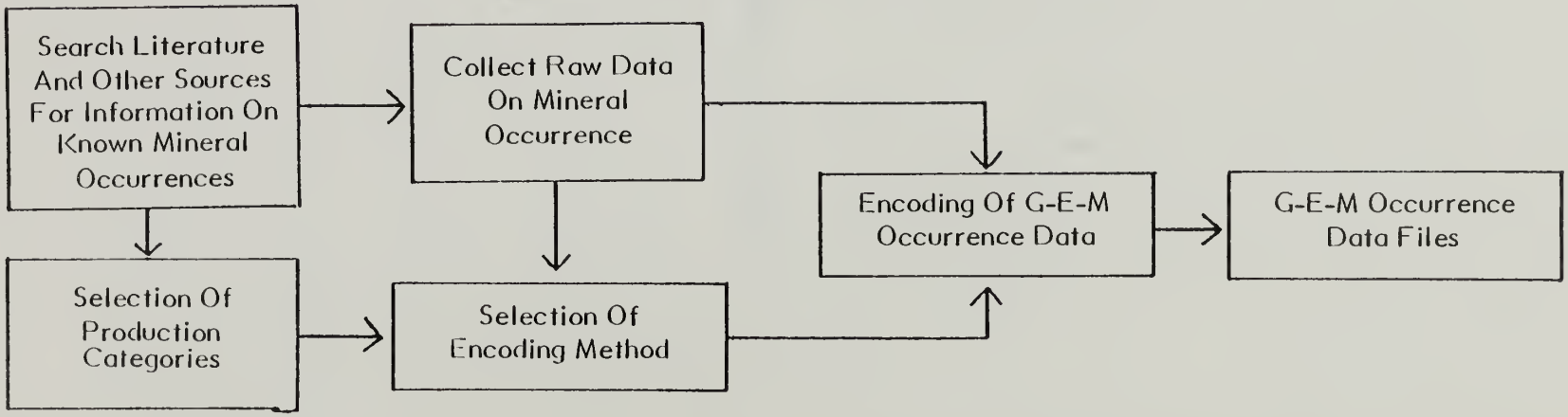
- A. Select Sources
  - 1. Geologic Maps (CDMG 1:250,000)
  - 2. Bouguer Gravity Data
- B. Select Relevent Variables And Unit Of Compilation
- C. Encode Data
- D. Edit Data

FLOWCHART OF DATA COLLECTION AND PREPARATION

Geological and Geophysical Data



Geology-Energy-Mineral Occurrence Data



D E S I R E D O C C U R R E N C E D A T A

- o EXACT LOCATION
- o ECONOMIC VALUE OF DEPOSIT
- o COMPLETE PRODUCTION HISTORY (QUANTITY & GRADE)
- o COMMODITY SEPARATION
- o CURRENT STATUS

PERSONS CONTACTED FOR MINERAL OCCURRENCE INFORMATION

BUREAU OF LAND MANAGEMENT

- Jean Juilland
- Desert Planning Staff

BUREAU OF MINES

- Gary Kingston, Washington
- Jim Evans, Washington
- Jerrold Thompson, Denver
- Richard Appling, Spokane
- Bob Weldon, Spokane
- Fred Carrillo, Spokane
- Bob Miller, Spokane
- Bill Kerns, Sacramento

GEOLOGICAL SURVEY

- Reid Stone, Menlo Park
- Marshall Reid, Menlo Park
- Bill Lee, Menlo Park
- Roscoe Smith, Menlo Park
- Maureen Johnson, Menlo Park
- Merritt Smith, Los Angeles
- Vivian Engler, Los Angeles

DEPARTMENT OF ENERGY

- Spence Shannon, Grand Junction
- Robert Meehan, Grand Junction
- Fred Files, Reno
- David Leach, Lawrence Livermore Lab

BUREAU OF RECLAMATION

- Mr. Funilius, Boulder City, NV

CALIFORNIA DIVISION OF MINES & GEOLOGY

- Tom Gay, Sacramento
- Bill Clark, Sacramento
- Hal Weber, UCLA
- Cliff Gray, Los Angeles
- Ed Kiessling, Los Angeles
- Paul Morton, Santa Ana

CALIFORNIA DIVISION OF OIL & GAS

- Don Lande, Los Angeles

COUNTY ASSESSORS

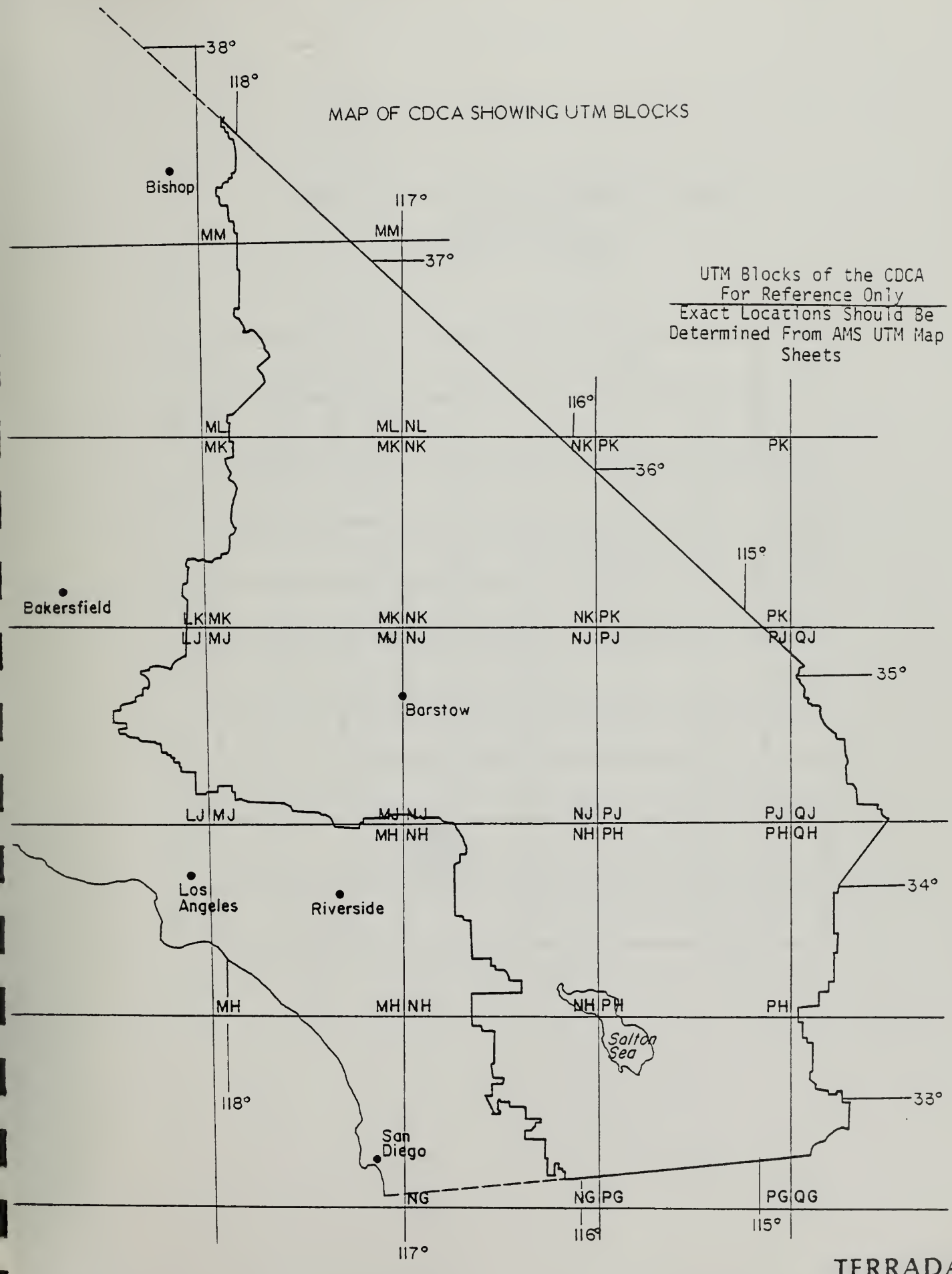
- Dan Blatt, Los Angeles County
- Mr. Lanto, San Bernardino County

