U.S. DEPARTMENT OF THE INTERIOR
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PRELIMINARY QUATERNARY GEOLOGIC MAPS OF SANTA CLARA VALLEY, SANTA CLARA, ALAMEDA, AND SAN MATEO COUNTIES, CALIFORNIA: A DIGITAL DATABASE

By

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Introduction

This digital map database, which is compiled from previously unpublished and open-filed U.S. Geol. Survey reports (Wesling and Helley, 1989), represents the general distribution and identity of Quaternary deposits in eight 7.5 minute quadrangles in the southern San Francisco Bay region, California (Figure 1). Together with the accompanying text file (scgeo.txt), it provides current information on the Quaternary geology of the area covered. The database delineates map units that are identified by general age and lithology following the compilation sources. One bedrock unit, the Santa Clara formation, is differentiated but the other bedrock units are combined and are not identified. More specific information about the units may be available in the original Open-file reports. The scale of the source maps limits the spatial resolution (scale) of the database to 1:24,000 or smaller. The content and character of the database are described herein. Two methods of obtaining the database are described hereafter.

Database Contents

The Quaternary geologic digital database itself consists of eight ARC coverages:

cal_utm	Quaternary geology of Calaveras Reservoir quadrangle
cup_utm	Cupertino quadrangle
mil_utm	Milpitas quadrangle (Helley and Wesling, 1989)
mtv_utm	Mountain View quadrangle
pal_utm	Palo Alto quadrangle
sje_utm	San Jose East quadrangle (Helley and Wesling, 1990)
sjw_utm	San Jose West quadrangle (Wesling and Helley, 1989)
sth_utm	Santa Teresa Hills quadrangle

The database directory also includes the following directories, ARC coverages, and files:

	info/	INFO directory containing files supporting the databases
	explsc_utm	
and	explsc_ano	Together, these ARC coverages produce a plottable or displayable map explanation and key.
	corr_utm	
and	corr_ano	Together, these ARC coverages contain a correlation table for the units in these maps.
	scc_dr	Drainage base map.
	scc_cu	Cultural base map.
	scc_topo	Topographic contours base map.
	scgeo.txt	A text file containing detailed unit descriptions and geological information.
	scdb.txt	Text file of this report, without figures.
	scmap.ps	A Postscript plottable file containing an image of the Quaternary geologic maps of all eight quadrangles, base maps, and map explanation at a scale of 1:50,000.

The database was compiled in ARC/INFO, a commercial Geographic Information System (Environmental Systems Research Institute, Redlands, California), and is stored in ARC coverage format (ARC/INFO version 6) in a UNIX tar file. A UNIX computer

system is therefore required to extract the database from the tar file, and ARC/INFO is required for its use or conversion to other format. The digital compilation was done using version 6.1.1 of ARC/INFO with version 2.0 of the menu interface ALACARTE (Fitzgibbon and Wentworth, 1991, Fitzgibbon, 1991, Wentworth and Fitzgibbon, 1991).

Obtaining the Digital Data

A 8.5 MB compressed tar file of the database and related files can be obtained by anonymous ftp over Internet, or by sending a tape with request and return address to:

Santa Clara Quaternary Database
c/o Carl M. Wentworth
U.S. Geological Survey
345 Middlefield Road, M/S 975
Menlo Park, CA 94025

Do not omit any part of this address

The compressed tar file will be returned on the tape. The acceptable tape types are:
1/4 inch, 150 MB cartridge tape
2.3 or 5.0 GB, 8 mm Exabyte tape.

To obtain the tar file by ftp, log in to your UNIX system and do the following:

cd local_directory	-go to a directory to receive the tar file
ftp sierra.wr.usgs.gov	-make ftp connection with the USGS computer Sierra
Name: anonymous	-use "anonymous" as your user name
Password: your name	-use your own user name as password
cd pub	-go down to the pub directory
type binary	-change transfer type to binary
get scc_q1.tar.Z	-copy the compressed tar file across Internet to your directory
quit	-close the ftp connection

Extracting the Database from the Tar file

If you obtained the database on tape:

put the tape in your tape drive	
cd local_directory	-go to a directory to receive the tar file
tar xvfb /dev/rstn 20	-/dev/rstn is the tape device with n an integer this puts the tar file in local_directory
uncompress scc_q1.tar.Z	-makes a 20 MB uncompressed tar file scc_q1.tar
cd local_directory2	-go to the directory that will hold the workspace sccq (if different from local_directory)
tar xvfb {path to tar file}/scc_q1.tar 20	-extract the sccq workspace from the tar file.

