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Date: June 30, 2006
Refer to: EP2006-0640

Mr. James Bearzi
NMED – Hazardous Waste Bureau
2905 Rodeo Park Road, Building 1
Santa Fe, NM 87505-6303

SUBJECT: SUBMITTAL OF GENERAL FACILITY INFORMATION COMPONENT #9 – HYDROGEOLOGIC SITE ATLAS

Dear Mr. Bearzi:

Enclosed are two hard copies with electronic files of the "2006 Hydrogeologic Site Atlas". This submittal fulfills the requirement for component #9 of the General Facility Information required by the Order on Consent (Consent Order).

The Consent Order requires "The Facility's existing Hydrogeologic Atlas, including water-level contour map of the regional aquifer and known radii-of-effects from pumping of municipal supply wells". The "2006 Hydrogeologic Site Atlas" does not specifically address effects from pumping of municipal supply wells. This information is not included because the original General Facility Information submittal in March 2005 stated that this requirement had been met by the January 27, 2005, Groundwater Level Data Submittal to NMED.

If you have any questions, please contact Mat Johansen at 665-5046 (mjohansen@doeal.gov) or Ardyth Simmons at 665-3935 (asimmons@lanl.gov).

Sincerely,

for Andrew Phelps, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David Gregory, Federal Project Director
Department of Energy
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AP/JD/ew

Enlosure: Two hardcopies and two electronic files of the "2006 Hydrogeologic Site Atlas"

14169

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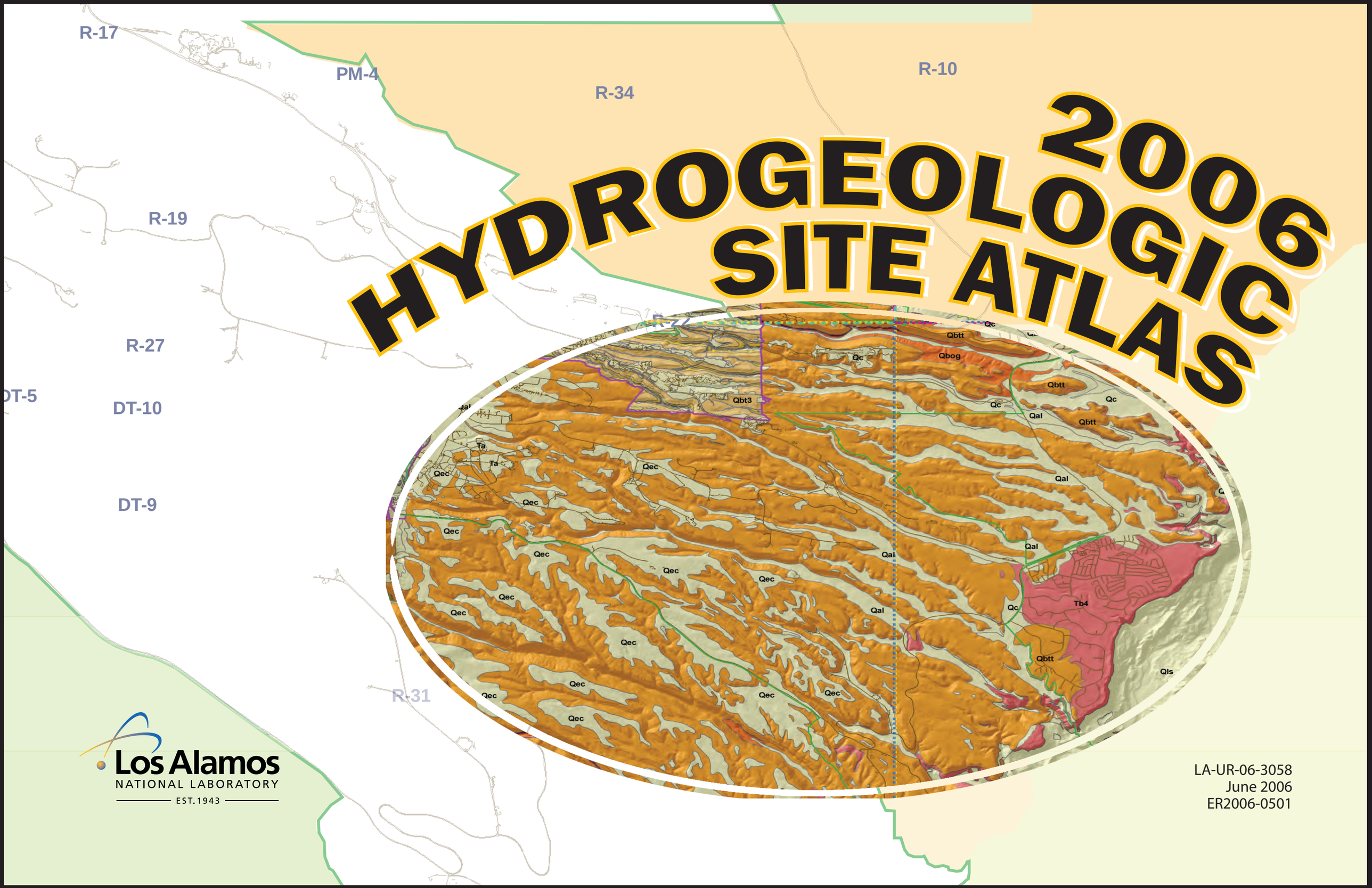
2006 HYDROGEOLOGIC SITE ATLAS



Los Alamos
NATIONAL LABORATORY
EST. 1943

LA-UR-06-3058
June 2006
ER2006-0501

Prepared by Environmental Programs–Water Stewardship Project

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LA-UR-06-3058
ER2006-0501

2006 Hydrogeologic Site Atlas

June 2006

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2006 Hydrogeologic Site Atlas for Los Alamos National Laboratory

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ABSTRACT

This report represents an update to the 2001 Hydrogeologic Site Atlas (Stone et al. 2001, 69830), incorporating the 2005 geologic framework model for the Pajarito Plateau. The 2005 geologic framework model represents a major upgrade to the previous model, incorporating new surface contact data from recently completed geologic quadrangle mapping and GPS-based mapping, as well as new subsurface contact data obtained from the characterization and monitoring wells of the Laboratory's Environmental Programs–Water Stewardship Project. The atlas contains a description of the stratigraphy of the Pajarito Plateau as well as a series of geologic and hydrogeologic maps, including a base map, surface geologic maps, structure contour and thickness maps for each stratigraphic unit, a structural block model and fault map, a water table map, a map of geology at the water table, hydrogeologic cross sections, and electrical resistivity cross sections.

1.0 INTRODUCTION

Los Alamos National Laboratory is located on the Pajarito Plateau, along the eastern flank of the Jemez Mountains in north-central New Mexico (Figure 1-1.). A preliminary hydrogeologic site atlas for the Laboratory was prepared in 1999 using the 1998 3-D geologic model (Stone et al. 1999, 64039), and an expanded version was prepared in 2001 using the 1999 3-D geologic model (Stone et al. 2001, 69830). The basis for this hydrogeologic site atlas is a recently completed 3-D geologic model of the Pajarito Plateau (Cole et al. 2006, in preparation).

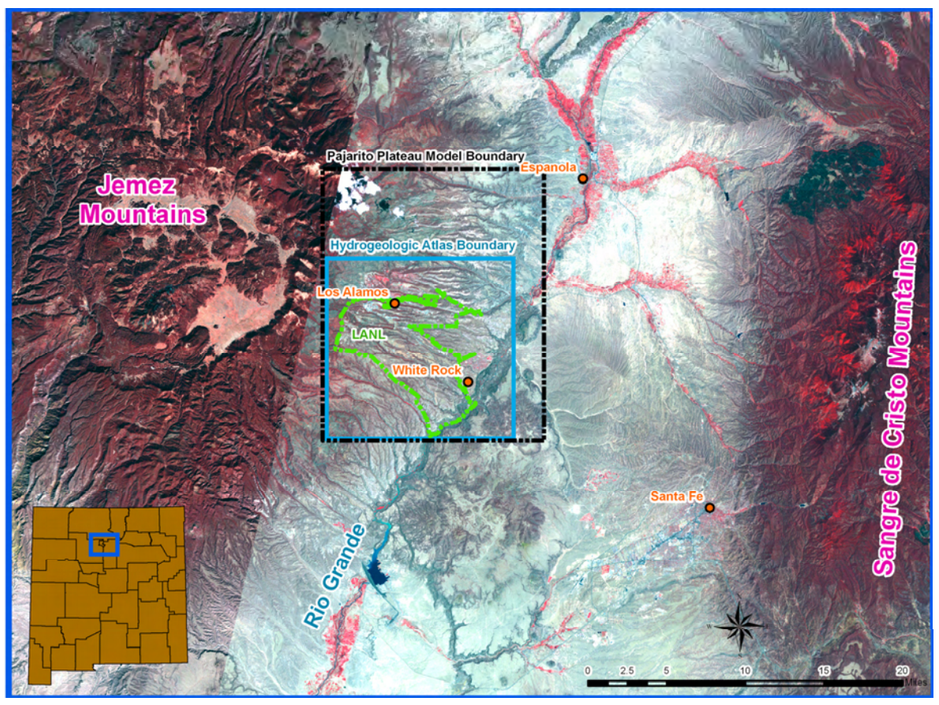

Figure 1-1. Location of Los Alamos National Laboratory. The Pajarito Plateau 3-D geologic model boundary is shown in black; the hydrogeologic site atlas boundary is shown in turquoise.

1.1 Purpose

Hydrologists, modelers, and environmental scientists at the Laboratory need various kinds of hydrogeologic information to perform their work. Maps that show subsurface geology are especially useful in predicting drilling conditions, describing hydrostratigraphic units, formulating conceptual hydrogeologic models, and providing the spatial controls necessary for assigning physical hydrogeologic properties for groundwater flow and contaminant transport modeling. In addition, maps that show infiltration, water levels, and the geology at the water table help workers conceptualize the hydrologic system (Stone et al. 1999, 69830; Stone et al. 2001, 64039; Cole et al. 2006, in preparation). Cross sections showing geology, perched water zones, and electrical resistivity further aid in interpretation of the hydrogeology of the Pajarito Plateau. The hydrogeologic site atlas presents this information graphically, in one place, in a manageable format.

1.2 Scope

The maps in this atlas cover the most well-constrained portion of the Pajarito Plateau 3-D geologic model, including Los Alamos National Laboratory and the surrounding area (Figure 1-1.). The atlas of 102 plates includes (1) a base map showing characterization wells, water supply wells, and other wells or boreholes important in constraining the 3-D geologic model, as well as land ownership; (2) maps showing both mapped and modeled surface geology; (3) a map showing the structural block model and mapped faults; (4) structure contour and thickness maps for each unit present in the 2005 3-D geologic model; (5) a map of the elevation of the regional water table produced for the 2006 General Facility Information report (LANL 2006, 92528); (6) a map of the geology at the water table; (7) cross sections of the model depicting geology as well as the location of the water table and any perched water zones encountered; and (8) maps and cross sections showing the results of direct-current resistivity surveys conducted from 2002 through 2005 in canyons throughout the Laboratory.

2.0 FY2005 PAJARITO PLATEAU 3-D GEOLOGIC MODEL

The fiscal year 2005 (FY2005) 3-D geologic model of the Pajarito Plateau is the latest in a series of 3-D geologic models that have evolved over the past 10 years. The 2005 3-D geologic model represents a major upgrade of the 2002 model, incorporating new surface contact data from recently completed geologic quadrangle mapping and GPS-based mapping, as well as new subsurface contact data obtained from the characterization and monitoring wells of Laboratory's Environmental Programs–Water Stewardship Project. Additional new data include ages of the fanglomerate units and newly identified outcrops of older dacitic volcanic units in the north-central Pajarito Plateau. The model is constructed through a process of hand contouring of all available data, followed by extensive processing using ArcInfo (Cole et al. 2006, in preparation).

2.1 Stratigraphic Framework of the Pajarito Plateau

The stratigraphic sequence of rock units of the Pajarito Plateau is shown in Figure 2-1, as well as their correlation to the hydrogeologic units used in the 3-D geologic model. The hydrogeologic units included in the 2005 3-D geologic model are described briefly below, from oldest to youngest.

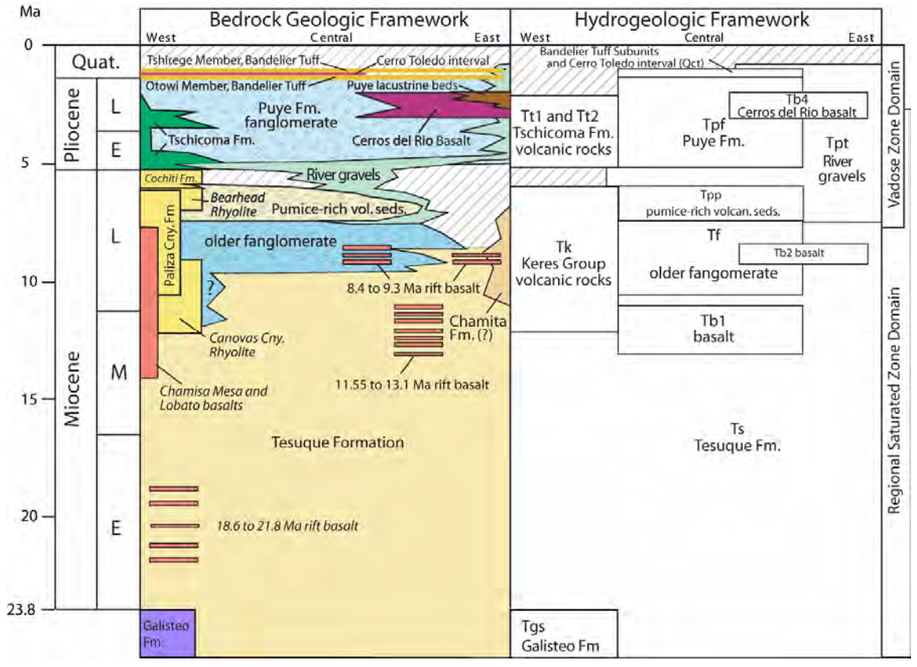

Figure 2-1. Pajarito Plateau stratigraphy and hydrogeologic units. The bedrock geologic framework shows the stratigraphy of the plateau and the adjacent Sierra de los Valles. Units with italicized names are not exposed or penetrated by boreholes in the immediate vicinity of the plateau, but they are coeval units of the Jemez volcanic field that may be important source rocks for plateau deposits. The hydrogeologic framework shows units that are defined for sitewide hydrogeologic modeling and are included in the 3-D geologic model and this atlas. Modified from Broxton and Vaniman (2005, 90038).