INDIVIDUALS

- Shawn Biehler, UC Riverside
- Bennett Troxel, UC Davis
- Jim Briscoe, Southwestern Exploration Associates, Tucson
- Charles Mardirosian, Albuquerque
- Dorothy Munger, Munger Oil Information, Los Angeles
- Richard Duda, SRI, Menlo Park

IDENTIFY LOCATION OF OCCURRENCES

1. 1:250,000 Topographic Sheets
2. CDMG County Reports
3. DOE Preliminary Reconnaissance Reports For Uranium
4. Southern Pacific Report: Minerals For Industry
5. CDMG Economic Mineral Maps
6. USGS Mineral Occurrence Map
7. USGS Planning Unit Reports
8. USBOM Mineral Industry Location System (MILS)

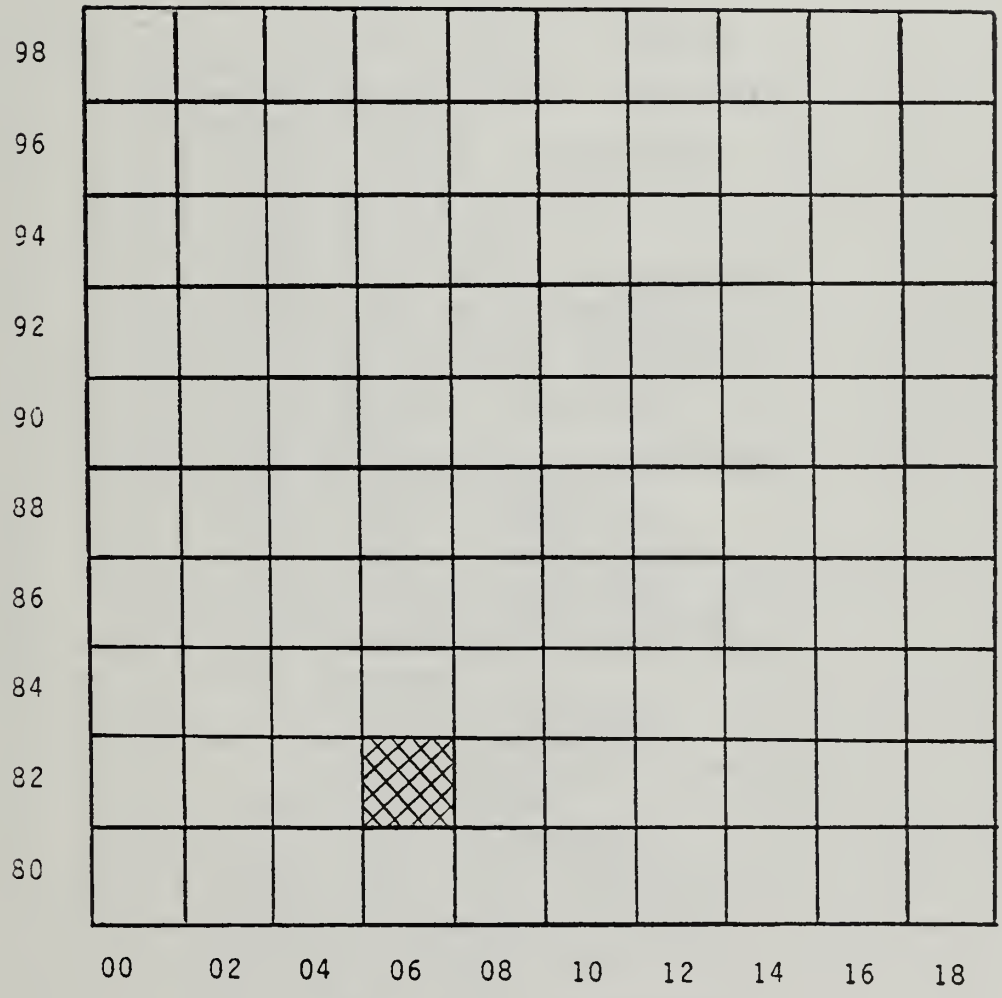

MAP OF CDCA SHOWING UTM BLOCKS
UTM Blocks of the CDCA
For Reference Only
Exact Locations Should Be
Determined From AMS UTM Map
Sheets
38°
118°
117°
116°
115°
37°
36°
35°
34°
33°
Bishop
Bakersfield
Barstow
Los Angeles
Riverside
San Diego
Salton Sea
MM
ML
MK
LK
LJ
MJ
NL
NK
NJ
PK
PJ
QJ
MH
NH
PH
QH
NG
PG
QG

TERRADATA

PORTION OF A UTM BLOCK DIVIDED INTO CELLS

UTM BLOCK PG

(Hatched cell is PG0682)