If you obtained the database by anonymous ftp:

uncompress scc_q1.tar.Z	-makes a 20 MB uncompressed tar file scc_q1.tar
cd local_directory2	-go to the directory that will hold the workspace sccq (if different from local_directory)
tar xvfb {path to tar file}/scc_q1.tar 20	-extract the sccq workspace from the tar file.

This process will create a workspace "/sccq" (a directory containing an INFO directory) that contains the databases and supporting files as described above.

Digital Compilation

The geologic map information was digitized from stable originals of the geologic maps at 1:24,000 scale. The author manuscripts (ink on mylar) were scanned using a Tektronix 4991 monochrome scanner with a resolution of 304.8 dots per inch. The scanned images were vectorized and transformed from scanner coordinates to projection coordinates with digital tics placed by hand at quadrangle corners. The scanned lines were edited interactively by hand using ALACARTE, color boundaries were tagged as a contact or fault as appropriate, and scanning artifacts visible at 1:24,000 were removed. Quadrangle boundaries are included in each coverage to retain the integrity of units in each quadrangle, except in cal_utm where a large area of undifferentiated bedrock was placed outside the map boundary to allow convenient placement of the map explanation.

Base Maps

Base Map layers were prepared from scale-stable printing negatives of the U.S. Geological Survey Palo Alto (1982 edition) and San Jose (1978 edition) 1:100,000 topographic maps. Scanned and vectorized images were transformed from scanner coordinates to projection coordinates with digital tics placed by hand at map corners. The images were then trimmed interactively by hand using ALACARTE to conform to the area of the geologic coverages, and the Palo Alto and San Jose portions were combined. Small mismatches at the San Jose - Palo Alto boundary caused by slight differences in the original scans remain in the three base map coverages. These base map layers are digital images but no information other than location is attached to the lines.

Faults and Landslides

Faults are distinguished in the database only where they are at or near unit boundaries and the database cannot be used to identify or delineate active faults in the region. Similarly, the database cannot be used to identify or delineate most landslides in the region, because only one large landslide, in San Jose East quadrangle, is shown.

Spatial Resolution

Uses of this digital geologic map should not violate the spatial resolution of the data. Although the digital form of the data removes the constraint imposed by the scale of a paper map, the detail and accuracy inherent in map scale are also present in the digital data. The fact that this database was compiled from maps at a scale of 1:24,000 means that higher resolution information is not present in the dataset. Plotting at scales larger than 1:24,000 will not yield greater real detail, although it may reveal fine-scale irregularities below the intended resolution of the database. Similarly, where this database is used in combination with other data of higher resolution, the resolution of the combined output will be limited by the lower resolution of these data. Note that in contrast to the geologic coverages, the base map layers have a resolution of 1:100,000, so significant discrepancies with the geologic coverages are possible. The base map layers are provided for reference only.

Database Specifics

The map databases consist of ARC coverages and supporting INFO files, which are stored in a UTM (Universal Transverse Mercator) projection (Table 1). Digital tics define a 2.5 minute grid of latitude and longitude in the geologic coverages, the outermost tics corresponding with quadrangle corners. In the base map layers, the tics define a 7.5 minute grid, corresponding with quadrangle corners.

Table 1 - Map Projection
The map is stored in UTM projection

PROJECTION UTM	-Universal Transverse Mercator
UNITS METERS	-on the ground
ZONE 10	-UTM zone
PARAMETERS	
END	

The content of the geologic database can be described in terms of the lines and the areas that compose the map. Descriptions of the database fields use the terms explained in Table 2.

Table 2 - Field Definition Terms

ITEM NAME	name of the database field (item)
WIDTH	maximum number of digits or characters stored
OUTPUT	output width
TYPE	B-binary integer, F-binary floating point number, I-ASCII integer, C-ASCII character string
N. DEC.	number of decimal places maintained for floating point numbers

Lines -

The lines (arcs) are recorded as strings of vectors and are described in the arc attribute table (Table 3). They define the boundaries of the map units, faults that do not bound units, the boundaries of open bodies of water, and the map boundaries. These distinctions, including the geologic identities of the unit boundaries, are recorded in the LTYPE field according to the line types listed in Table 4.