2.1.1 Galisteo Formation (Tgs)

The Eocene Galisteo Formation is the oldest unit included in the 3-D geologic model. It consists of orange to tan to brick red beds of well-indurated sandstone, siltstone, arkose, and conglomerate (Goff et al. 2002, 88776). The Galisteo Formation crops out only in uplifted fault blocks in the extreme southwest corner of the model, and is unconformably overlain by sandstone of the Santa Fe Group. None of the wells on the plateau were deep enough to penetrate the Galisteo Formation, if present (Cole et al. 2006, in preparation).

2.1.2 Santa Fe Group, Tesuque Formation (Ts)

The Tesuque Formation is composed mainly of thick, west-tilting Miocene fluvial deposits derived from Precambrian rocks of the Sangre de Cristo Range and Tertiary intermediate to felsic volcanic rocks of northern New Mexico and possibly southern Colorado (Cavazza 1989, 21501). Individual beds of the Tesuque Formation are generally less than 10 ft thick and consist of massive to planar- and cross-bedded siltstone and sandstone with minor lenses of pebbly conglomerate (Broxton and Vaniman 2005, 90038). This unit makes up a significant portion of the regional aquifer for local communities and the Laboratory.

2.1.3 Dome Lookout basalt (Tb0)

Contained within the Tesuque Formation, this unit is composed of basalts with ages ranging from 18.6 to 21.8 Ma. The Dome Lookout basalt occurs only within faulted blocks at the southwest corner of the model. This unit has an extremely small spatial extent, and it is not included in the set of maps of the geologic units.

2.1.4 Guaje Canyon basalt (Tb1)

The Guaje Canyon basalt is a thick sequence of basalt flows contained within the Tesuque Formation in the vicinity of Guaje Canyon. The basalts range in age from 11.55 to 13.1 Ma (WoldeGabriel et al. 1996, 54427; WoldeGabriel et al. 2001, 92523).

2.1.5 Keres Group (Tk)

The Keres Group includes basaltic and rhyolitic rocks that erupted as the Jemez volcanic field began to develop (Gardner et al. 1986, 21527; Goff and Gardner 2004, 92526). These rocks intrude and cover Santa Fe Group rocks along the western edge of the Española Basin (Cole et al. 2006, in preparation).

2.1.6 Bayo Canyon basalt (Tb2)

The Bayo Canyon basalt (labeled as rift basalt in Figure 2-1) is composed of local, episodic Miocene basalt to latite flows with ages of 8.4 to 9.3 Ma (WoldeGabriel et al. 1996, 54427; WoldeGabriel et al. 2001, 92523). The flows are intermixed with both Keres Group and Santa Fe Group sedimentary units in a zone that extends from the central plateau, east to Bayo Canyon, and south to Ancho Canyon (Cole et al. 2006, in preparation).

2.1.7 Older fanglomerate (Tf)

Older fanglomerate is an informal name for fanglomerates derived predominantly from erosion of the Keres Group volcanic highlands. These fanglomerates interfinger with Santa Fe Group sands within a north-south trending, trough-like structure in the central portion of the Plateau. The older fanglomerates do not crop out; their existence and modeled geometry are based solely on well logs and cuttings. The geometry of the older fanglomerate unit suggests deposition within a fault-controlled basin with associated episodic basaltic volcanism (Cole et al. 2006, in preparation). This unit tends to be part of the most productive aquifer beneath the Pajarito Plateau (Purtymun 1995, 45344).

2.1.8 River gravels (Tpt)

This unit includes the Totavi Lentil as well as older river gravels. Based on new well data, it appears that the Totavi Lentil river gravels may form lenticular deposits of limited lateral extent and that ancient river deposits in the Pajarito Plateau area are coeval with a variety of stratigraphic units that span a longer time interval than previously recognized (Broxton and Vaniman 2005, 90038). The river gravels probably represent channel deposits of the ancestral Rio Chama/Rio Grande drainages and contain Precambrian and younger cobbles from northern source areas, indicating through-going, north-to-south fluvial systems dating to at least approximately 7.9 Ma (Cole et al. 2006, in preparation; Broxton et al. 2006, 92520).

2.1.9 Pumice-rich volcaniclastic rocks (Tpp)

The pumice-rich volcaniclastic rocks are of limited regional extent. These rocks appear to have a source to the southwest and may in fact represent detritus from disparate events of Keres and Polvadera age. The pumice-rich volcaniclastic rocks are characterized by well-bedded horizons of light-colored, reworked, tephra-rich sedimentary deposits and subordinate primary ash- and pumice-fall deposits. This unit is more homogenous and contains fewer gravel and cobble beds than the underlying older fanglomerate and the overlying Puye Formation. In some areas, the pumice-rich volcaniclastic rocks have undergone significant alteration, and most of the volcanic glass is replaced by smectite (Broxton and Vaniman 2005, 90038).

2.1.10 Tschicoma Formation, Rendija Canyon lobe (Tt1)

The Tschicoma Formation of the Polvadera Group consists of thick dacite to low-silica rhyolite lava flows that make up the rugged Sierra de los Valles highlands west of Los Alamos. The flows erupted from large overlapping dome complexes. Tt1, the Rendija Canyon lobe of the Tschicoma Formation, includes low-silica rhyolite erupted from a deeply-eroded dome complex in the Rendija Canyon and Guaje Mountain area which has yielded ages between 4.95 and 5.32 Ma (WoldeGabriel unpublished data; Broxton and Vaniman 2005, 90038).

2.1.11 Tschicoma Formation, Pajarito Mountain, Cerro Grande, and Caballo Mountain lobes (Tt2)

The unit designated as Tt2 includes the Pajarito Mountain, Cerro Grande, and Caballo Mountain lobes of the Tschicoma Formation as well as fine-grained dacites of unknown source. Lavas from the Pajarito Mountain, Cerro Grande, and Caballo Mountain centers are predominantly dacite and have ages between 2.91 and 3.34 Ma (WoldeGabriel unpublished data; Broxton and Vaniman 2005, 90038).

2.1.12 Puye Formation, fanglomerate (Tpf)

The Puye Formation is a large apron of overlapping alluvial and pyroclasitc fans that were shed eastward from the Jemez volcanic field into the western Española Basin (Griggs 1964, 92516; Bailey et al. 1969, 08406). This unit consists of highly stratified, poorly cemented gravels and conglomerates consisting of subrounded dacitic and andesitic lava clasts in a poorly sorted, sandy to silty matrix. Debris flows, ash beds, pumiceous volcaniclastic sediments, and beds of fluvial sand and silt are interbedded with the gravels and conglomerates. Because its primary source area was volcanic domes in the Sierra de los Valles, the Puye Formation overlaps and postdates the Tschicoma Formation in age (Broxton and Vaniman 2005, 90038).

2.1.13 Cerros del Rio basalt (Tb4)

The Cerros del Rio volcanic field was active from approximately 4.5 to 2 Ma (WoldeGabriel et al. 2001, 92523). These rocks are mostly basalts and basaltic andesites, but subordinate dacite is also present. The Cerros del Rio basalt is generally composed of thick sequences of stacked lava flows separated by interflow breccia, scoria, sediment, and ash. Outcrops of the Cerros del Rio basalt cap the Tesuque Formation east of the Rio Grande and the Puye Formation in the vicinity of White Rock. These basalts are buried to increasing depths below the Plateau in the central portions of the model and may lap onto the Tschicoma flows at isolated locations to the west (Cole et al. 2006, in preparation).

2.1.14 Guaje Pumice Bed of the Bandelier Tuff (Qbog)

The Guaje Pumice Bed forms the base of the Otowi Member of the Bandelier Tuff, which erupted from the Toledo caldera at approximately 1.61 Ma (Izett and Obradovich 1994, 48817; Spell et al. 1996, 55542). The Guaje Pumice Bed contains layers of sorted pumice fragments whose mean size varies between 2 and 4 cm. It has an average thickness of ~9 m over much of the plateau. Geophysical logs show that the Guaje Pumice Bed has a higher porosity than overlying Otowi ash-flow tuffs and the underlying Puye Formation (Broxton and Vaniman 2005, 90038).

2.1.15 Otowi Member of the Bandelier Tuff (Qbof)

The Otowi Member consists of moderately consolidated, porous, nonwelded ash-flow tuffs. The ash-flow tuffs are vitric and contain light gray-to-orange pumice supported in a white to tan ashy matrix of glass shards, broken pumice, crystals, and rock fragments (Broxton et al. 1995, 58207; Goff 1995, 49682). Structure contours indicate that Otowi ash-flow tuffs filled a broad south-draining paleovalley west of the Cerros del Rio basaltic highland (Broxton and Vaniman 2005, 90038).

2.1.16 Cerro Toledo interval (Qct)

The Cerro Toledo interval, a stratified sequence of volcaniclastic sediments and tephra, occurs between the two ash-flow tuff members of the Bandelier Tuff but is not itself considered part of the Bandelier Tuff (Broxton et al. 1995, 58207; Goff 1995, 49682; Broxton and Reneau 1995, 49726; Broxton and Vaniman 2005, 90038). Structure contours for the base of the Cerro Toledo indicate that this unit fills a broad southeast-draining valley fed by one or more canyons exiting the Sierra de los Valles. The rhyolitic tuffaceous sandstone and tephra within this interval represent the reworked equivalents of Cerro Toledo Ryolite tephra erupted from the Cerro Toledo and Rabbit Mountain dome complexes located northeast and southeast of the Valles caldera, respectively. Clast-supported gravel, cobble, and boulder deposits derived from the Tschicoma Formation are interbedded with the tuffaceous rocks. In the western part of the plateau the interval also contains tuffaceous sediments that represent reworked Otowi tuff (Broxton and Vaniman 2005, 90038).

2.1.17 Tshirege Member, Bandelier Tuff

The Tshirege Member of the Bandelier Tuff, a multiple-flow ash-and-pumice unit, was erupted from the Valles Caldera at approximately 1.22 Ma (Izett and Obradovich 1994, 48817; Spell et al. 1996, 55542) and today is the most widely exposed bedrock unit of the Pajarito Plateau. The Tshirege Member tends to be more strongly welded than the Otowi Member, especially toward the western side of the plateau, closer to the Valles Caldera. Time breaks between the successive emplacements of ash-flow units caused the tuff to cool as several distinct cooling units, resulting in a complex internal stratigraphy that varies laterally as a function of distance from the caldera source. The stratigraphic nomenclature for the subunits of the Tshirege Member has evolved significantly through time (Broxton and Vaniman 2005, 90038; Broxton and Reneau 1995, 49726; Broxton et al. 1995, 58207). In the FY2005 3-D geologic model, the Tshirege Member is broken into a basal pumice layer and four overlying cooling units. Two of the cooling units are divided further based on lithologic differences (Cole et al 2006, in preparation). The subunits of the Tshirege Member included in the geologic model are shown in Figure 2-2. (Lewis et al. 2002, 73785).

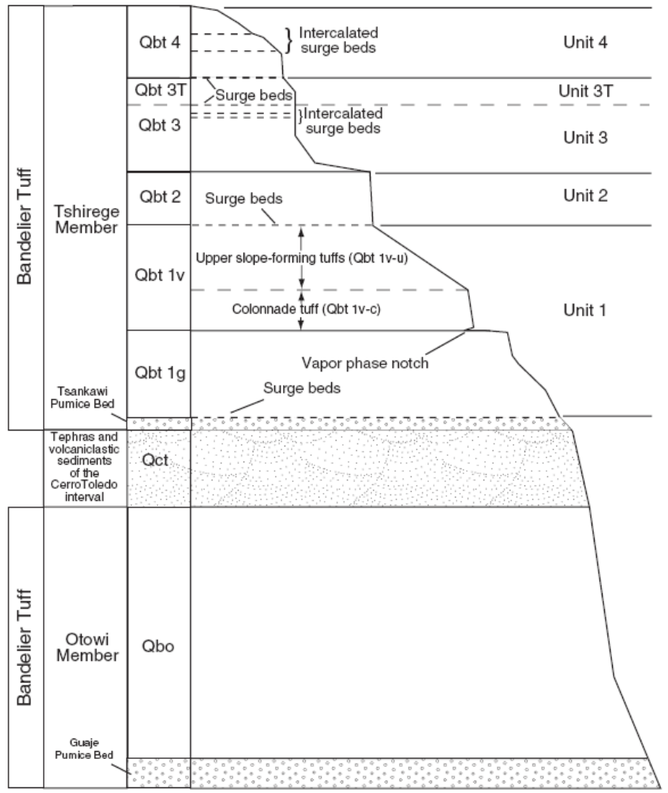

Figure 2-2. Stratigraphy of the Bandelier Tuff modified from Broxton and Reneau 1995, 49726

2.1.17.1 Tsankawi Pumice Bed (Qbtt)

The Tsankawi Pumice Bed is the basal pumice fall of the Tshirege Member. This unit is typically 20 to 100 cm thick. Pumices in the Tsankawi Pumice Bed are mostly of rhyolitic composition, but there is a small (<5%) amount of dacitic pumice as well (Broxton and Reneau 1995, 49726).