Sample Printout From
Mineral Occurrence
File: CDCAPROD

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MK420 90 29W- 25 03 2 00623 STRINGER DISTRICT PLACER  12,13,23,24-30S-40EM
MK420 90 29W- 25 2 STRINGERS IN QZ MONZONITE
MK405110 29AU 43 03 2 00187 GOLD CROWN  11,12-30S-40EM
MK405110 29AU 43 2 SCHEELITE,AN BEARING STRINGERS
MK405110 29AU 77 03 2 00245 LA CROSSE  11-30S-40EM
MK405110 29AU 77 2 SEVERAL 100 OZ,QZ VEIN IN SCHIST
MK405110 29AU125 03 1 00324 BIZZ NO 2  12-30S-40EM
MK405110 29AU125 2 STRINGER IN SCHIST
MK405110 29AU149 03 4       SUNSHINE  11-30S-40EM
MK405110 29AU149 2 $1060000,SCHIST
MK405115 29AU126 03 1 00327 ROSE M  2-30S-40EM
MK405115 29AU126 2 SHEAR ZONE IN SCHIST
MK405120 29AU 99 03 2 00281 NANCY HANKS  2-30S-40EM
MK405120 29AU 99 2 FAULT ZONES IN SCHIST
MK415115 29W-  1 03 2 00550 BARBARA-DIANA  2-30S-40EM
MK415115 29W-  1 2 STRINGERS IN SCHIST
MK415115 29W-  3 03 2 00556 BLUEBIRD  12-30S-40EM
MK415115 29W-  3 2 QZ VEINS IN SCHIST
MK415115 29W- 11 03 2 00580 HESS  1-30S-40EM
MK415115 29W- 11 2 STRINGERS IN SCHIST
MK365260 29AU  3 03 1 00110 APPLE GREEN  30-28S-40EM
MK365260 29AU  3 2 QZ SHEAR ZONES IN QZ MONZONITE
MK425115 29AU 41 03 2 00185 GOLD COIN  1,12-30S-40EM
MK425115 29AU 41 2 SEVERAL 1000 OZ,VEINS IN SCHIST
MK425115 29AU 60 03 1 00212 HAWKEYE  1-30S-40EM
MK425115 29AU 60 2 VEIN IN SCHIST
MK425115 29AU 96 03 2 00275 MONARCH RAND  1-30S-40EM
MK425115 29AU 96 2 FEW 100 OZ,SCHIST ALONG QZ
MK425115 29AU  5 03 3 00113 BALTIC  1-30S-40EM
MK425115 29AU  5 2 AT LEAST #50K,QZ VEINS IN SCHIST
MK425115 29AG  3 03 1       JASPER  12-30S-40EM
MK425115 29AG  3 2 SILICIFIED FAULT ZONE IN SCHIST
MK425115 29AG  6 03 1       NONDESCRIPT  12-30S-40EM
MK425115 29AG  6 2 QZ VEIN IN SCHIST
MK425115 29AG 10 03 1       VIENNA  12-30S-40EM
MK425115 29AG 10 2 VEINS ALONG FAULT IN SCHIST
MK425115 29AG 11 03 1       WHITE HORSE RAND  1-30S-40EM
MK425115 29AG 11 2 QZ STRINGERS IN SCHIST
MK425115 29AG  8 03 1       TOGO  12-30S-40EM
MK425115 29W- 15 03 2 00587 JERSEY LILY  12-30S-40EM
MK425125 29AU 87 03 2 00264 MASTER KEY  1-30S-40EM
MK425125 29AU 87 2 QZ VEINS IN RHYOLITE
MK390 85 29AU134 03 1 00338 SILVERTON  22-30S-40EM
MK390 85 29AU134 2 SHEAR ZONE IN SCHIST
MK425125 29AU153 03 1 00362 WADE H.NO.2  1-30S-40EM
MK425125 29AU153 2 SHEAR ZONE IN QZ MONZONITE
MK425125 29AG  5 03 1       MIZPAH-NEVADA  1-30S-40EM
MK425125 29AG  5 2 QZ STRINGERS IN QZ MONZONITE
MK425125 29AG  9 03 1       TREASURE HILL  1-30S-40EM
MK425125 29AG  9 2 QZ BEARING FAULT ZONES IN SCHIST
MK425125 29W-  9 03 1 00575 GOLD WASH  1-30S-40EM
MK425125 29W-  9 2 STRINGERS & VEINS IN SILICEOUS SCHIST
MK425150 29AU104 03 4 00294 CREBATOR DIVIDE  25-29S-40EM
MK425150 29AU104 2 $600K,QZ STRINGERS IN SCHIST
MK425150 29AU109 03 2       PINMORE  25-29S-40EM
MK425150 29AU109 2 FEW 1000 OZ,QZ IN SCHIST
MK385125 29AU 12 03 3 00125 BIG GOLD  3-30S-40EM
MK385125 29AU 12 2 #500S,FAULT ZONE IN QZ MONZONITE
MK385125 29AU 13 03 1 00131 BOBBY  3-30S-40EM
MK385125 29AU 13 2 VIEN IN METAMORPHIC
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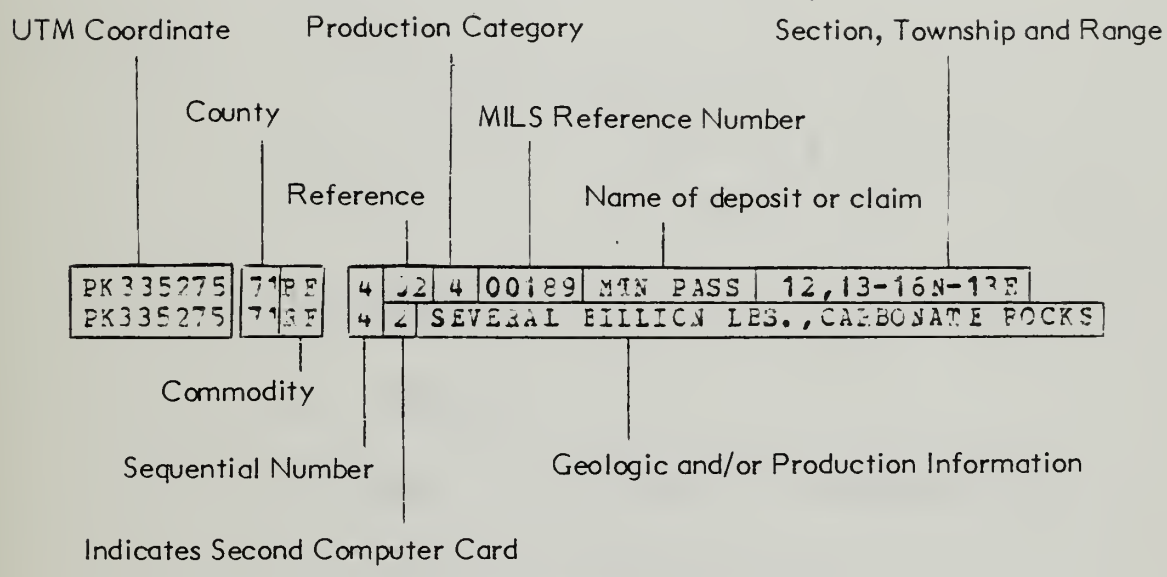
Key to data listings:



REQUIREMENTS OF GEOLOGIC INFORMATION

1. UNIFORM
2. COMPLETE
3. DETAIL TO DISTINGUISH NEIGHBORING CELLS
4. RELATED TO MINERALIZATION

GEOLOGIC AND GEOPHYSICAL VARIABLES FOR THE CDCA

Lithologic Units

Variable Number	Description	Areal Extent Within CDCA (km^2)	% Of CDCA Area
1.	Precambrian granitic rocks. - Precambrian anorthosite. - Undivided Precambrian granitic rocks.	701	0.67
2.	Precambrian metamorphic rocks. - Precambrian igneous and metamorphic rock complex. - Earlier Precambrian metamorphic rocks. - Later Precambrian sedimentary and metamorphic rocks. - Undivided Precambrian metamorphic rocks.	5,542	5.28
3.	Cambrian and late Precambrian sedimentary rocks. - Cambrian and Precambrian marine. - Cambrian marine.	1,963	1.87
4.	Ordovician through Mississippian marine sedimentary rocks. - Ordovician marine. - Pre-Silurian metasedimentary rocks. - Silurian marine. - Devonian marine. - Mississippian marine. - Paleozoic marine.	2,318	2.21
5.	Pennsylvanian through Permian marine sedimentary rocks. - Pennsylvanian marine. - Undivided carboniferous marine. - Permian marine.	489	0.47
6.	Pre-Cretaceous metasedimentary rocks and pre-Cretaceous metamorphic rocks.	1,298	1.24
7.	Paleozoic and Precambrian metavolcanic rocks. - Pre-Silurian metamorphic rocks. - Pre-Silurian metavolcanic rocks. - Devonian and pre-Devonian metavolcanic rocks. - Devonian metavolcanic rocks. - Carboniferous metavolcanic rocks. - Permian metavolcanic rocks. - Paleozoic metavolcanic rocks.	14	0.01

