EXPLANATION

Aeromagnetic data area—Limit of high-resolution data coverage

Bedrock interpreted or penetrated at base of Santa Fe Group sediments—Color coded as indicated below. Quality of constraints available to make these interpretations differ by area, as shown in the index map. Boundaries are queried where poorly constrained

YLM#3

Well location—Color coded to indicate the bedrock lithology penetrated at the base of the Santa Fe Group, as indicated below. Label on well symbol refers to wells described in appendix 1, this publication

Interpreted unit	Well-bottom lithology	Description
		Tertiary older volcanic rocks—Generally represented by the Espinaso Formation south of Gallina Arroyo and along the mountain front from Seton Village to Santa Fe. Farther north along the mountain front, this unit is interpreted to include Espinaso equivalent volcaniclastic units and basaltic rocks, such as basalt found in the Castle Wigzell Kelly Federal #1 well (castlewig1) 5 km (3 mi) south-southwest of Chimayó (Koning and others, 2002). Generally northwest of Gallina Arroyo, the Cieneguilla volcanic complex overlies the Espinaso Formation. Although extrapolated for an extensive area of the deep basin in this interpretation map, the presence of this unit and underlying Espinaso Formation is not well constrained (index map). In the west-central part of the study area, magnetotelluric models show relatively conductive units at the base of interpreted Santa Fe Group. Some ambiguities exist in the interpretation of the conductor; it could represent Mesozoic Mancos or Chinle Formation at the top or middle of the pre-rift sedimentary section, respectively; Espinaso Formation within the package of Tertiary older volcanic rocks; or the clay-rich base of the Santa Fe Group (B.D. Rodriguez and D.A. Sawyer, USGS, oral commun., 2008). In the deep basin where constraints are poor, these rocks may be absent over Paleozoic limestones or locally over Precambrian basement
		Tertiary intrusive rocks—Intrusive rocks related to the Cerrillos intrusion. This unit can be definitively interpreted to underlie only one small area 3 km (1.9 mi) east of Los Cerrillos. Most of these rocks are included in the areas interpreted to have locally varying bedrock type
		Galisteo and Diamond Tail Formations, undivided—Clastic sedimentary rocks (late Paleocene and Eocene) interpreted in areas where these formations are exposed or penetrated by wells nearby. They are also included in the areas interpreted to have locally varying bedrock type
		Mesozoic sedimentary rocks, undivided—Sedimentary rocks (Mesozoic) penetrated by wells are indicated, although they are not distinguished from Paleozoic sedimentary rocks on the interpreted map. Mesozoic and Paleozoic rocks are interpreted primarily for the area near Eldorado at Santa Fe. They are also included in the areas interpreted to have locally varying bedrock type
		Paleozoic sedimentary rocks, undivided—Sedimentary rocks (Paleozoic) penetrated by wells are indicated, although they are not distinguished from Mesozoic sedimentary rocks on the interpreted map. Mesozoic and Paleozoic rocks are interpreted primarily for the area near Eldorado at Santa Fe. They are also included in the areas interpreted to have locally varying bedrock type
		Precambrian basement rocks—Crystalline rocks (Precambrian) interpreted in areas where these rocks are exposed or penetrated by wells nearby. Locally they may also directly underlie Santa Fe Group sediments in areas of the deep basin where constraints are poor
		Areas interpreted to have locally variable bedrock type—Local variations caused by complexities related to structure, deposition, or erosion so that individual units cannot be distinguished within the area. These complexities are exemplified where multiple bedrock types are exposed surrounding La Cienega (fig. 3, this publication) and penetrated in wells nearby, east of the town. The nature of these complexities is well illustrated by cross sections in Sawyer and others (2006) that cross the southwestern part of the study area

Not interpreted—Area where basin fill is absent

Not interpreted—Area of basin fill outside of the Española basin

Interpreted Cerrillos intrusion—Outline encompassing the bulk of rocks related to the Cerrillos intrusion; based on geophysical interpretations (plate 1, this publication)

Interpreted Rancho Viejo hinge zone—Zone where the three-dimensional model indicates that the basin floor abruptly descends to the north, accompanied by a pronounced thickening of the overlying Santa Fe Group sediments and a contrast in aeromagnetic patterns

500 **Isopach contours of modeled thickness of Santa Fe Group sediments**—Contour interval = 500 feet for thicknesses greater than 1,000 feet; contour interval = 100 feet for thicknesses less than 1,000 feet. Constructed by subtracting grids of the modeled base of Santa Fe Group sediments from a topographic surface. Because the topographic surface is more detailed than the model surface, insignificant detail related to the topography has been introduced. Digital grid of isopach thickness is available as part of this publication