2.1.17.2 Unit 1 (Qbt1)

Cooling unit 1 of the Tshirege Member is a thick sucession of ash-flow tuffs that dips gently east-southeast. This unit is characterized by a lack of welding and has been subdivided into a glassy lower tuff and an upper devitrified, vapor-phase crystallized tuff. The vapor-phase tuff is further divided into a colonnade portion and an upper portion (Broxton and Reneau 1995, 49726; Broxton and Vaniman 2005, 90038).

2.1.17.2(a) Unit 1, glassy (Qbt1g)

Unit 1g of the Tshirege Member is a porous, nonwelded, poorly sorted ash-flow tuff containing abundant volcanic glass that has not undergone devitrification or vapor-phase alteration. This unit tends to form steep cliffs because a resistant bench near the top of the unit forms a hard, protective cap over the softer underlying tuffs (Broxton et al. 1995, 58207; Broxton and Reneau 1995, 49726; Broxton and Vaniman 2005, 90038).

2.1.17.2(b) Unit 1, colonnade vapor-phase (Qbt1vc)

The base of this unit is a thin, horizontal zone of preferential weathering that forms a marker horizon often called the vapor-phase notch, which marks the transition from glassy tuffs below to crystallized tuffs above. In some places, the vapor-phase notch grades laterally into a prominent bench developed on top of the glassy tuff. The colonnade vapor-phase tuff has distinctive columnar cooling joints and is a resistant, cliff-forming unit that may be slightly welded (Broxton and Reneau 1995, 49726; Broxton and Vaniman 2005, 90038).

2.1.17.2(c) Unit 1, upper vapor-phase (Qbt1vu)

The upper part of the vapor-phase unit forms a distinctive grayish-white band between the darker colored colonnade tuff and unit 2. The upper vapor-phase unit is generally nonwelded and slope-forming, but in some localities forms weakly developed cliffs and benches due to slight variations in welding (Broxton and Reneau 1995, 49726; Broxton and Vaniman 2005, 90038).

2.1.17.3 Unit 2 (Qbt2)

Unit 2 is typically the most strongly welded tuff in the Tshirege Member and is characterized by lower porosity and higher density than the other units. It forms a distinctive medium-brown, vertical cliff that stands out in marked contrast to the slope-forming, lighter colored tuffs above and below. Unit 2 contains numerous well-developed, near-vertical fractures (Broxton and Reneau 1995, 49726; Broxton et al. 1995, 58207; Broxton and Vaniman 2005, 90038).

2.1.17.4 Unit 3 (Qbt3)

Unit 3 is a nonwelded to partially welded tuff that forms the cap rock of mesas in the central part of the Pajarito Plateau. This unit is absent from large areas in the eastern part of the Laboratory, where it has been removed by erosion (Broxton and Reneau 1995, 49726; Broxton et al. 1995, 58207; Broxton and Vaniman 2005, 90038).

2.1.17.5 Unit 3, transition zone (Qbt3t)

Unit 3t is a moderately to densely welded ash-flow tuff that has petrographic and geochemical characteristics that are transitional between Unit 3 and Unit 4. Unit 3t is present in the western part of the Laboratory (Broxton and Vaniman 2005, 90038).

2.1.17.6 Unit 4 (Qbt4)

Unit 4 is a complex unit consisting of nonwelded to densely welded ash-flow tuffs which crops out in the western part of the Laboratory. Lewis et al. (2002, 73785) divide Qbt4 into local subunits and provide detailed descriptions of this heterogenous unit. However, in the 3D geologic model, Qbt4 is not subdivided (Cole et al. 2006, in preparation).

3.0 RELATIONSHIP BETWEEN GEOLOGY AND HYDROLOGY OF THE PAJARITO PLATEAU

The intrinsic properties of individual geologic units as well as the relative geometry and absolute spatial position of the units are important controls to groundwater flow. For example, the juxtaposition of permeable and impermeable units can constrain groundwater flow; the hydraulic conductivities of the geologic units affect the travel times for recharge or contamination to reach the regional aquifer.

The Pajarito Plateau consists of mesas separated by steep canyons, which can be subdivided into wet canyons and dry canyons. The mesas tops and dry canyons are characterized by significantly different hydrologic regimes than the wet canyons. On dry mesa tops, much of the water that does enter the soil zone is lost through evapotranspiration, resulting in annual net infiltration rates for dry mesas of less than 10 mm/yr and possibly even less than 1 mm/yr. Travel times for contaminants to reach the regional aquifer from dry mesas are expected to be several hundred to thousands of years (Kwicklis et al. 2005, 90069; Birdsell et al. 2005, 92521; LANL 2005, 92518). In dry canyons, infiltration rates and travel times to the regional aquifer are expected to be similar to those for dry mesas (Birdsell et al. 2005, 92521). In contrast, in wet canyons, water infiltrates the alluvium in canyon bottoms to form alluvial groundwater. Alluvial groundwater generally flows down the canyon until it reaches an area where infiltration is enhanced either by thin or absent Bandelier Tuff, highly fractured rock below the alluvium, or anthropogenic alterations such as sediment traps. In these areas, alluvial groundwater may percolate through the vadose zone and

collect in relatively more permeable units such as fractured basalts, if there are any present beneath the canyon (Figure 3-1.). Alluvial groundwater and perched intermediate groundwater continue to percolate through the deeper vadose zone until they reach the regional aquifer (LANL 2005, 92518).

As mentioned earlier, hydraulic conductivity is an important factor in the determining the flow of groundwater through geologic units. Table 3-1 presents estimates of hydraulic conductivity from well tests on the Pajarito Plateau, and Table 3-2 summarizes hydraulic conductivity data for each hydrostratigraphic unit. Well names used throughout this report are based on a database of information that has been compiled for and used in the 3-D geologic modeling effort. Some names may be nonstandard. The database will be updated as soon as a standardized compilation of well names and locations becomes available.

The overall hydrogeologic conceptual model of the water-bearing zones of the Pajarito Plateau is shown in Figure 3-1. The figure depicts the relative locations of alluvial groundwater, intermediate-perched groundwater, and the regional aquifer, as well as other components of the hydrologic cycle. Table 3-3 lists known occurrences of intermediate-depth perched groundwater, while the elevation of the regional water table is shown in Plate 5-1.

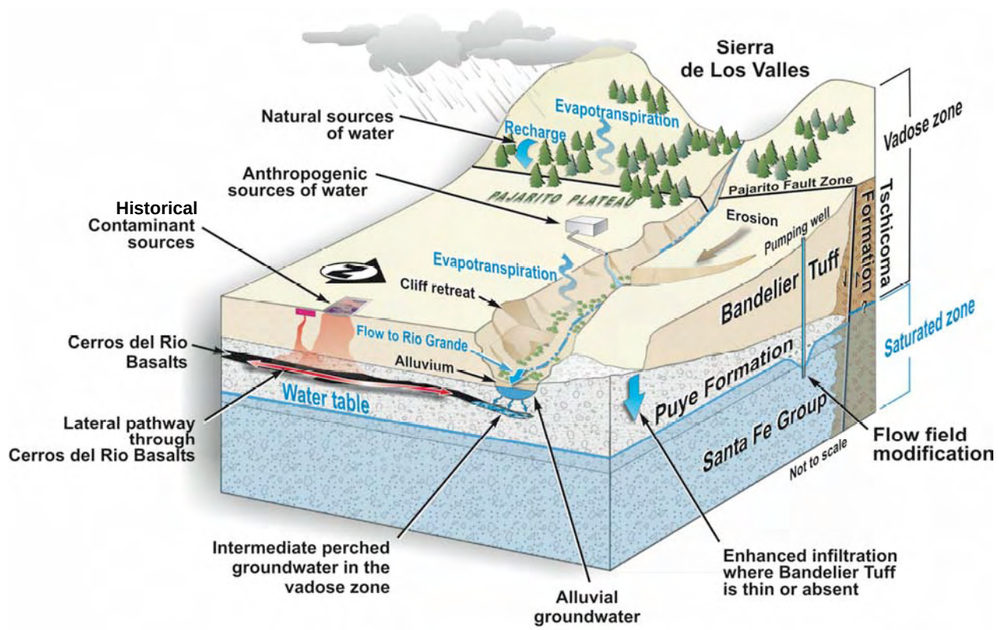

Figure 3-1. Conceptual hydrogeologic model of the Pajarito Plateau from LANL 2005, 92518

Table 3-1
Estimates of Hydraulic Conductivity from Well Tests on the Pajarito Plateau LANL 2005, 92518

Well	Source	Method	m/day	ft/day	Unit	Screen Depth (m)		Comments
						Top	Bottom	
DT-10	Purtymun (1995, 45344)	Pump test	4.53	14.87	Tb4	472	475	Tf, Tpt, and Tpf also
R-22-2	McLin and Stone (2004, 87308)	Injection	0.01	0.04	Tb4	289	301	Could be a breccia zone
R-31-3	McLin and Stone(2004, 87308)	Injection	0.15	0.48	Tb4	203	206	—[b]
R-9i-1	McLin and Stone (2004, 87308)	Injection	2.16	7.10	Tb4	331	429	Fractured
R-9i-2	McLin and Stone (2004, 87308)	Injection	0.03	0.11	Tb4	82	85	Massive
G-3A	Shomaker (1999, 92525)	Pump test	0.45	1.48	Tb1	180	604	—
G-5A	Shomaker (1999, 92525)	Pump test	0.23	0.75	Tb1	228	604	—
R-22-4	McLin and Stone (2004, 87308)	Injection	0.16	0.54	Tb1	420	422	Fractured basalt with alteration
CDV-R-15-3-5	Well completion report	Injection	0.08	0.25	Tpf	411	413	—
R-13	McLin and Stone (2004, 87308)	Pump test	5.36	17.60	Tpf	292	311	Straddles Tpf/Tpp contact
R-22-3	McLin and Stone (2004, 87308)	Injection	0.10	0.32	Tpf	388	390	High glass to clay ratio
R-26-2	Shafer (personal communication)	Pump test	0.00	.002	Tpf	433	440	—
R-28	Kleinfelder (2004, 92517)	Pump test	45.42	149.00	Tpf	285	292	Tpf according to cuttings, Tpp/Tpf mixture according to geophysics
R-32-3	McLin and Stone (2004, 87308)	Injection	0.37	1.20	Tpf	295	302	—
R-11	Kleinfelder (2004, 092515)	Pump test	35.51	116.50	Tpp	261	268	Assigned by Broxton and Vaniman
R-19-7	McLin and Stone (2004, 87308)	Injection	6.71	22.00	Tpp	558	561	—
R-19-6	McLin and Stone (2004, 87308)	Injection	5.67	18.60	Tpp	526	529	—
R-1	Kleinfelder (2004, 92519)	Pump test	1.19	3.90	Tpp	314	322	Assigned by Broxton and Vaniman
R-34	Shafer (personal communication)	Pump test	1.07	3.5	Tpp	269	276	—
TW-8	Purtymun (1995, 45344)	Pump test	1.02	3.35	Tpp	290	325	—
R-15	McLin (2004, 82833)	Pump test	0.67	2.20	Tpp	292	311	Small portion is Tpf
R-14-2	McLin and Stone (2004, 87308)	Injection	0.30	1.00	Tpp	390	404	—
CDV-R-15-3-6	Well completion report	Injection	0.03	0.10	Tpp	499	501	—
R-4	Kleinfelder (2004, 88033)	Pump test	5.30	17.40	Tf	242	249	—
O-4[a]	Purtymun (1995, 45344)	Pump test	1.23	4.02	Tf	340	791	Basalt and Tsf, as well
O-4	Stoker et al. (1992, 12017)	Pump test	2.18	7.15	Tf	340	791	—
O-4	Purtymun et al. (1995, 92522)	Pump test	2.88	9.46	Tf	340	791	—
G-6	Purtymun (1995, 45344)	Pump test	0.27	0.90	Tf	213	460	Basalt and a little Tsf
R-2	Kleinfelder (2004, 88034)	Pump test	0.09	0.31	Tf	277	284	Very fine grained with fine-scale bedding

Table 3-1 (continued)