8.	Triassic-Jurassic marine sediments. - Triassic marine. - Middle and/or Lower Jurassic marine. - Upper Jurassic marine. - Knoxville Formation.	28	0.03
9.	Pre-Cretaceous metavolcanic rocks (if age cannot be established other than pre-Cretaceous). - Pre-Cretaceous metavolcanic rocks. - Jura-Triasic metavolcanic rocks.	472	0.45
10.	Mesozoic basic intrusives. - Mesozoic ultrabasic intrusive rocks. - Mesozoic basic intrusive rocks.	277	0.26
11.	Mesozoic granitic intrusives and pre-Cenozoic granitic and metamorphic rocks.	14,431	13.76
12.	Eolian deposits.	3,271	3.12
13.	Tertiary sediments (marine and non-marine).	2,860	2.73
14.	Tertiary igneous intrusives (hypabyssal).	515	0.49
15.	Tertiary volcanics. - Eocene volcanics. - Oligocene volcanics. - Miocene volcanics. - Pliocene volcanics.	5,142	4.90
16.	Quaternary sediments. - Plio-Pleistocene non-marine. - Pleistocene non-marine. - Pleistocene marine and marine terrace deposits. - Quaternary non-marine terrace deposits. - Glacial deposits. - Salt deposits. - Basin deposits. - Fan deposits. - Stream channel deposits. - Alluvium.	61,815	58.93
17.	Quaternary volcanics. - Pleistocene volcanics. - Recent volcanics.	1,652	1.57
18.	Bodies of water and unmapped areas.	2,112	2.01
	TOTAL	104,900	100.0

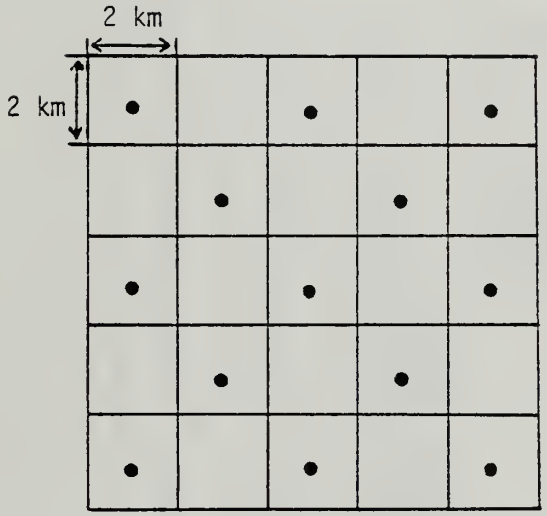
GEOLOGICAL AND GEOPHYSICAL VARIABLES FOR THE CDCA
Rock Contact Relationships

Variable Number	Description	Total Length In CDCA (Km)
19	Length of contact between Precambrian granitic rocks (1) and Precambrian metamorphic rocks (2).	481.0
20	Length of contact between Mesozoic granitic intrusives and pre-Cenozoic granitic and metamorphic rocks (11), and either Ordovician through Mississippian marine sedimentary rocks (4), or Pennsylvanian through Permian marine sedimentary rocks (5).	565.0
21	Length of contact between Mesozoic granitic intrusions and pre-Cenozoic granitic and metamorphic rocks (11) and Triassic-Jurassic marine sediments (8).	1.6
22	Length of contact between Tertiary igneous intrusives (14) and Precambrian granitic rocks (1).	0.8
23	Length of contact between Tertiary igneous intrusives (14) and Precambrian metamorphic rocks (2).	53.2
24	Length of contact between Tertiary igneous intrusives (14) and Cambrian and late Precambrian sedimentary rocks (3).	3.2
25	Length of contact between Tertiary igneous intrusives (14) and Ordovician through Mississippian marine sedimentary rocks (4).	5.2
26	Length of contact between Tertiary igneous intrusives (14) and Pennsylvanian through Permian marine sedimentary rocks (5).	9.6
27	Length of contact between Tertiary igneous intrusives (14) and pre-Cretaceous metasedimentary rocks and pre-Cretaceous metamorphic rocks (6).	7.2
28	Length of contact between Tertiary igneous intrusives (14) and Paleozoic and Precambrian metavolcanic rocks (7).	2.8
29	Length of contact between Tertiary igneous intrusives (14) and Triassic-Jurassic marine sediments (8).	2.8
30	Length of contact between Tertiary igneous intrusives (14) and pre-Cretaceous metavolcanic rocks (9).	2.8
31	Length of contact between Tertiary igneous intrusives (14) and Mesozoic basic intrusives (10).	4.8
32	Length of contact between Tertiary igneous intrusives (14) and Mesozoic granitic intrusives and pre-Cenozoic granitic and metamorphic rocks (11).	208.0
33	Length of contact between Tertiary igneous intrusives (14) and eolian deposits (12).	0.1
34	Length of contact between Tertiary igneous intrusives (14) and Tertiary sediments (13).	83.0

GEOLOGICAL AND GEOPHYSICAL VARIABLES
AND NUMBER OF SUBCELLS
FOR THE CDCA
Structural Relationships

Variable Number	Description	Total In CDCA
35.	Length of thrust faults (km).	518
36.	Number of thrust faults.	415
37.	Length of non-thrust faults (km).	14,907
38.	Number of non-thrust faults.	12,629
39.	Number of fault intersections.	1,889
40.	Curvature of faults.	n/a
41.	Gravity value measured at cell center.	n/a
42.	Number of subcells.	26,812

Configuration of Gravity Data



Sample Printout From
4 Km X 4 Km Geologic
Data File: GEOGRAV

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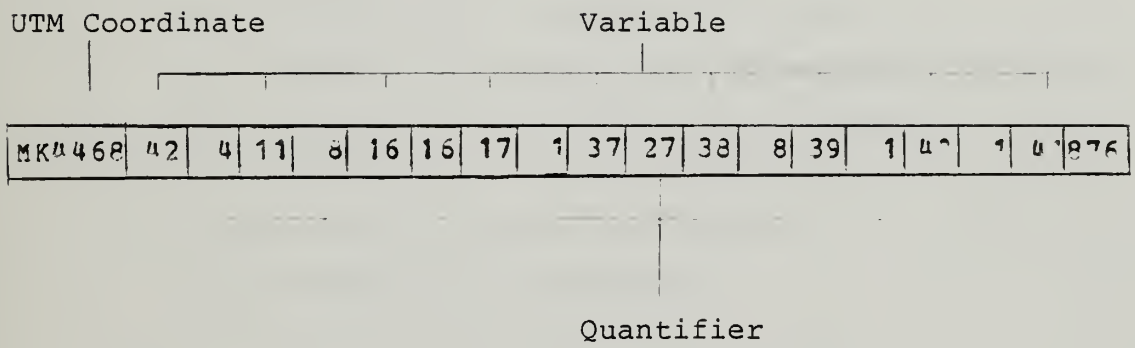