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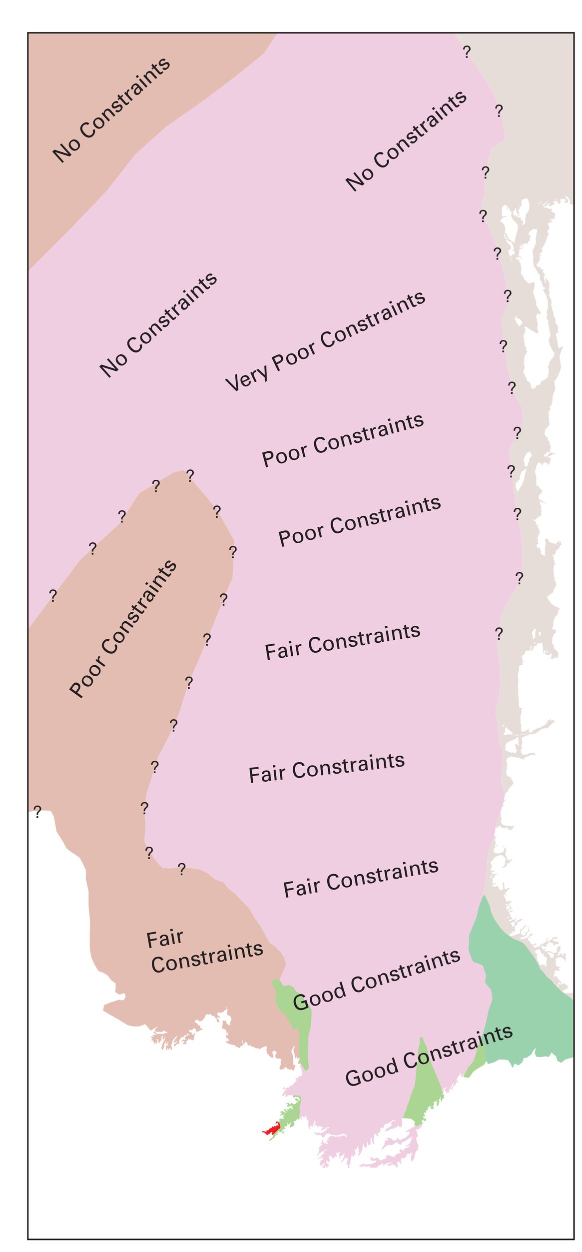

INDEX MAP SHOWING QUALITY OF CONSTRAINTS ON INTERPRETED ROCK TYPE

Geophysical interpretations from a three-dimensional model are depicted as colors representing inferred bedrock below basin fill and isopach contours of basin-fill thickness. The model was derived primarily by V.J.S. Grauch during 2007–2008 incorporating analysis of high-resolution aeromagnetic and regional gravity data and a variety of independent constraints. The interpretations build on earlier work by Grauch and Bankey (2003) and Phillips and Grauch (2004) but contain considerable new information and modifications to earlier models.

The updated geophysical data, methods, approach, sources of independent constraints, caveats, input models, and description of the model are described in detail in the text of this publication (Grauch and others, 2009). V.J.S. Grauch digitally merged high-resolution aeromagnetic data from surveys flown during 1997–2005 (section “Aeromagnetic Data”). She is also responsible for analysis, interpretation, and modeling that is not attributed otherwise, as follows.

J.D. Phillips designed and modified magnetic depth-estimation techniques specifically for this study (section “Magnetic Depth Estimation” and appendix 3). He also supplied computer programs and collaborated on general data analysis and magnetic interpretation.

D.J. Koning provided extensive guidance on geologic information, much of which is derived from his own mapping (sections “Geologic Setting” and “Other Data”).

P.S. Johnson provided locations, data, and assistance on interpreted lithology in wells that she and D.J. Koning compiled (section “Other Data” and appendixes 1 and 2). Bedrock types penetrated by many of these wells are indicated on this plate.

Viki Bankey compiled and rectified inconsistencies in gravity data available as of 2006 (section “Gravity Data”) and helped construct two-dimensional geophysical models (section “Profile Models”).

Additional independent constraints are in large part from unpublished sources (most recently from 2008) that are described in the text; they include physical-property measurements (section “Physical Properties”, table 2, and fig. 4) and other types of geophysical interpretations and well data (section “Other Data” and appendix 4).

GEOLOGIC UNITS INTERPRETED TO DIRECTLY UNDERLIE THE SANTA FE GROUP, SOUTHERN ESPAÑOLA BASIN, NEW MEXICO

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