Well	Source	Method	m/day	ft/day	Unit	Screen		Comments
						Top	Bottom	
R-22-5	McLin and Stone (2004, 87308)	Injection	0.08	0.27	Tf	441	443	High glass to clay ratio
G-1[a]	Purtymun (1995, 45344)	Pump test	0.29	0.94	Ts	86	604	Also Tf and basalt
G-1	Griggs (1964, 92516)	Pump test	0.40	1.31	Ts	86	604	—
G-1	Griggs (1964, 92516)	Pump test	0.55	1.79	Ts	86	604	—
G-1A	Purtymun (1995, 45344)	Pump test	0.37	1.22	Ts	83	461	Significant Tf?
G-2[a]	Purtymun (1995, 45344)	Pump test	0.37	1.22	Ts	86	597	Significant Tf?
G-2	Griggs (1964, 92516)	Pump test	0.05	0.16	Ts	86	597	—
G-2	Griggs (1964, 92516)	Pump test	0.54	1.78	Ts	86	597	—
G-2A	Shomaker (1999, 92525)	Pump test	0.21	0.70	Ts	172	431	—
G-3[a]	Griggs (1964, 92516)	Pump test	0.27	0.90	Ts	134	544	Also Tf and basalt
G-3	Purtymun (1995, 45344)	Pump test	0.22	0.71	Ts	134	544	—
G-4[a]	Purtymun (1995, 45344)	Pump test	0.46	1.51	Ts	130	587	Also Tf and basalt
G-4	Griggs (1964, 92516)	Pump test	0.63	2.05	Ts	130	587	—
G-4	Griggs (1964, 92516)	Pump test	0.91	3.00	Ts	130	587	—
G-4A	Shomaker (1999, 92525)	Pump test	0.36	1.17	Ts	200	604	—
G-5[a]	Purtymun (1995, 45344)	Pump test	0.36	1.17	Ts	141	558	—
G-5	Griggs (1964, 92516)	Pump test	0.50	1.65	Ts	141	558	—
G-5	Griggs (1964, 92516)	Pump test	0.72	2.35	Ts	141	558	—
LA-1B	Purtymun (1995, 45344)	Pump test	0.38	1.25	Ts	99	516	—
LA-3[a]	Theis and Conover (1962, 37144)	Pump test	0.16	0.51	Ts	32	264	—
LA-3	Theis and Conover (1962, 37144)	Pump test	0.08	0.25	Ts	32	264	—
LA-3	Purtymun (1995, 45344)	Pump test	0.13	0.44	Ts	32	264	—
LA-3	Theis and Conover (1962, 37144)	Pump test	0.14	0.46	Ts	32	264	—
LA-3	Theis and Conover (1962, 37144)	Pump test	0.22	0.72	Ts	32	264	—
LA-2	Purtymun (1995, 45344)	Pump test	0.14	0.47	Ts	32	264	—
LA-2[a]	Purtymun et al. (1995, 92524)	Pump test	0.20	0.66	Ts	32	264	—
LA-2	Purtymun et al. (1995, 92524)	Pump test	0.36	1.17	Ts	32	264	—
LA-4	Purtymun (1995, 45344)	Pump test	0.23	0.76	Ts	230	599	—
LA-5[a]	Theis and Conover (1962, 37144)	Pump test	0.20	0.67	Ts	134	530	—
LA-5	Purtymun (1995, 45344)	Pump test	0.12	0.40	Ts	134	530	—
LA-6[a]	Purtymun (1977, 05714)	Pump test	0.29	0.96	Ts	128	542	—
LA-6	Purtymun (1977, 05714)	Pump test	0.22	0.73	Ts	128	542	—
LA-6	Purtymun (1995, 45344)	Pump test	0.37	1.22	Ts	128	542	—
O-1[a]	Purtymun (1995, 45344)	Pump test	0.19	0.63	Ts	310	755	Thin basalt
O-1	Purtymun et al. (1993, 15371)	Pump test	0.25	0.81	Ts	310	755	—
R-16-2	McLin (2005; personal communication)	Pump test	0.49	1.6	Ts	187	187	—
R-16-3	McLin (2005; personal communication)	Pump test	0.55	1.8	Ts	306	314	—
R-16-4	McLin (2005; personal communication)	Pump test	0.52	1.7	Ts	367	392	—

Table 3-1 (continued)

Well	Source	Method	m/day	ft/day	Unit	Screen		Comments
						Top	Bottom	
TW-2	Purtymun (1995, 45344)	Pump test	9.84	32.29	Tpt	234	251	—
TW-3	Purtymun (1995, 45344)	Pump test	4.90	16.08	Tpt	245	248	—
R-31-4	McLin and Stone (2004, 87308)	Injection	3.38	11.10	Tpt	252	255	—
R-31-5	McLin and Stone (2004, 87308)	Injection	2.53	8.30	Tpt	307	310	—
TW-1	Purtymun (1995, 45344)	Pump test	0.16	0.54	Tpt	193	196	—
R-32-1	McLin and Stone (2004, 87308)	Injection	1.28	4.20	Tpt	867	875	—
CDV-R-37-2-4	Well completion report	Injection	3.46	11.36	Tt	472	475	—
CDV-R-37-2-3	Well completion report	Injection	2.14	7.01	Tt	472	475	—
TW-4	Purtymun (1995, 45344)	Pump test	0.78	2.55	Tt	364	367	—
PM-1	Purtymun (1995, 45344)	Pump test	1.26	4.15	mixed	288	756	—
PM-2	Purtymun (1995, 45344)	Pump test	1.14	3.75	mixed	306	695	—
PM-3	Purtymun (1995, 45344)	Pump test	7.31	23.99	mixed	291	772	—
PM-4	Purtymun (1995, 45344)	Pump test	0.98	3.22	mixed	384	870	—
PM-5	Purtymun (1995, 45344)	Pump test	0.22	0.71	mixed	439	936	—
DT-5A	Purtymun (1995, 45344)	Pump test	0.69	2.28	mixed	357	555	—
DT-9	Purtymun (1995, 45344)	Pump test	4.98	16.35	mixed	317	457	—

[a] Symbols have been changed to reflect new geologic model. Tsf →Ts.
[b] — = No comment.

Table 3-2
Summary Table of Hydraulic Conductivity for Each Hydrostratigraphic Unit LANL 2005, 92518

Unit	Symbol	Number of Wells	Minimum Hydraulic Conductivity (m/day)	Maximum Hydraulic Conductivity (m/day)	Geometric Mean Hydraulic Conductivity
Cerros del Rio basalt	Tb4	5	< .1	4.5	0.2
Older basalt	Tb1	3	0.2	0.6	0.3
Puye fanglomerate	Tpf	6	.007	45	0.4
Pumaceous unit	Tpp	9	0.3	36	1.3
River gravels (Totavi)	Tpt	5	0.2	9.8	2.1
Santa Fe Group—fanglomerate	Tf	5	0.1	5.3	0.4
Santa Fe Group—Sandy/Tesuque Formation	Ts	18	0.2	0.5	0.3
Santa Fe Group—Tesuque Fm—off plateau data	Ts	15	< 0.1	4.4	0.1
Tschicoma	Tt1 and Tt2	3	0.2	9.8	0.9

Table 3-3
Known Occurrences of Intermediate-Depth Perched Groundwater LANL 2005, 92518

Well Name	Surface Elevation (ft)	Depth to Water (ft)	Elevation of Water (ft)	Saturated Thickness (ft)	Groundwater Host Rock	Nature of Perching Layer
TW-2a	6646	110	6536	>23	Puye Fm. fanglomerate	Within Puye Fm. fanglomerate; perching lithology not known
R-5	6473	380	6093	37	Puye Fm. dacitic sands and gravels mixed with 5%–15% rounded quartzite and granite river gravels	With Puye Fm. fanglomerate; perching lithology not known
TW-1a	6370	188	6182	27	Interflow breccia and siltstone in Cerros del Rio basalt	Possibly unfractured massive basalt
POI-4	6372	160	6212	>21	Cerros del Rio fractured basalt	Confining layer not penetrated
H-19	7172	450	6722	22	Porous, well-bedded and well-sorted fall deposits of the Guaje Pumice Bed	Tschicoma Fm. lava flow top
LAOI(A)1.1	6833	289	6544	27	Porous, well-bedded and well-sorted fall deposits of the Guaje Pumice Bed	Top of Puye Fm.; possible clay-rich soil horizon
R-7	6779	373	6406	9	Puye Fm. silty, clayey, and sandy gravels	Clay-rich gravels from 382 to 397 ft deep in the Puye Fm.
R-7	6779	744	6035	23	Puye Fm. sandy gravel with abundant pumice clasts	Puye Fm.; possible perching layer from 767 to 772 ft in silty pebble gravel or from 772 to 777 ft in clayey pumiceous sands
LADP-3	6756	320	6436	9	Porous, well-bedded and well-sorted fall deposits of the Guaje Pumice Bed	Smectite- and kaolinite-rich soil a few inches thick at top of Puye Formation
LAOI-3.2a	6620	134	6486	>31	Basal ash-flow tuffs of the Otowi Member and orous, well-bedded and well-sorted fall deposits of the Guaje Pumice Bed	The perched zone was not fully penetrated during drilling; perching lithology not known
O-4	6639	253	6386	Not known	Puye Fm. gravels	Within Puye Fm. fanglomerate; perching lithology not known
R-6	6995	592	6403	23	Puye Fm. gravels	Poorly sorted fanglomerate with a silty matrix
R-9i	6383	137	6246	45-99	Cerros del Rio basalt interflow breccia and highly fractured basalt	Massive basalt with few fractures
LAWS-01	6305	137	6168	45-99	Cerros del Rio basalt interflow breccia and highly fractured basalt	Massive basalt with few fractures
R-9i	6383	275	6108	7	Cerros del Rio basalt brecciated flow base	Clay-rich stratified, basaltic tephra (maar deposits) from 282 to 289.9 ft
LAWS-01	6305	275	6030	7	Cerros del Rio basalt brecciated flow base	Clay-rich stratified, basaltic tephra (maar deposits) from 282 to 289.9 ft
R-9	6383	524	5859	48-103	Puye Formation sands and gravels	Clay-rich tuffaceous sands and gravels
PM-1	6513	450	6063	Not known	Cerros del Rio Basalt	Not known
R-12	6500	424	6076	76-95	Fractured Cerros del Rio basalt and underlying fluvial sands and silts, and riverine gravels of the lacustrine facies of the Puye Fm.	Clay-rich lake beds of the lacustrine facies of the Puye Fm. from 519 to 535 ft
I-8	~6820	675	~6145	probably very thin	Fractured Cerros del Rio basalt	Not known
MCOBT-4.4	6836	520	6316	2-4	Puye Fm. pebble gravel and silty sands	Top of Cerros del Rio basalt
I-4	~6820	520	~6300	2-4	Puye Fm. pebble gravel and silty sands	Top of Cerros del Rio basalt
R-15	6820	646	6174	99	Fractured Cerros del Rio basalt	Clay-rich flow-base rubble or underlying silty basaltic sand (745-746.7 ft)
I-5	6820	687	6133	20	Interflow breccia in Cerros del Rio basalt	Possible confining unit in massive basalt in lower part of Cerros del Rio basalt
I-6	6811	662	6149	43	Interflow breccia and fractured basalt in Cerrod del Rio basalt	Possible confining unit in massive basalt in lower part of Cerros del Rio basalt
R-23	6528	Not known	6528	Not known	Cerros del Rio basalt	Not known
R-19	7066	894	6172	18	Puye Fm. sand and gravel beds	Puye Fm. low-porosity sedimentary deposits
R-25	7516	723	6793	409	Otowi ash-flow tuff, Guaje Pumice bed, and Puye Fm. fanglomerate	Confining layer occurs in Puye Fm. sedimentary deposits. From 1132 to 1137 ft, cuttings of fine-grained sand and silt are interbedded with gravels and cobbles. Alternating wet and dry sediments occur below this zone to a depth of 1286 ft
CdV-16-1i	7382	563	6819	>120 ft	Otowi ash-flow tuff	Perching horizon not know; below drill hole depth
CdV-16-2i	7467	827	6640	Not known	Puye Fm. fanglomerate	With Puye Fm. fanglomerate; perching lithology not known
R-26	7642	173	7469	Zones of thin, discontinuous saturation associated with fractures	Fractured densely welded tuff in unit Qbt3t of the Tshirege Member	Water production associated with fractures
R-26	7642	604	7038	Not known	Cerro Toledo interval	Not known
SHB-3	7608	663	6945	>197 ft	Otowi ash-flow tuff, Guaje Pumice bed, and Puye Fm. fanglomerate	Confining layer probably not penetrated

4.0 MAP SPECIFICATIONS

All maps are presented in 11 × 17-in. format at a scale of 1:80,000.

4.1 Base Map

The base map (Plate 1-1) shows the extent of the hydrogeologic site atlas as well as the locations of R-wells, water supply wells, and other wells or boreholes important in constraining the 3-D geologic model. This map also includes the boundary of Los Alamos National Laboratory and the surrounding land ownership. Roads are included for reference.

4.2 Surface Geology

Plates 2-1 and 2-2 show mapped and modeled surface geology, respectively. The colors of stratigraphic units were chosen to correspond to the 1970 geologic map of the Jemez Mountains (Smith et al. 1970, 09752). The mapped surface geology is derived from the 7.5 min Puye, White Rock, Guaje Mountain, and Frijoles quadrangle geologic maps as well as Los Alamos National Laboratory Seismic Hazards Mapping (Dethier 2003, 89548; Dethier 1997, 49843; Kempter and Kelley 2002, 88777; Goff et al. 2002, 88776; Lewis et al., in preparation). Although the mapped surface geology depicts a combination of bedrock geology and Quaternary cover, the modeled surface geologic map does not include Quaternary cover. Instead, this map depicts the likely bedrock geology everywhere, based on the intersection of the 3-D geologic model surfaces with topography.

4.3 Structural Block Model and Mappped Faults

The structural block model (Plate 3-1) is used during model building to reconstruct the past relative positions of control points so that the surface-fitting algorithm can reconstruct the surfaces in their original, unfaulted form. The structural block model is based on published fault data (Goff et al. 2002, 88776; Kempter and Kelley 2002, 88777; Lavine et al. 2003, 092527; Gardner et al. 2001, 70106; Gardner et al. 1999, 63492; Gardner and House 1987, 06682) and strain measurements collected by participants of the Seismic Hazards Project. These data identify zones of multiple offsets and/or distributed strain with widths of hundreds to thousands of feet, oriented in a predominantly north-south direction. To create the structural block model, the multiple faults and regions of distributed strain were reduced to a set of fault blocks with discrete vertical offsets along boundaries and distributed vertical strain within the interior of the blocks (Cole et al. 2006, in preparation).

The map shows the fault blocks, a grid of offsets of the Tshirege Member of the Bandelier Tuff, representing offsets at 1.2 million years ago. To reconstruct the model surfaces at the time of deposition, a constant strain rate is assumed based on the 1.2 Ma offsets, and surfaces are reconstructed according to their ages. The map also shows faults mapped by the Seismic Hazards Group at the Laboratory and by Kempter and Kelley (2002, 88777).