V. GEOSTATISTICAL ANALYSIS

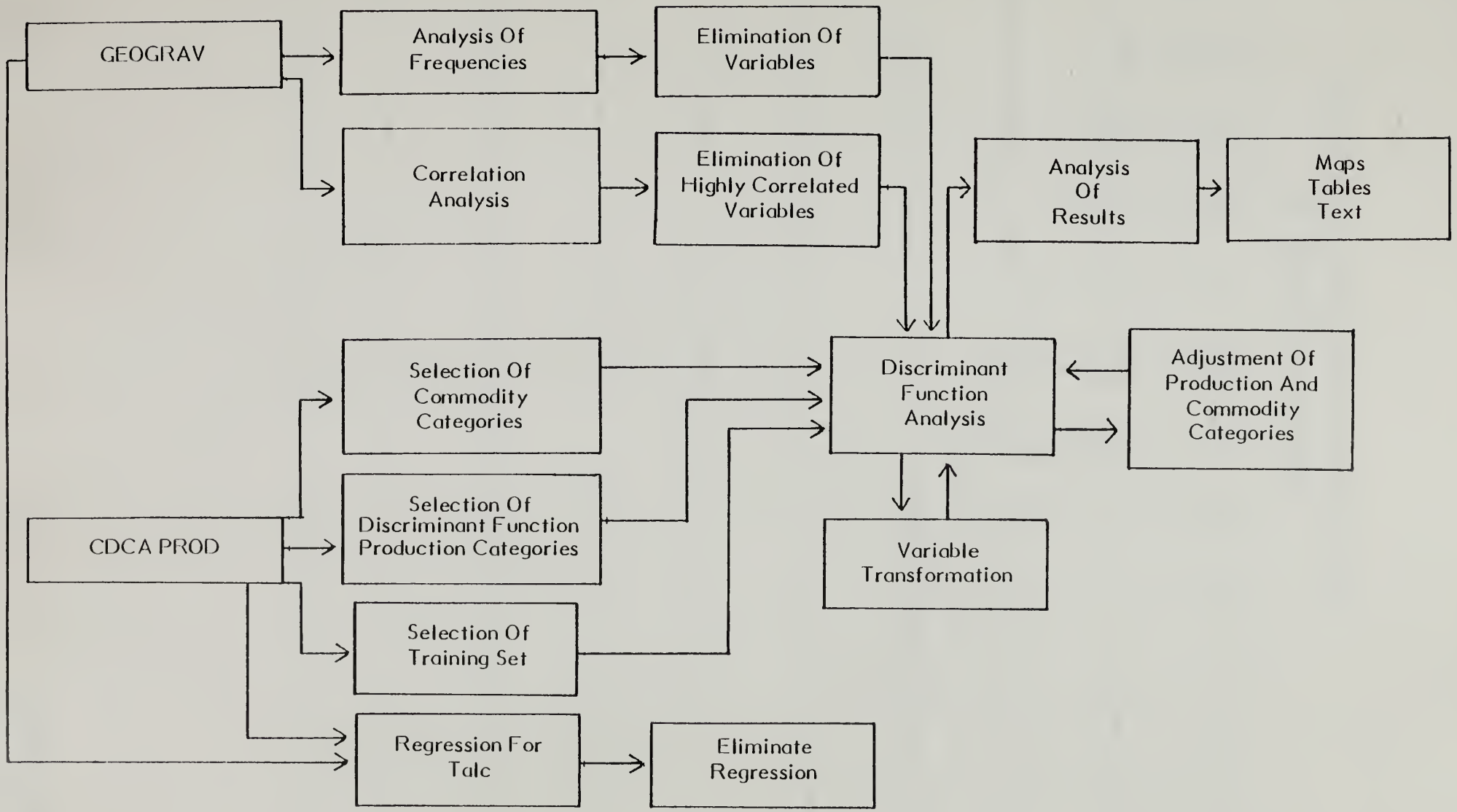
A. Principles

B. Final Selection of Geologic Variables
   1. Eliminate Low Frequency Variables
   2. Eliminate Variables With No Geologic Relevance
   3. Eliminate Highly Correlated Variables

C. Selection of Statistical Technique -
   Discriminant Function Analysis

D. Discriminant Function Analysis (DFA)
   1. Overview
   2. Cases Considered
      a. Commodity Categories
      b. Production Categories
   3. Training Sets
   4. Cases Selected
      a. Error And Significance Measures
      b. Statistical Interpretation
      c. Geologic Interpretation

FLOW CHART-GEOSTATISTICAL ANALYSIS



PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS

All Variables Untransformed

	V2	V3	V4	V5	V6	V9	V10	V11	V12	V13	V14	V15	V16
V1	0.10	-0.02	-0.02	-0.01	0.00	-0.01	-0.01	-0.06	-0.02	-0.01	-0.01	-0.01	-0.11
V2		0.00	-0.04	-0.03	-0.03	-0.02	0.00	-0.08	-0.07	-0.03	-0.02	-0.04	-0.31
V3			0.04	0.00	-0.03	-0.02	-0.02	-0.08	-0.04	-0.04	-0.02	-0.03	-0.18
V4				0.08	-0.02	-0.02	0.02	-0.06	-0.04	-0.02	-0.02	-0.04	-0.21
V5					-0.02	0.04	0.00	-0.02	-0.02	-0.03	-0.01	-0.03	-0.10
V6						-0.01	-0.01	0.01	-0.02	-0.03	-0.01	-0.03	-0.13
V9							0.01	-0.01	-0.02	0.00	-0.01	-0.02	-0.07
V10								0.04	-0.02	-0.02	0.02	-0.02	-0.07
V11									-0.10	-0.08	-0.03	-0.11	-0.49
V12										-0.05	-0.03	-0.08	-0.15
V13											0.02	0.04	-0.18
V14												0.16	-0.10
V15													-0.26
V16													
V17													
V18													
V19													
V20													
V32													
V34													
V35													
V36													
V37													
V38													
V39													
V40													