Table 3 - Content of the Arc Attribute Tables

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
FNODE#	4	5	B		starting node of arc (from node)
TNODE#	4	5	B		ending node of arc (to node)
LPOLY#	4	5	B		polygon to the left of the arc
RPOLY#	4	5	B		polygon to the right of the arc
LENGTH	4	12	F	3	length of arc in meters
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
LTYPE	35	35	C		line type (see Table 4)

Table 4 - Line Types Recorded in the LTYPE Field

contact, certain
contact, approx. located
contact, concealed
fault, certain
fault, approx. located
fault, concealed
water boundary, certain
map boundary
ca. 1850 shoreline

The geologic linetypes are ALACARTE line types that correlate with the geologic line symbols in the ALACARTE line set ALCWRG.LIN according to the ALACARTE lines lookup table. The LTYPE "ca. 1850 shoreline" is a special linetype signifying the position of the Bay edge at the last high stand (the upper contact of Qhbm); no line symbol is assigned to it in the ALACARTE line set. Therefore, while differentiated in the database, this line plots as a contact when using the ALACARTE line set.

Areas -

Map units (polygons) are described in the polygon attribute table (Table 5) The identities of the map units from compilation sources are recorded in the PTYPE field by map label (Table 6). Map units are described more fully in the accompanying text file scgeo.txt.

Table 5 - Content of the Polygon Attribute Tables

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
AREA	4	12	F	3	area of polygon in square meters
PERIMETER	4	12	F	3	length of perimeter in meters
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
PTYPE	35	35	C		unit label

Table 6 - Map Units
(See scgeo.txt for descriptions of units)

GP - Gravel Pits
PP - Percolation Ponds
Qhsc - Stream Channel Deposits (Holocene)
Qhl - Natural Levee Deposits (Holocene)
Qhfp2 - Second Alluvial Terrace Deposits (Holocene)
Qhfp1 - First Alluvial Terrace Deposits (Holocene)
Qhfp - Floodplain Deposits (Holocene)
Qhb - Floodbasin Deposits (Holocene)
Qhbs - Salt-affected Floodbasin Deposits (Holocene)
Qhbm - Estuary Deposits (bay mud) (Holocene)
Qhaf1 - Younger Alluvial Fan Deposits (Holocene)
Qhaf - Alluvial Fan Deposits (Holocene)

Qls - Landslide Deposits (Pleistocene and Holocene)
Qpaf1 - Younger Alluvial Fan Deposits (Pleistocene)
Qpaf - Alluvial Fan Deposits (Pleistocene)
Qpoaf - Older Alluvial Fan Deposits (Pleistocene)
QTsc - Santa Clara Formation (Pliocene and Pleistocene)
br - Undifferentiated Bedrock (Pliocene and older)

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References Cited

Fitzgibbon, T.T., 1991, ALACARTE installation and system manual (version 1.0): U.S. Geological Survey, Open-File Report 91-587B.

Fitzgibbon, T.T., and Wentworth, C.M., 1991, ALACARTE user interface - AML code and demonstration maps (version 1.0): U.S. Geological Survey, Open-File Report 91-587A.

Helley, E.J., and Wesling, J.R., 1989, Quaternary Geologic Map of the Milpitas Quadrangle, Alameda and Santa Clara Counties, California: U.S. Geological Survey Open-File Report 89-671, scale 1:24,000.

Helley, E.J., and Wesling, J.R., 1990, Quaternary geologic map of the San Jose East Quadrangle, Santa Clara County, California; U.S. Geological Survey Open-File Report 90-427, scale 1:24,000.

Wentworth, C.M., and Fitzgibbon, T.T., 1991, ALACARTE user manual (version 1.0): U.S. Geological Survey, Open-File Report 91-587B.

Wesling, J.R., and Helley, E.J., 1989, Quaternary Geologic Map of the San Jose West Quadrangle, Santa Clara County, California: U.S. Geological Survey Open-File Report 89-672, scale 1:24,000.

Figure 1. Index map showing the location of the 8 quadrangles (ARC coverages) included in this digital database.