4.4 Structure Contour and Thickness Maps

A structure contour map and a thickness map are provided for each geologic unit in the 3-D geologic model (Plates 4-1 through 4-58). The structure contour maps show the elevation of the top of each unit, with 100-ft contour lines overlain on hill shades of the unit tops. The hill shades provide a visualization aid and use the default sun azimuth of 315 degrees, at an altitude of 45 degrees. Wells that intersect the unit are shown on the maps and are labeled with the well name and the elevation of the top of unit in the well. For near-surface units that are penetrated by a large number of wells, the wells are labeled by name and elevations of the units in the wells are given in table form.

Either one or two thickness maps are provided for each geologic unit. Most units were adequately described by a single thickness map; however, a few of the units included in the geologic model are defined in such a way that they may entirely or partially contain other geologic units. For example, the Puye Formation (Tpf) may contain all or part of the geologic units: Tb4, Tt2, Tt1, Tpp, and Tpt. The older fanglomerate unit (Tf) may contain Tb2, Tk, Tpp, and Tpt. The Santa Fe Group (Ts) may contain Tb2, Tb1, and Tb0. Therefore, two thickness maps are provided for units that contain portions of other units. A total thickness map illustrates the full thickness of the unit, including any interior units, while an adjusted thickness map provides the thickness of the geologic unit after the thicknesses of interior units have been removed. Since thickness can vary greatly from unit to unit, the contour interval used on the unit thickness maps varies.

Also, it is important to note that the oldest units in the model, the Galisteo Formation and the Tesuque Formation, extend beyond the lower limits of the model, so the thicknesses of these units should be considered to be minimum thicknesses, rather than absolute thicknesses. Wells that intersect the geologic units are also shown on the thickness maps and are labeled with the name of the well and the thickness of the unit encountered in the well. As with the structure contour maps, for near-surface units that are penetrated by a large number of wells, the wells are labeled by name, and the thicknesses of the unit encountered are given in table form. For the units that contain portions of other units, the listed thicknesses and elevations in the wells may not necessarily match the contours because they pertain to just the physical lithostratigraphic unit, rather than the chronostratigraphic unit defined in the geologic model. In addition, in some places wells did not fully penetrate particular units; thus, some of the listed thicknesses are minimum thicknesses rather than actual thicknesses.

Three of the geologic units, Tb2, Tpp, and Tpt, were divided into upper and lower portions during model building because of complexities created where these units cross stratigraphic boundaries. For example, Tb2 is a basaltic unit which is found within both the Tesuque Formation and the older fanglomerate. To avoid problems that would be created where Tb2 crosses the stratigraphic boundary between Ts and Tf, Tb2_upper was defined as the portion of Tb2 that occurs within Tf, while Tb2_lower was defined as the portion of Tb2 that occurs within Ts. A similar situation exists for Tpp and Tpt. Thus, two structure contours maps and two thickness maps are provided for each of these three units, which are divided into upper and lower portions. All wells that encounter these units are included on the maps of both the lower and upper portions of the units.

4.5 Regional Water Table Elevation

Plate 5-1 shows the elevation of the regional water table, using a 100-ft contour interval. Well locations are provided for reference. The contour map of the water table was created for the 2006 General Facility Information report (LANL 2006, 92528).

4.6 Geology at the Water Table

The map of the geology at the water table (Plate 6-1) was created by intersecting the units of the geologic model with a grid derived from 100-ft contours of the 2006 regional water table elevation (Plate 5-1).

4.7 Hydrogeologic Cross-Sections

Locations of cross sections through the geologic model are shown in Plate 7-1. Four cross sections run east to west across the Laboratory (EE’, FF’, GG’, and HH’), while four additional cross sections run north to south (AA’, BB’, CC’, and DD’). The cross sections are displayed at a 2.5x vertical exaggeration.

4.8 Electrical Resistivity Cross-Sections

Surface-based direct-current electrical resisitivity surveys were performed between 2002 and 2005 in various canyon areas of the Laboratory (Plate 8-1) by Geophex, Inc. The purpose of these surveys was to image the electrical structure of the upper 200 ft of the vadose zone beneath canyon floors. These data are designed to be used in conjunction with data from shallow borings and alluvial wells to identify potential groundwater pathways to aid in the selection of locations for new alluvial monitoring wells. Methods of data collection and data processing are presented in Geophex, Inc. (2002, 2004, 2006). The final series of plates (8-1 through 8-35) presents the results of these surveys.

5.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the EP-ERSS Division Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the EP-ERSS Division master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the EP-ERSS Division. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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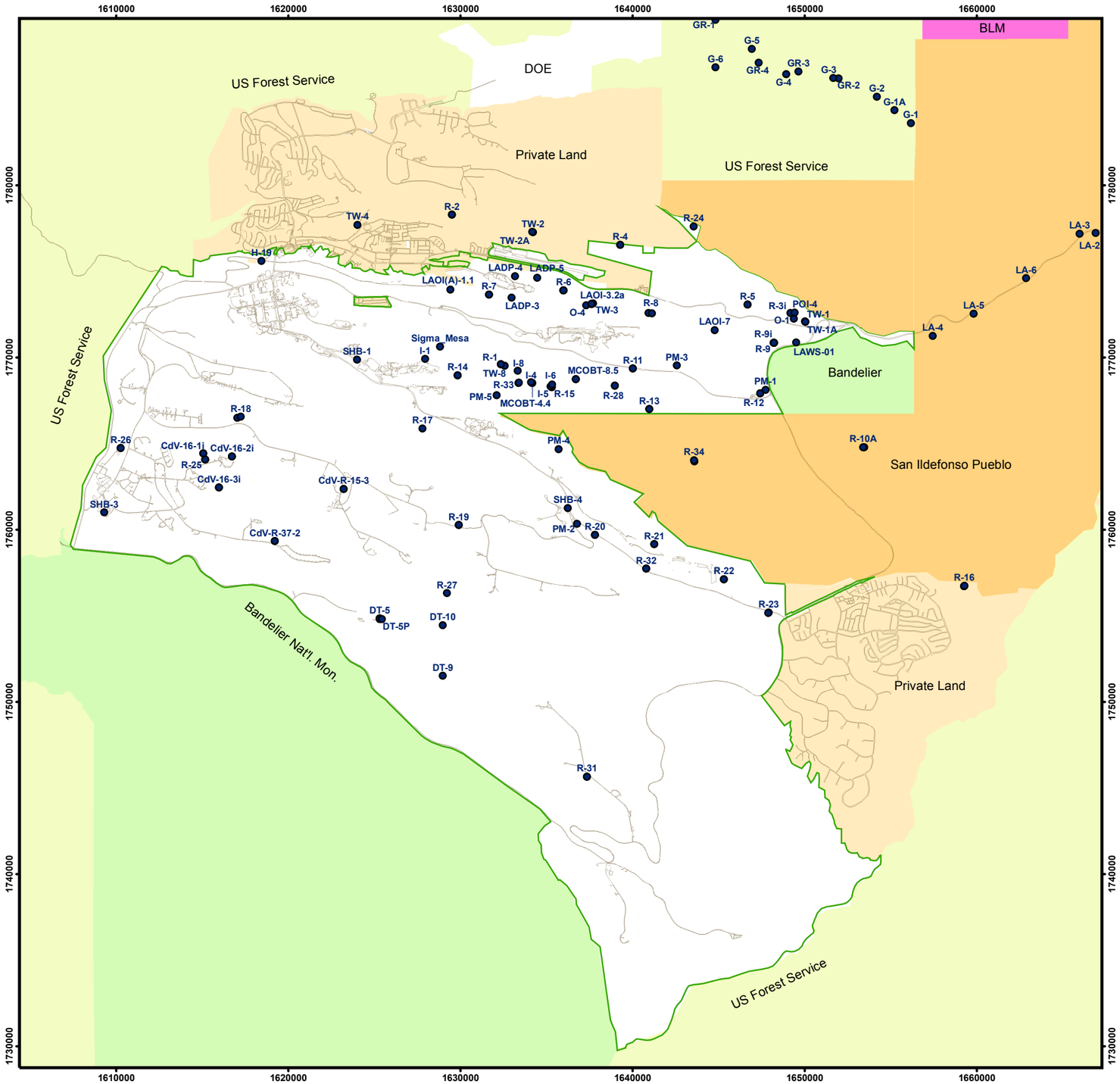

LEGEND

- Wells
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Constructed using land ownership and cultural data from LANL's ER GIS database and well locations used in construction of the 2005 sitewide geologic model.

Date: April, 2006

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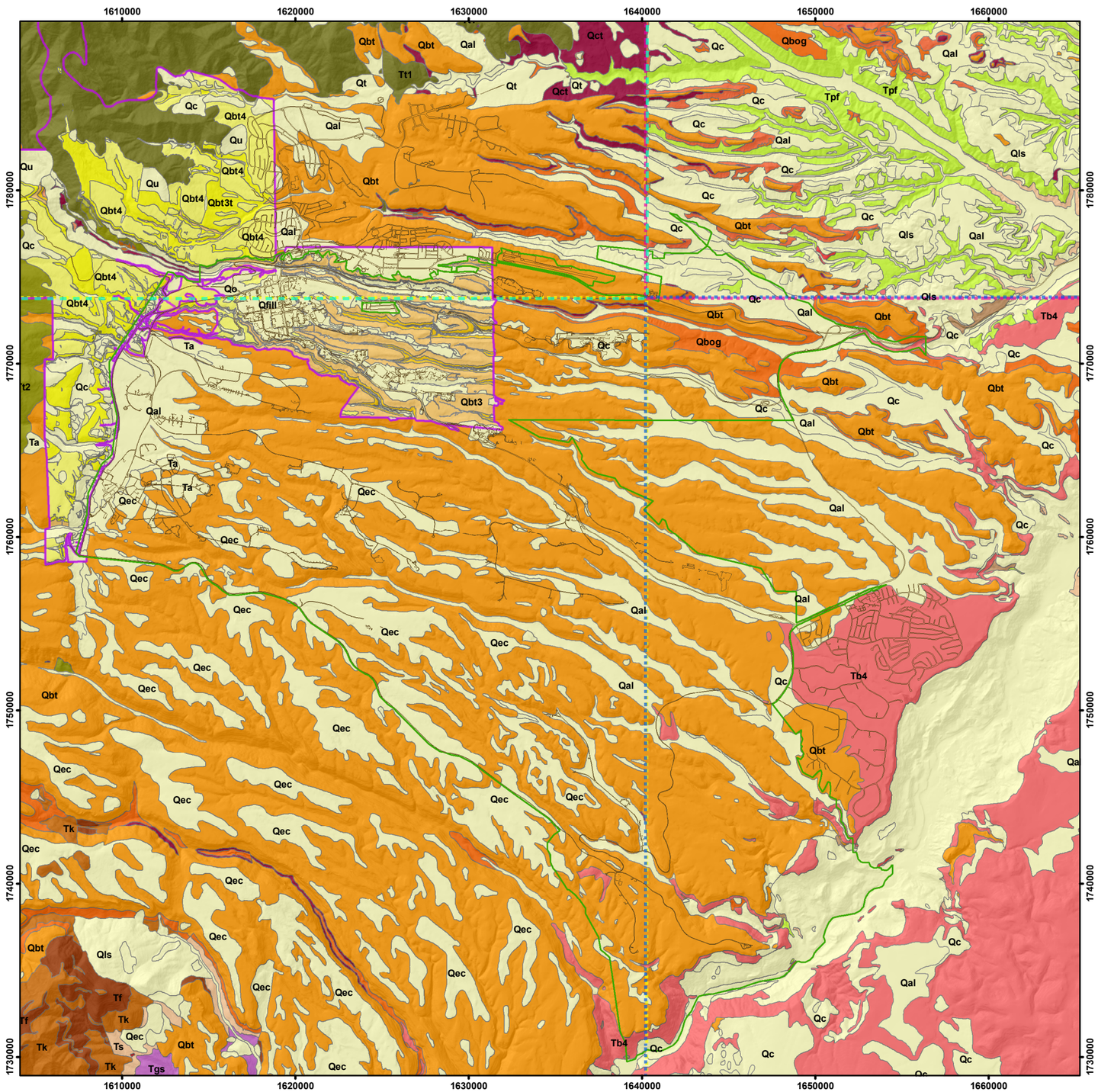
Plate 1-1. Base map showing land ownership as well as R-wells, water supply wells, and other wells or boreholes important in constraining the 3-D geologic model



Geologic Unit

- Qal
- Qc
- Qf
- Qec
- Qfill
- Qls
- Qo
- Qt
- Qmt
- Qu
- Ta
- Qbt4
- Qbt3t
- Qbt3
- Qbt2
- Qbt1vc
- Qbt1g
- Qbt
- Qct
- Qbof
- Qbog
- Tpf
- Tb4
- Tt2
- Tpp
- Tpt
- Tt1
- Tf
- Tb2
- Tk
- Ts
- Tb1
- Tb0
- Tgs

LEGEND

- Los Alamos National Laboratory
- Seismic Hazards Mapping Extent
- Frijoles Geologic Quadrangle
- Puye Geologic Quadrangle
- Guaje Mountain Geologic Quadrangle
- White Rock Geologic Quadrangle
- Roads

SCALE 1:80,000

0 0.4 0.8 1.6 2.4 3.2 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Mapping Sources:

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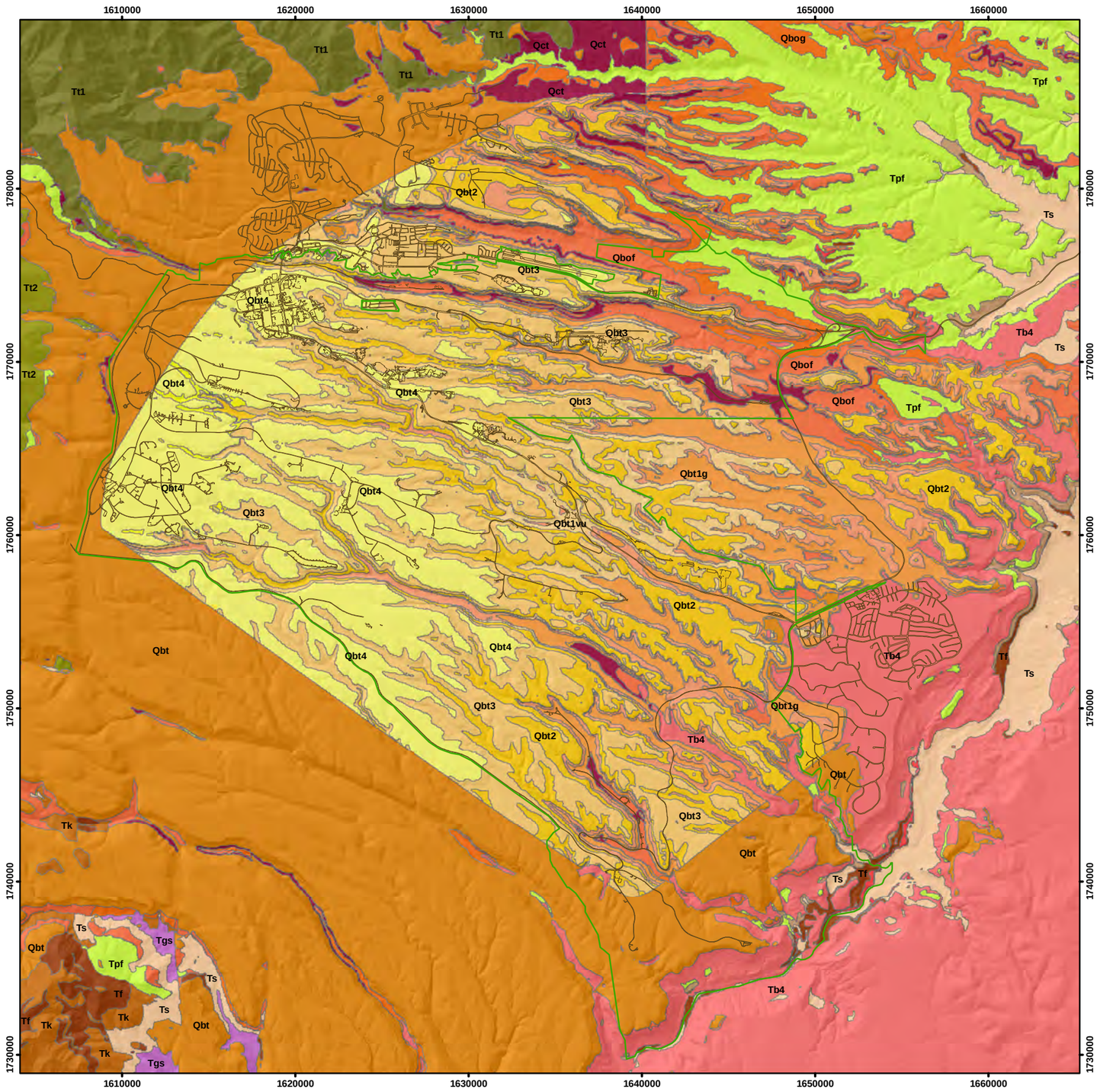
Lewis, C.J., J.N. Gardner, E. Schultz, A.. Lavine, S.L. Reneau, and S. Olig, in preparation. "Lateral Displacement Variation and Fault Interaction in the Pajarito Fault System, Rio Grande Rift, New Mexico," to be submitted to Geospheres, May 2006.

Date: April, 2006

Plate 2-1. Mapped surface geology



LEGEND

GEOLOGY

- Qbt
- Qbt4
- Qbt3t
- Qbt3
- Qbt2
- Qbt1vu
- Qbt1vc
- Qbt1g
- Qct
- Qbof
- Qbog
- Tpf
- Tb4
- Tt2
- Tpp
- Tpt
- Tt1
- Tf
- Tb2
- Tk
- Ts
- Tb1
- Tb0
- Tgs
- LANL
- Roads

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Date: April, 2006

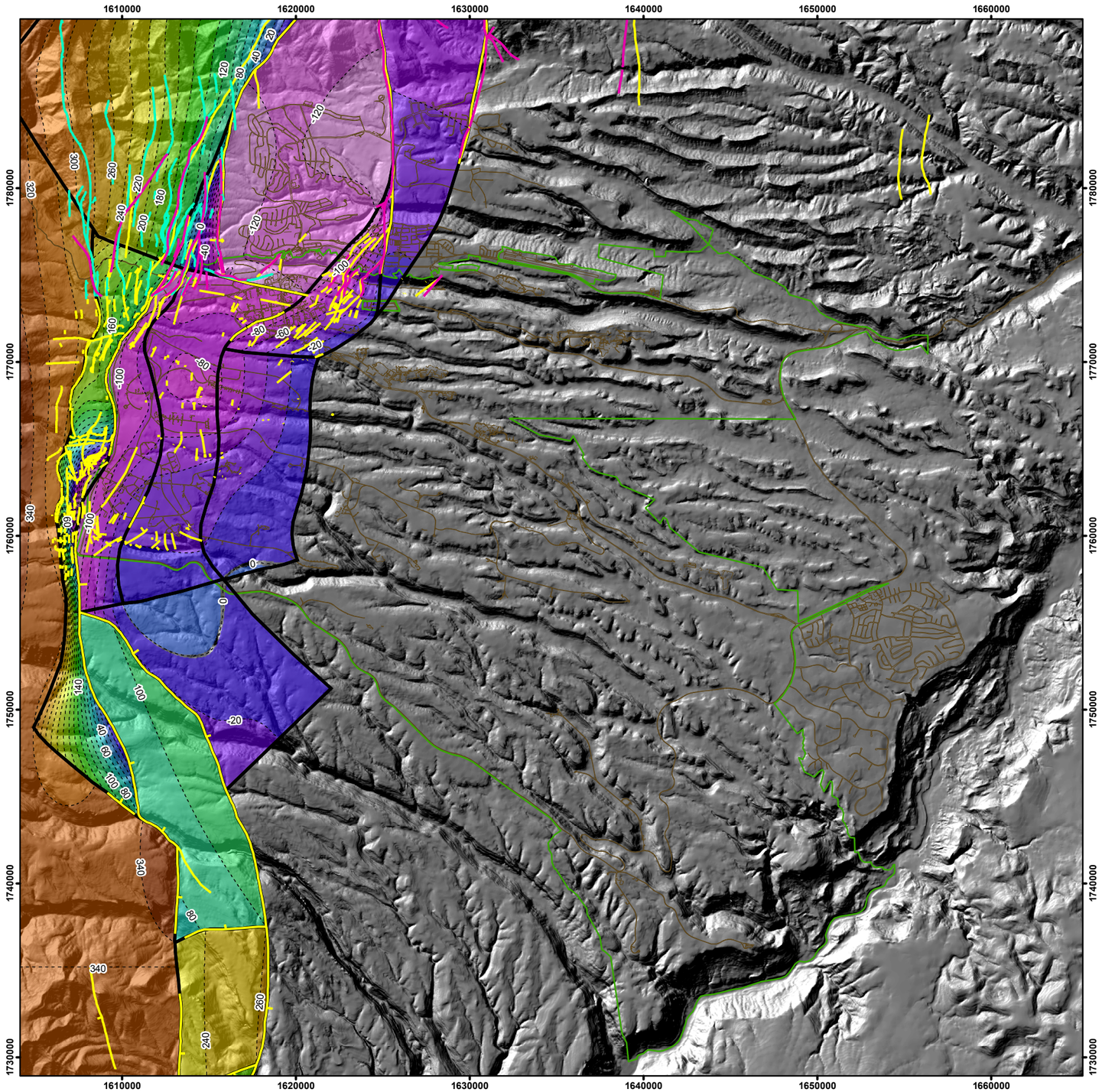
SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

N W E S

Plate 2-2. Modeled surface geology



LEGEND

- Faults - Kempter and Kelley, 2002
- Faults (S) - Seismic Hazards Team
- Faults (N) - Seismic Hazards Team
- 1.2 Ma Structural Offsets
- Structural Blocks
- Los Alamos National Laboratory
- Roads

1.2 Ma Offsets (feet)

- -172 - -160
- -159 - -140
- -139 - -120
- -119 - -100
- -99 - -80
- -79 - -60
- -59 - -40
- -39 - -20
- -19 - -1
- 0
- 1- 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100
- 101 - 120
- 121 - 140
- 141 - 160
- 161 - 180
- 181 - 200
- 201 - 220
- 221 - 240
- 241 - 260
- 261 - 280
- 281 - 300
- 301 - 320
- 321 - 340
- 341 - 360
- 361 - 380
- 381 - 400

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

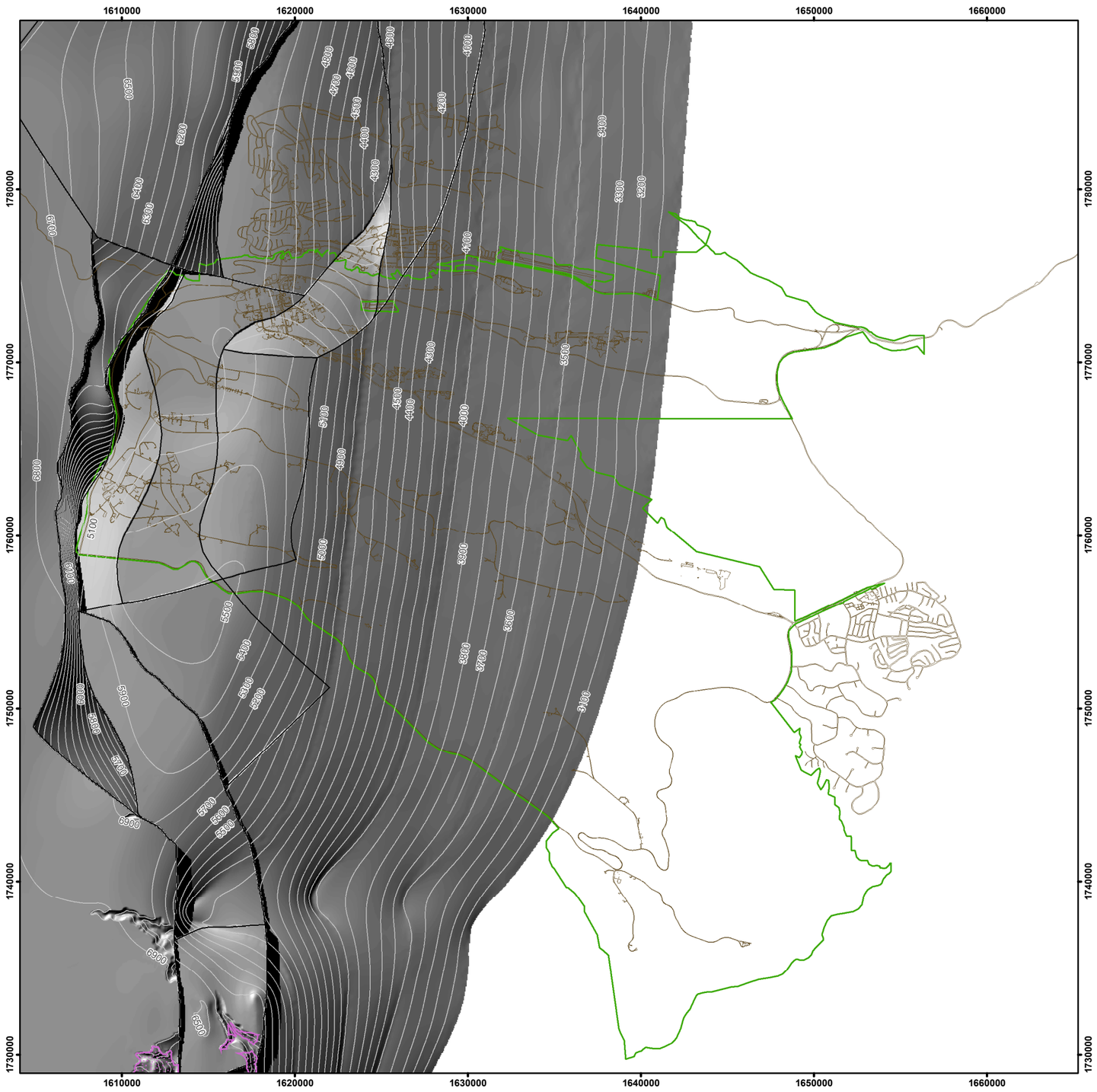
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Fault data was provided by the LANL Seismic Hazards Team and from preliminary geologic mapping by Kempter and Kelley (2002)

Date: April, 2006

Plate 3-1. Structural block model and mapped faults; fault sets shown account during construction of the Structural Block Model.