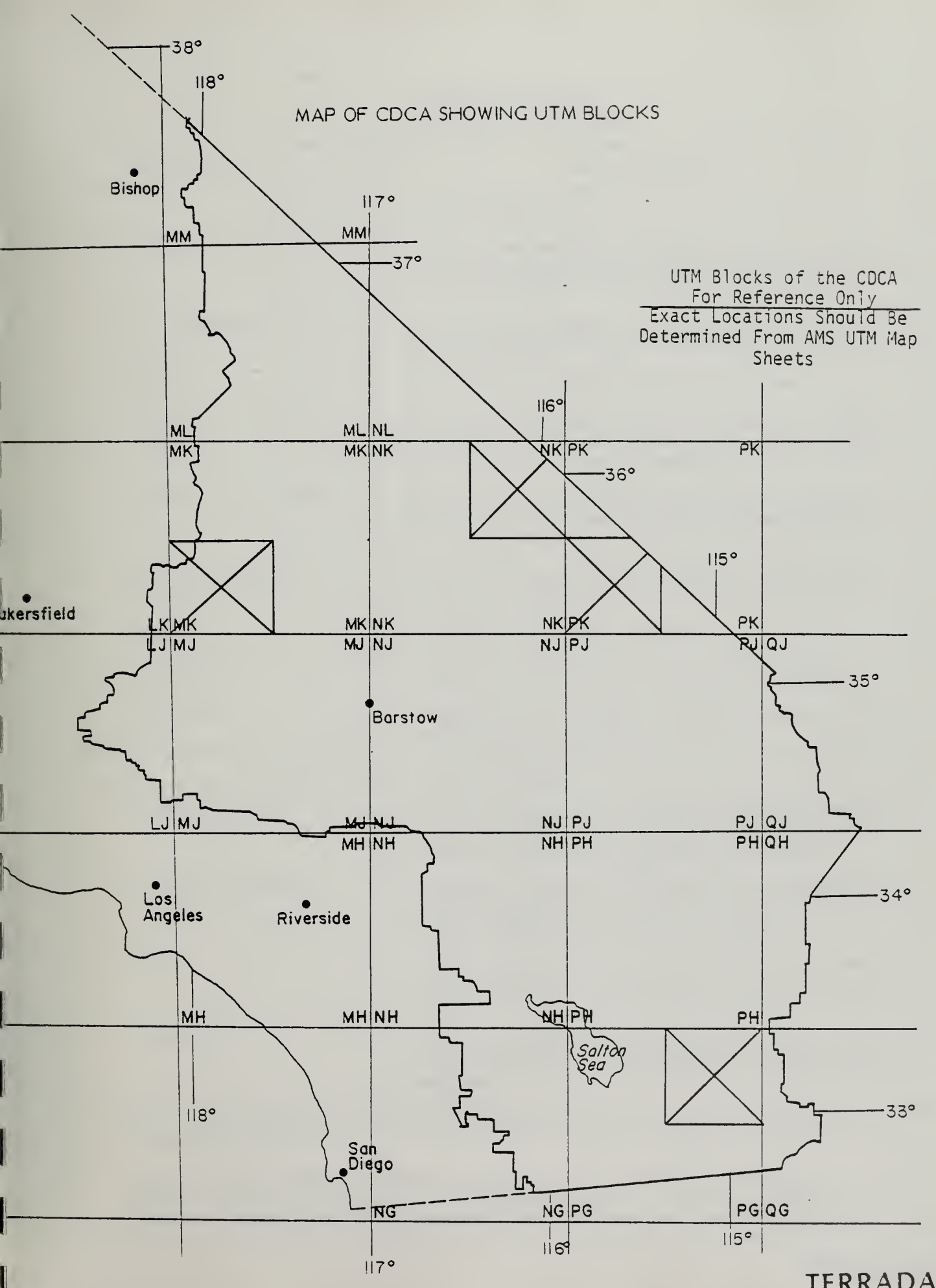
PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS

All Variables Untransformed

	V17	V18	V19	V20	V32	V34	V35	V36	V37	V38	V39	V40	V41
V1	-0.02	-0.01	0.45	-0.01	-0.01	-0.01	0.06	0.06	0.02	0.01	0.02	0.06	0.03
V2	-0.05	-0.05	0.25	-0.03	-0.02	-0.01	0.11	0.11	0.18	0.16	0.15	0.13	-0.01
V3	-0.03	-0.01	-0.02	-0.01	-0.01	-0.01	0.12	0.11	0.17	0.18	0.16	0.18	0.02
V4	0.00	0.00	-0.02	0.21	-0.02	-0.01	0.11	0.10	0.07	0.07	0.08	0.09	0.02
V5	0.03	0.01	-0.01	0.23	0.00	-0.01	0.03	0.03	0.07	0.07	0.05	0.05	0.01
V6	-0.03	-0.02	-0.01	-0.01	-0.01	-0.01	0.08	0.08	0.07	0.08	0.06	0.04	-0.04
V9	-0.02	-0.02	-0.01	0.01	0.00	0.00	0.00	0.00	0.04	0.05	0.08	0.02	0.03
V10	-0.02	-0.02	-0.01	0.05	0.00	0.01	-0.01	-0.01	0.04	0.04	0.02	0.00	0.01
V11	-0.02	-0.06	-0.04	0.12	0.09	-0.02	-0.04	-0.04	0.07	0.06	0.00	-0.03	-0.05
V12	-0.04	-0.04	-0.02	-0.02	-0.02	0.00	-0.02	-0.03	-0.09	-0.09	-0.06	-0.04	0.03
V13	-0.02	-0.03	0.00	-0.02	0.00	0.09	0.02	0.03	0.12	0.15	0.10	0.05	-0.04
V14	-0.01	-0.03	-0.01	0.00	0.24	0.25	-0.01	-0.01	0.05	0.05	0.04	-0.01	-0.01
V15	-0.02	-0.04	-0.02	0.00	0.01	0.03	-0.03	-0.03	0.10	0.10	0.08	-0.01	0.03
V16	-0.14	-0.21	-0.11	-0.13	-0.06	-0.03	-0.09	-0.09	-0.27	-0.27	-0.20	-0.13	0.01
V17		-0.03	-0.02	0.00	-0.01	0.00	-0.02	-0.02	-0.04	-0.05	-0.01	-0.01	0.02
V18			-0.02	0.00	0.00	-0.01	-0.02	-0.02	-0.08	-0.07	-0.04	-0.04	0.00
V19				-0.01	-0.01	-0.01	0.03	0.03	0.02	0.01	0.00	0.04	0.03
V20					0.00	-0.01	0.01	0.00	0.03	0.04	0.03	0.02	-0.01
V32						0.02	-0.01	-0.01	0.02	0.02	0.01	-0.01	-0.09
V34							-0.01	-0.01	0.00	0.01	0.00	0.00	-0.04
V35								0.96	0.12	0.13	0.35	0.74	0.03
V36									0.12	0.13	0.37	0.75	0.03
V37										0.95	0.63	0.24	-0.03
V38											0.68	0.26	-0.02
V39												0.36	0.01
V40													0.03

PRELIMINARY COMMODITY CATEGORIES

1. Lead, Silver, Zinc or Copper
2. Gold
3. Iron or Manganese
4. Copper
5. Lead, Silver, Zinc, Copper or Gold
6. Tungsten


MAP OF CDCA SHOWING UTM BLOCKS
UTM Blocks of the CDCA
For Reference Only
Exact Locations Should Be
Determined From AMS UTM Map
Sheets
38°
118°
117°
116°
115°
37°
36°
35°
34°
33°
Bishop
Barstow
Los Angeles
Riverside
San Diego
Salton Sea
MM
ML NL
MK NK
NK PK
PK
LK MK
LJ MJ
MJ NJ
NJ PJ
PJ QJ
MH NH
PH QH
NG PG
PG QG

TERRADATA

CASES CONSIDERED
DISCRIMINANT ANALYSIS[a]

Name of Run	Brief Description
	Two-Category Runs
GOLD NO TRANSF.	High and low probability of occurrence of gold. Unlike other runs, this run does not use transformations on the geologic variables to make them more nearly normal.
GOLD MINRESID	High and low probability of occurrence of gold, with discriminant function found by minimizing $(1 + D^2/4)^{-1}$.
GOLD	High and low probability of occurrence of gold.
HYDRO W/GOLD[b]	High and low probability of occurrence of any of the following: gold, lead, silver, zinc, copper, either individually or in any combination.
HYDRO W/O GOLD[b]	High and low probability of occurrence of any of the following: lead, silver, zinc, copper, either individually or in any combination.
IRON-MANGANESE	High and low probability of occurrence of either iron or manganese, or both.
COPPER	High and low probability of occurrence of copper.
TUNGSTEN	High and low probability of occurrence of tungsten.
HYDWOGP	Production or no known production of any of the following: lead, silver, zinc, copper.
	Three-Category Runs
HYDRO W/GOLD[b]	Occurrence valued at under $50,000, occurrence valued at over $50,000, or low probability of occurrence of any of the following: gold, lead, silver, zinc, copper.
HYDRO W/O GOLD[b]	Occurrence valued at under $50,000, occurrence valued at over $50,000, or low probability of occurrence of any of the following: lead, silver, zinc, copper.
GOLD	Occurrences valued at under $50,000, occurrence valued at over $50,000, or low probability of occurrence of gold.
TUNGSTEN	Occurrence valued at under $50,000, occurrence valued at over $50,000, or low probability of occurrence of tungsten.

(a) Unless otherwise indicated, the discriminant function is found by maximizing the Mahalanobis distance.

(b) The name "HYDRO" has been used informally here to designate those classes of ore deposits commonly referred to as "hydrothermal", and in this case, specifically, to deposits of copper, lead, zinc and silver occurring individually or in any combination.

TEST OF SIGNIFICANCE OF SEPARATION BETWEEN THE MEANS
IN TWO-CATEGORY DISCRIMINATION[a],[b]

Name of Run	n_1	n_2	k	D^2	F^o	$F_{.05}$	$F_{.01}$
GOLD MINRESID[c]	40	572	10	1.39	5.12	1.85	2.36
GOLD NO TRANSF[d]	40	572	10	1.41	5.19	1.85	2.36
GOLD	40	572	10	1.39	5.12	1.85	2.36
Gold, Lead, Silver, Zinc, Copper (HYDRO W/GOLD)	86	526	13	1.26	7.02	1.74	2.17
Lead, Silver, Zinc, Copper (HYDRO W/O GOLD)	56	556	16	1.58	4.90	1.37	1.54
HYDWOGP	25	587	13	2.21	4.00	1.74	2.17
IRON-MANGANESE	13	599	8	2.15	3.37	1.69	2.07
COPPER	25	587	10	1.95	4.61	1.85	2.36
TUNGSTEN	21	591	8	2.07	5.19	1.69	2.07

(a) The F-test has been used as discussed on the previous page. When F^o exceeds $F_{.05}$, the separation between the means is significant at the 95 percent confidence level. When F^o exceeds $F_{.01}$, the separation is significant at the 99 percent level. As shown in the table, the separation between the means is significant at the 99 percent confidence level in all cases.

(b) Except for case GOLD MINRESID discriminators where chosen by maximizing D^2.

(c) Here, discriminators were chosen by minimizing $(1 + D^2/4)^{-1}$.

(d) In this case, the discriminators were not transformed to approach normality.

RESULTS OF F-TEST FOR THREE-CATEGORY DISCRIMINATION[a],[b]

Name of Run	Categories Compared	n_1	n_2	n_3	k	D^2	F^o	Confidence Level .05	Confidence Level .01
Lead, Silver, Zinc, Copper (HYDRO W/O GOLD)	1, 2	52	4		18	5.00	0.71	1.83	2.38
	1, 3	52		556	18	1.55	3.98	1.58	1.88
	2, 3		4	556	18	5.24	1.12	1.58	1.88
Gold, Lead, Silver, Zinc, Copper (HYDRO W/GOLD)	1, 2	72	14		16	2.37	1.43	1.79	2.28
	1, 3	72		526	16	1.23	4.75	1.67	2.03
	2, 3		14	526	16	2.57	2.13	1.67	2.03
GOLD	1, 2	29	11		12	2.07	0.98	2.13	2.93
	1, 3	29		572	12	1.45	3.27	1.78	2.22
	2, 3		11	572	12	2.14	1.89	1.78	2.22
TUNGSTEN	1, 2	19	2		6	4.35	0.97	2.85	4.46
	1, 3	19		591	6	2.11	6.42	2.12	2.83
	2, 3		2	591	6	4.30	1.42	2.12	2.83

(a) The F-test guarantees a certain confidence level when F^o exceeds the value of F associated with that level.

(b) Discriminators were chosen by maximizing D^2.

FIRST PARTIAL APPARENT ERROR RATE P_1 FOR TWO-CATEGORY RUNS[a],[b]

Name of Run	Number n_1 of Cells In Category 1	P_1
GOLD	40	.375
GOLD - MINRESID	40	.375
GOLD NO TRANSF	40	.375
HYDRO W/GOLD	86	.326
HYDRO W/O GOLD	56	.304
IRON - MANGANESE	13	.385
COPPER	25	.480
TUNGSTEN	21	.429

(a) P_1 is the fraction of training cells in category 1 predicted by the discriminant analysis to be in category 2.

(b) HYDWOGP is not included in this table.

DFA RESULTS FOR GOLD

Training Cells Correctly and Incorrectly Classified

	Actual	Correctly Classified By DFA	Incorrectly Classified By DFA
Occurrence	40	25 (62.5%)	15 (37.5%)
No Known Occurrence	572	471 (82.3%)	101 (17.7%)
Total	612	496 (81.0%)	116 (19.0%)

DFA RESULTS FOR GOLD[a]

DFA VARIABLES

Number	Variable Name	F Value[b]
2	Precambrian metamorphics	22.7
19	Contact of Precambrian granite with Precambrian metamorphics	18.1
11	Mesozoic granite and Pre-Cenozoic granite and metamorphics	16.3
13	Tertiary sediments	4.5
37	Length of non-thrust faults	3.3
41	Bouguer gravity	3.2
39	Number of fault intersections	2.8
10	Mesozoic basic intrusives	2.7
20	Contact of Mesozoic granite with Paleozoic sedimentary rocks	2.4
14	Tertiary intrusives	2.1

[a] Geological variables are ranked in decreasing order of their contribution to the discrimination process.

[b] F Value is a measure of the relative contribution of the variable to the discriminant function (77).