LEGEND

- Elevation of the top of Tgs (100' Contours)
- Outcrop of Tgs
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

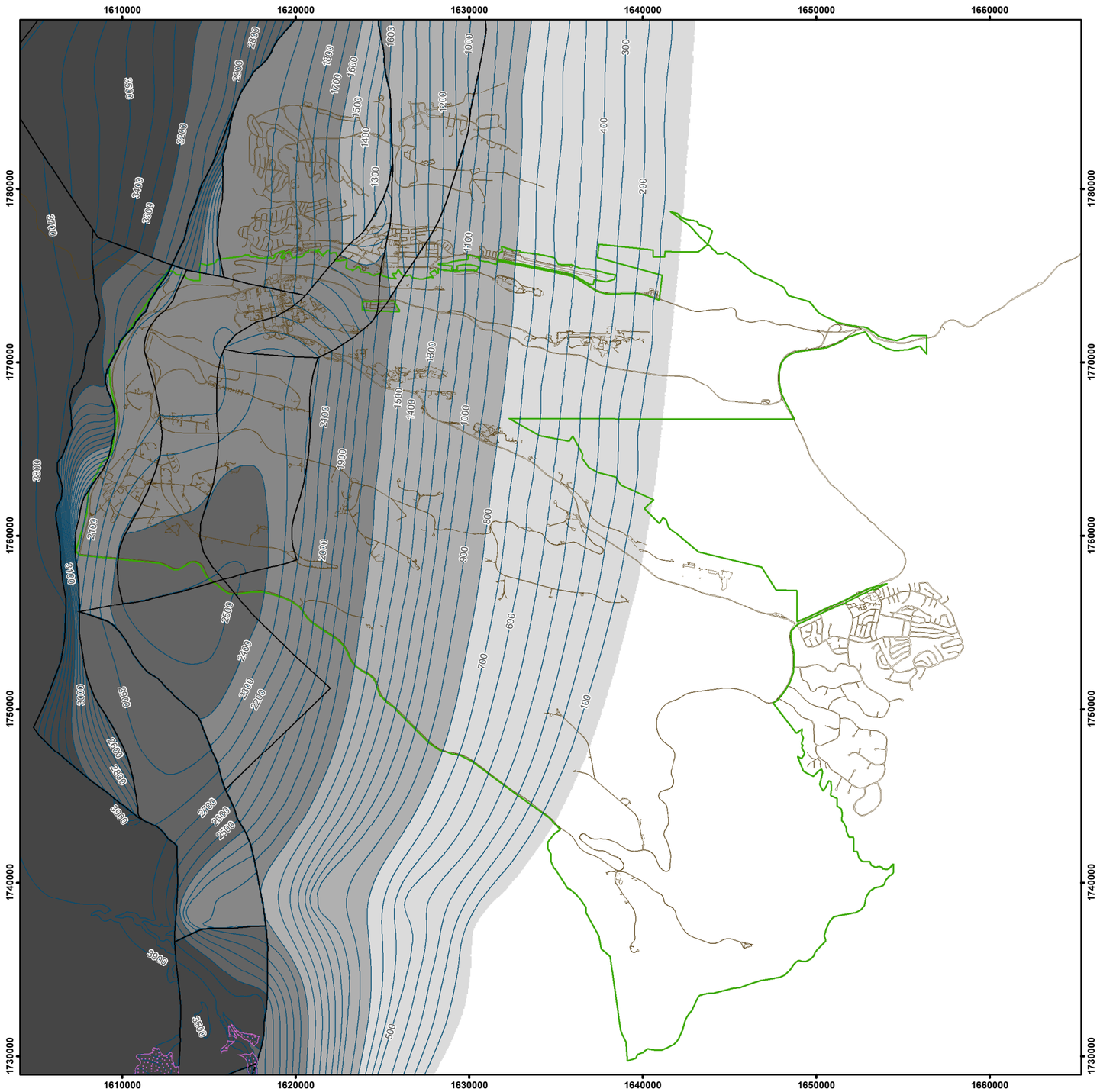
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-1. Structure contours of the top of the Galisteo Formation (Tgs)



LEGEND

- Thickness of Tgs (100' Contours)
- Outcrop of Tgs
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 800
- 801 - 1,600
- 1,601 - 2,400
- 2,401 - 3,200
- 3,201 - 4,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

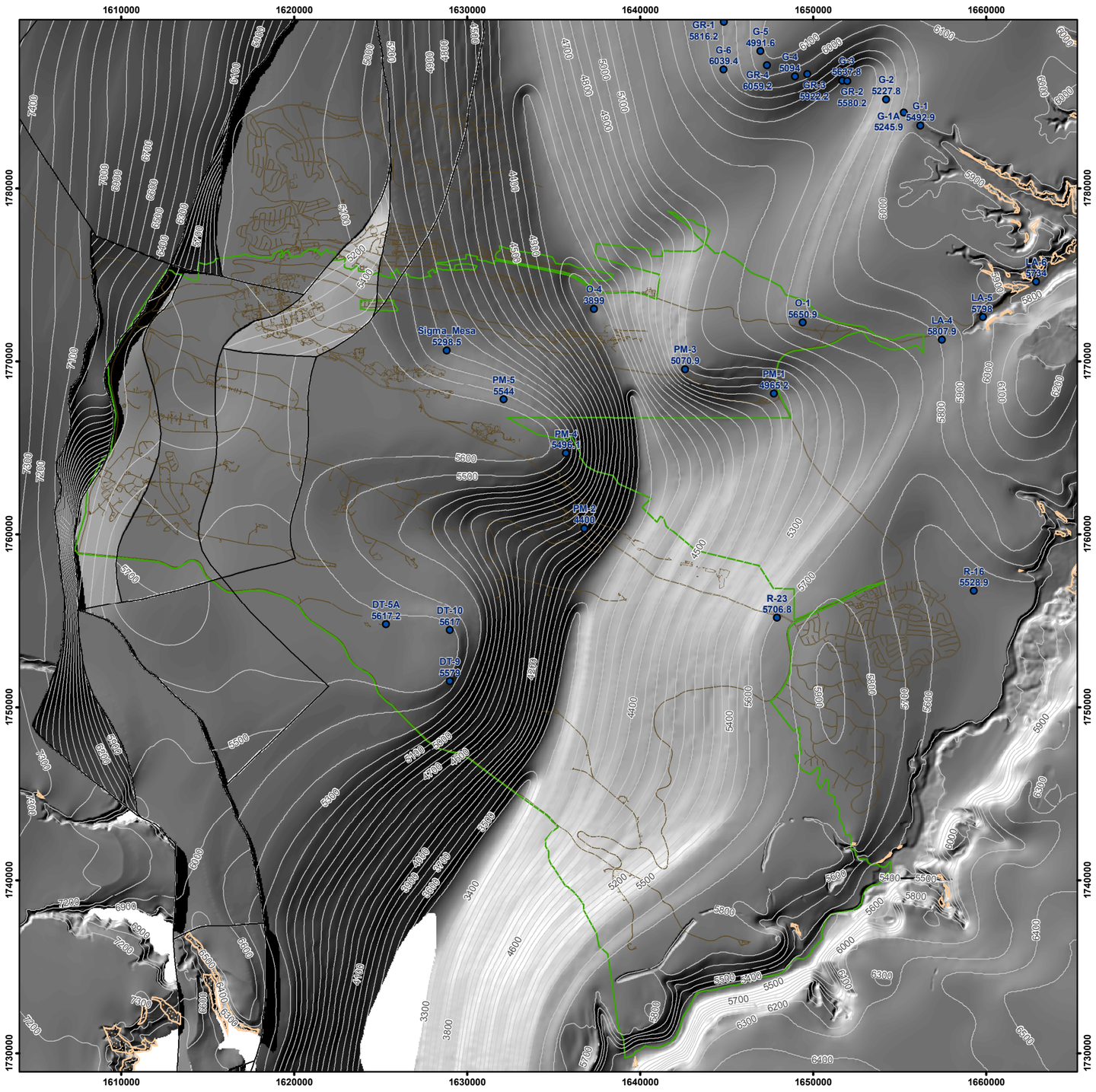
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-2. Thickness of the Galisteo Formation (Tgs)



Elevation of top of Ts in illustrated wells

Well ID	Top Elev.
DT-10	5617.0
DT-5A	5617.2
DT-9	5579.0
G-1	5492.9
G-1A	5245.9
G-2	5227.8
G-3	5637.8
G-4	5094.0
G-5	4991.6
G-6	6039.4
GR-1	5816.2
GR-2	5580.2
GR-3	5922.2
GR-4	6059.2
LA-1	5548.0
LA-1B	5544.0
LA-2	5591.0
LA-3	5621.0
LA-4	5807.9
LA-5	5798.0
LA-6	5734.0
O-1	5650.9
O-4	3899.0
PM-1	4965.2
PM-2	4400.0
PM-3	5070.9
PM-4	5496.1
PM-5	5544.0
R-16	5528.9
R-23	5706.8
Sigma_Mesa	5298.5

LEGEND

- Wells Intersecting Ts
- Elevation of the top of Ts (100' Contours)
- Outcrop of Ts
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

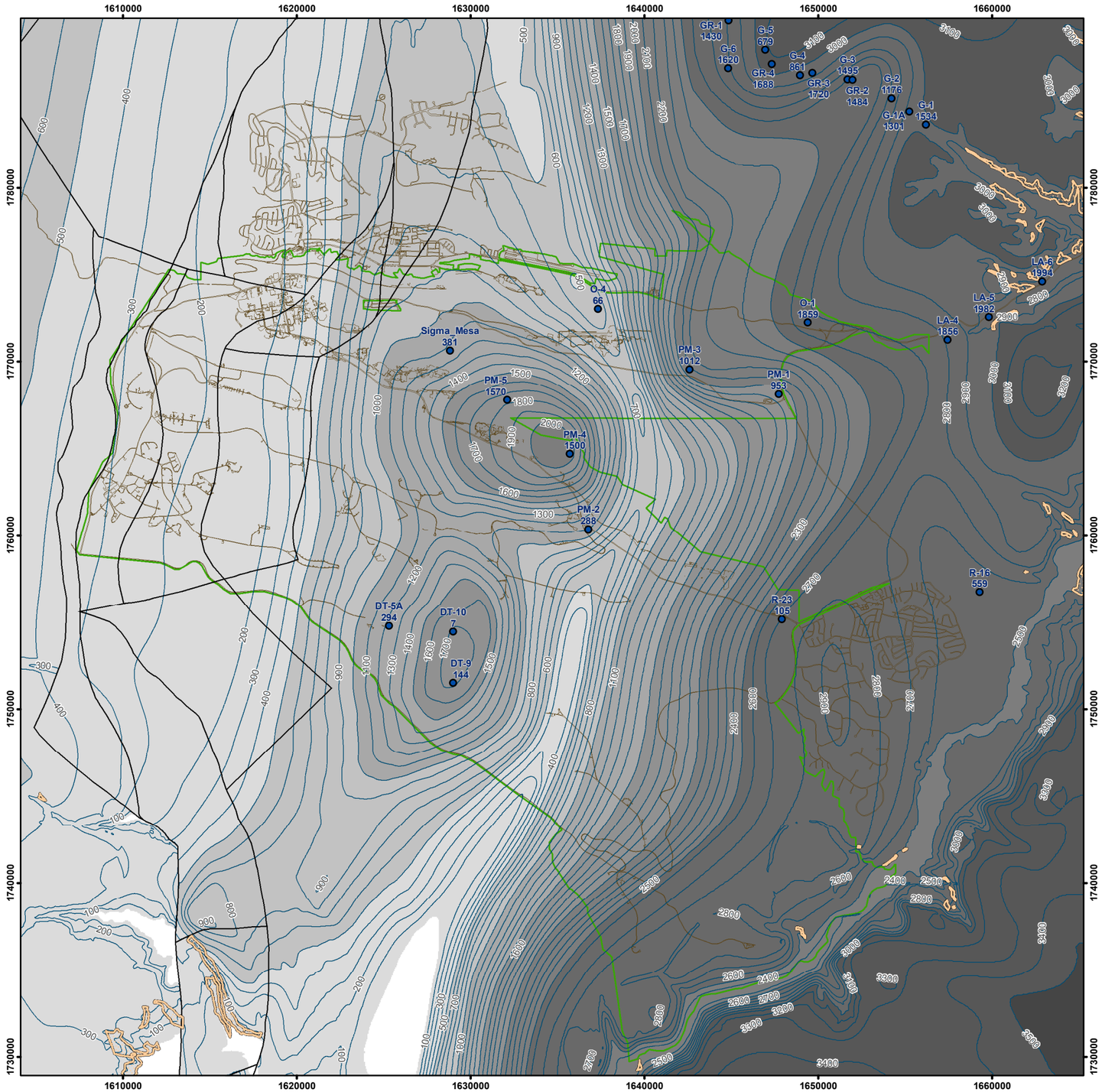
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-3. Structure contours of the top of the Santa Fe Group, Tesuque Formation (Ts)



Thickness of Ts in illustrated wells

Well ID	Thickness
DT-10	7.0
DT-5A	294.0
DT-9	144.0
G-1	1534.0
G-1A	1301.0
G-2	1176.0
G-3	1495.0
G-4	861.0
G-5	679.0
G-6	1620.0
GR-1	1430.0
GR-2	1484.0
GR-3	1720.0
GR-4	1688.0
LA-1	925.0
LA-1B	2178.0
LA-2	822.0
LA-3	859.0
LA-4	1856.0
LA-5	1982.0
LA-6	1994.0
O-1	1859.0
O-4	66.0
PM-1	953.0
PM-2	288.0
PM-3	1012.0
PM-4	1500.0
PM-5	1570.0
R-16	559.0
R-23	105.0
Sigma_Mesa	381.0

LEGEND

- Wells Intersecting Ts
- Thickness of Ts (100' Contours)
- Outcrop of Ts
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 500
- 501 - 1,000
- 1,001 - 1,500
- 1,501 - 2,000
- 2,001 - 2,500
- 2,501 - 3,000
- 3,001 - 3,500
- 3,501 - 4,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