DFA RESULTS FOR GOLD

Known Deposits In Low Probability Cells*

Production Category Of Known Deposit	Number In CDCA	Number In Low Probability Cell (Percentage Of Total)
0	166	3 (1.8%)
1	400	15 (3.7%)
2	172	13 (7.6%)
3	46	7 (15.2%)
4	22	5 (22.7%)
TOTAL	806	43 (5.3%)

* Cells classified as 10 percent or less of probability occurrence.

Production Categories:

0 = Occurrence

1 = Workings, but no production

2 = Production under $50,000

3 = Production between $50,000 and $500,000

4 = Production over $500,000

GEOLOGIC SETTING OF SELECTED GOLD DEPOSITS
IN INYO AND SAN BERNARDINO COUNTIES (1, 2)*

NAME OF MINE OR PROSPECT	GEOLOGIC SETTING	POSSIBLE STATISTICAL VARIABLE
Inyo County		
Arando Mine	Quartz-bearing shear zone in granitic rocks	11
Ashford Mine	Veins in granite gneiss	2 & 11
Burro and Mary F. Claims	Quartz veins in schist	2
Corona Mine	Quartz veins, contact of schist with granite	2 & 19
Del Norte Group	Fractured quartzite	2
Independent Mine	Quartz masses in Precambrian dolorite adjacent to diorite intrusive	2, 19, 11
Skidoo Mine	Brecciated diorite sill intrusive into limestone and quartzite	2, 19, 11
Sunset Mine	Quartz vein in quartz monzonite associated with granitic dike	11
San Bernardino County		
Alvord Mine	Quartz vein in crystalline limestone in contact with granite	2, 19, 11
Brannigan Mine	Quartz veins in Precambrian quartzite	2
Oro Fino Mine	Siliceous shoots in Precambrian quartzite schist and dolomite	2
Williams Well Placers	"Placer" mining of weathered granite mantle	13

* Only representative examples of each setting are listed, in as much as many deposits occur in similar geologic settings.

DFA RESULTS FOR COMBINED LEAD, SILVER, ZINC AND COPPER

Training Cells Correctly and Incorrectly Classified

	Actual	Correctly Classified By DFA	Incorrectly Classified By DFA
Production of $50,000 or more	4	3 (75.0%)	1 (25.0%)
Occurrence, but production less than $50,000	52	32 (61.5%)	20 (38.5%)
No Reported Occurrence	556	477 (85.8%)	79 (14.2%)
Total	612	512 (83.7%)	100 (16.3%)

DFA RESULTS FOR COMBINED COPPER-LEAD-ZINC-SILVER[a]
DFA VARIABLES

Number	Variable Name	F Value[b]
4	Ordovician through Mississippian marine sediments	31.2
32	Contact Tertiary intrusives (14) with Mesozoic granite (11)	14.7
2	Precambrian metamorphics	14.1
1	Precambrian granite	13.3
14	Tertiary intrusives	9.4
20	Contact Mesozoic granite (11) with Paleozoic sediments (4 and 5)	6.6
5	Pennsylvanian and Permian marine sediments	5.6
3	Cambrian and Precambrian sediments	4.7
11	Mesozoic granite and pre-Cenozoic granite and metamorphics	4.2
41	Bouguer gravity	3.6
19	Contact Precambrian granite (1) with Precambrian metamorphics (2)	3.3
40	Curvature of faults	2.9
39	Number of fault intersections	2.7
36	Number of thrust faults	1.9

[a] Geological variables are ranked in decreasing order of their contribution to the discrimination process.

[b] F Value is a measure of the relative contribution of the variable to the discriminant function (77).

DFA RESULTS FOR COMBINED LEAD, SILVER, ZINC, AND COPPER

Known Deposits In Low Probability Cells*

Production Category Of Known Deposit	Number In CDCA	Number In Low Probability Cell (Percentage Of Total)
0	160	11 (6.9%)
1	280	18 (6.4%)
2	148	8 (5.4%)
3	30	1 (3.3%)
4	9	0 (0.0%)
TOTAL	627	38 (6.1%)

* Cells classified as 10 percent or less probability of occurrence.

Production Categories:

0 = Occurrence

1 = Workings, but no production

2 = Production under $50,000

3 = Production between $50,000 and $500,000

4 = Production over $500,000

GEOLOGIC SETTING OF SELECTED COPPER, LEAD, SILVER AND ZINC MINES AND PROSPECTS IN INYO AND SAN BERNARDINO COUNTIES

MINE OR PROSPECT	COMMODITIES PRESENT OR PRODUCED	GEOLOGIC SETTING	POSSIBLE STATISTICAL VARIABLE
Inyo County			
Sally Ann Mine	Copper	Contact quartz monzonite with Paleozoic metamorphics	20
Argenta Mine	Lead - zinc	Contact of limestone with schist and quartzite	4 & 2
Cerro Gordo Mine	Lead, zinc, silver	Devonian quartzite and marble	4
Darwin District	Lead, silver, zinc, copper	Pennsylvanian limestone, shale, quartzite intruded by granodiorite	20 & 5
Empress Mine	Silver, zinc, copper	Quartz vein in granite, near contact with limestone	4 & 20
Lippincott Mine	Lead, zinc, silver	Siliceous veins in dolomite	4
San Bernardino County			
Blue Bell Mine	Lead, silver, copper	Veins in limestone near intrusive contact with granite	4 & 20
Gold Hill Group	Silver, lead	Quartz veins in brecciated schist and gneiss	2

DFA RESULTS FOR IRON AND MANGANESE

Training Cells Correctly and Incorrectly Classified

	Actual	Correctly Classified By DFA	Incorrectly Classified By DFA
Occurrence	13	8 (61.5%)	5 (38.5%)
No Known Occurrence	599	548 (91.5%)	51 (8.5%)
Total	612	556 (90.8%)	56 (9.2%)

DFA RESULTS FOR IRON AND MANGANESE[a]

DFA VARIABLES

Number	Variable Name	F Value[b]
14	Tertiary igneous intrusives	25.3
2	Precambrian metamorphics	13.1
34	Contact of Tertiary sediments and Tertiary igneous intrusives	8.5
32	Contact between Tertiary igneous intrusives and Mesozoic granitic intrusives	5.6
15	Tertiary volcanics	3.3

[a] Geological variables are ranked in decreasing order of their contribution to the discrimination process.

[b] F Value is a measure of the relative contribution of the variable to the discriminant function (77).

DFA RESULTS FOR IRON AND MANGANESE

Known Deposits In Low Probability Cells*

Production Category Of Known Deposit	Number In CDCA	Number In Low Probability Cell (Percentage Of Total)
0	55	30 (54.5%)
1	76	33 (43.4%)
2	40	19 (47.5%)
3	4	4(100.0%)
4	3	1 (33.3%)
TOTAL	178	87 (48.9%)

* Cells classified as 10 percent or less probability of occurrence.

Production Categories:

0 = Occurrence

1 = Workings, but no production

2 = Production under $50,000

3 = Production between $50,000 and $500,000

4 = Production over $500,000

VI. RECOMMENDATIONS

A. Incorporate Additional Data (Especially LANDSAT)

B. Refine Technique

C. Perform Local Studies