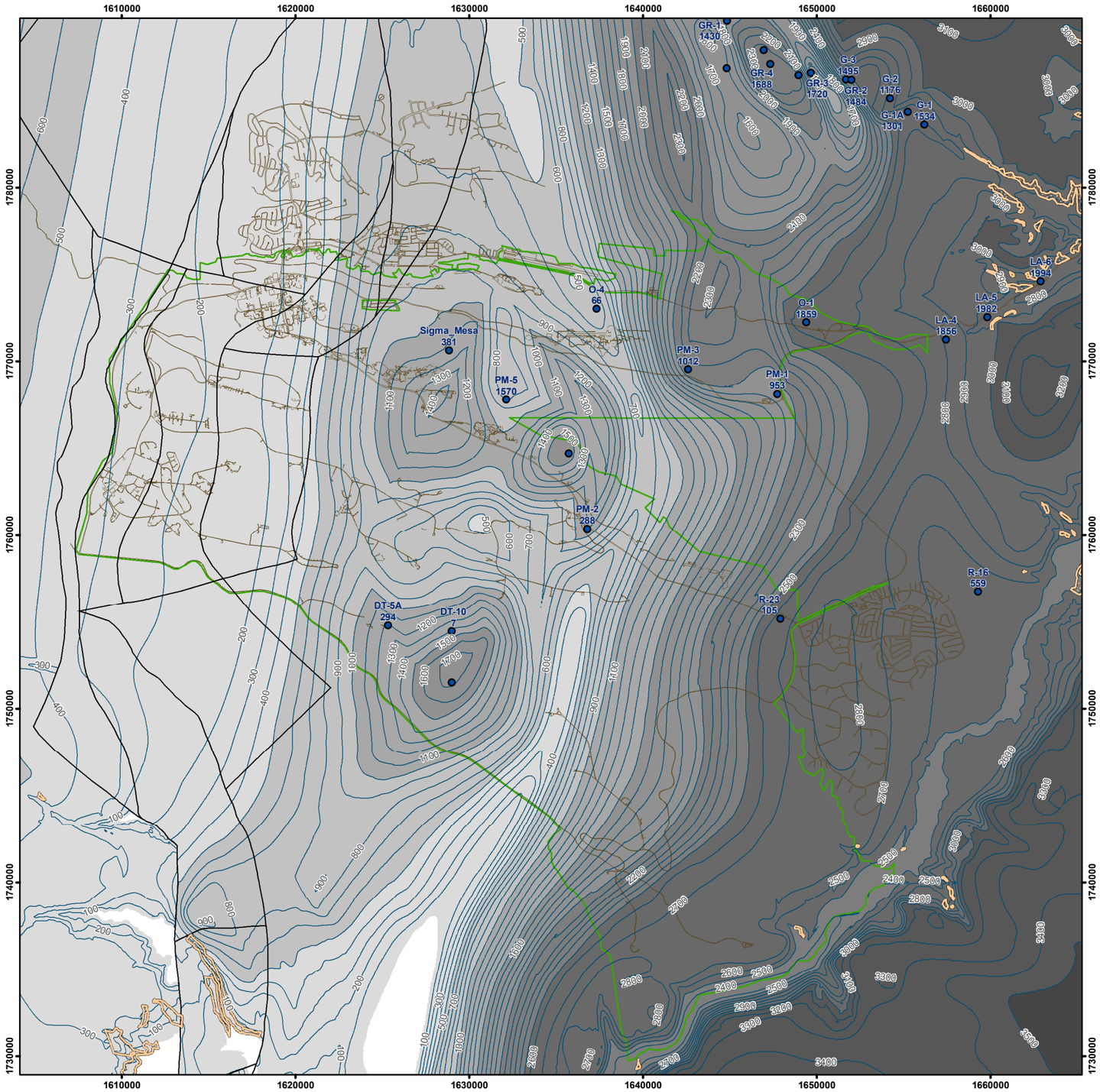
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-4. Thickness of the Santa Fe Group, Tesuque Formation (Ts), including interior flow units



Thickness of Ts in illustrated wells

Well ID	Thickness
DT-10	7.0
DT-5A	294.0
DT-9	144.0
G-1	1534.0
G-1A	1301.0
G-2	1176.0
G-3	1495.0
G-4	861.0
G-5	679.0
G-6	1620.0
GR-1	1430.0
GR-2	1484.0
GR-3	1720.0
GR-4	1688.0
LA-1	925.0
LA-1B	2178.0
LA-2	822.0
LA-3	859.0
LA-4	1856.0
LA-5	1982.0
LA-6	1994.0
O-1	1859.0
O-4	66.0
PM-1	953.0
PM-2	288.0
PM-3	1012.0
PM-4	1500.0
PM-5	1570.0
R-16	559.0
R-23	105.0
Sigma_Mesa	381.0

LEGEND

- Wells Intersecting Ts
- Thickness of Ts (100' Contours)
- Outcrop of Ts
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 500
- 501 - 1,000
- 1,001 - 1,500
- 1,501 - 2,000
- 2,001 - 2,500
- 2,501 - 3,000
- 3,001 - 3,500
- 3,501 - 4,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

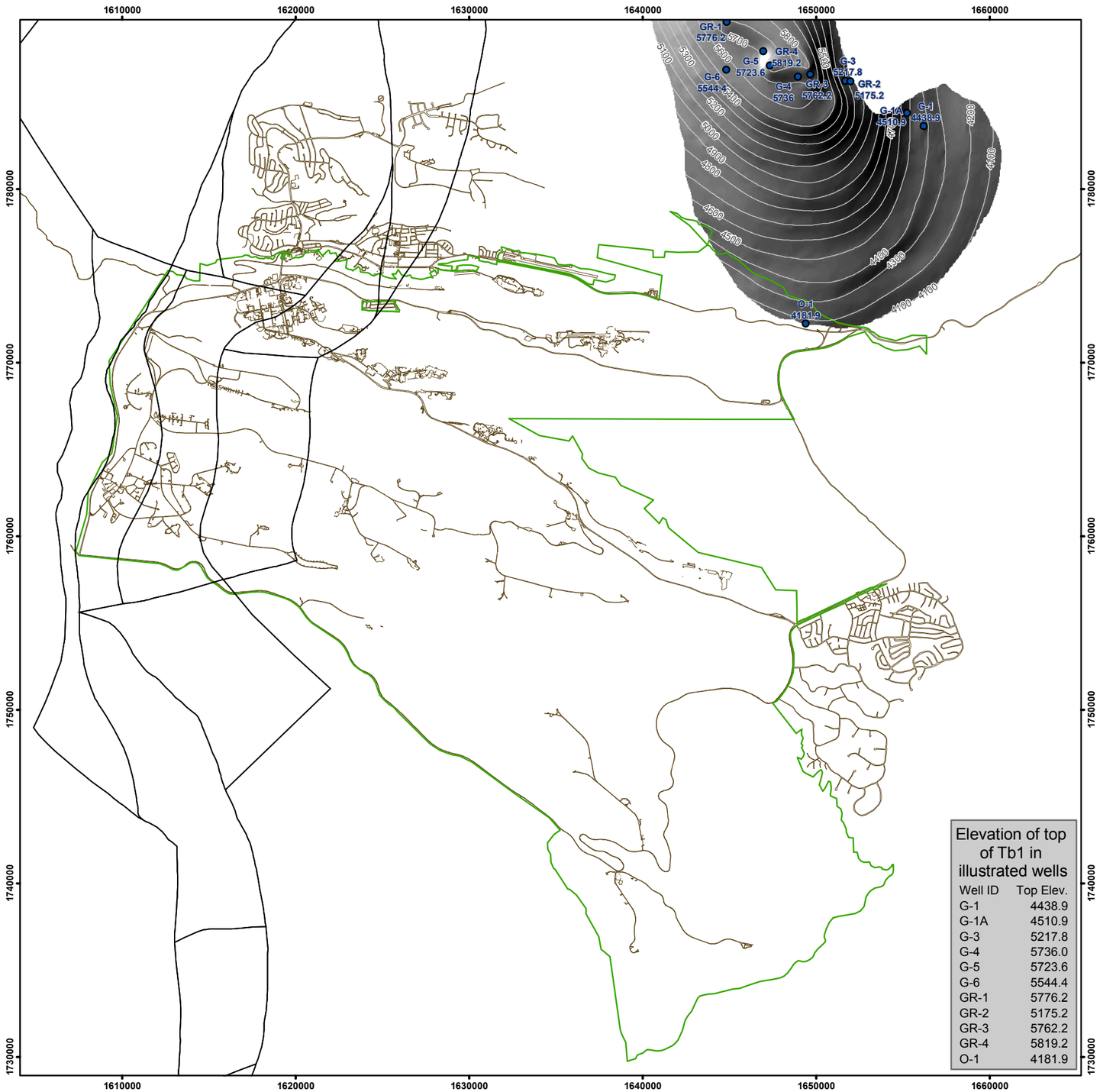
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-5. Adjusted thickness of the Santa Fe Group, Tesuque Formation (Ts) with thicknesses of interior flow units subtracted



Elevation of top of Tb1 in illustrated wells

Well ID	Top Elev.
G-1	4438.9
G-1A	4510.9
G-3	5217.8
G-4	5736.0
G-5	5723.6
G-6	5544.4
GR-1	5776.2
GR-2	5175.2
GR-3	5762.2
GR-4	5819.2
O-1	4181.9

LEGEND

- Wells Intersecting Tb1
- Elevation of the top of Tb1 (100' Contours)
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

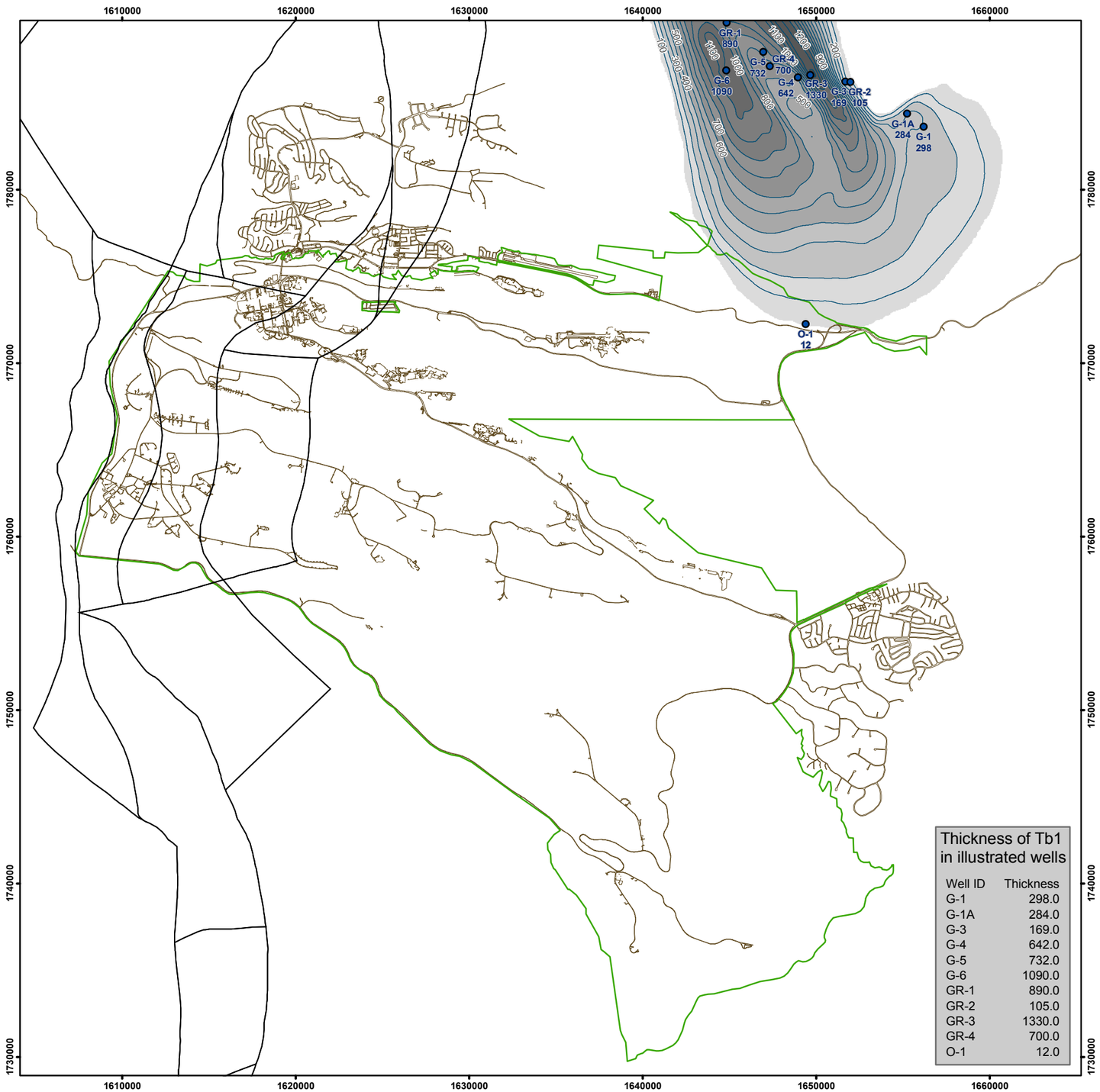
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Date: April, 2006

Plate 4-6. Structure contours of the top of the Guaje Canyon basalt (Tb1)



Thickness of Tb1 in illustrated wells

Well ID	Thickness
G-1	298.0
G-1A	284.0
G-3	169.0
G-4	642.0
G-5	732.0
G-6	1090.0
GR-1	890.0
GR-2	105.0
GR-3	1330.0
GR-4	700.0
O-1	12.0

LEGEND

- Wells Intersecting Tb1
- Thickness of Tb1 (100' Contours)
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 200
- 201 - 400
- 401 - 600
- 601 - 800
- 801 - 1,000
- 1,001 - 1,200
- 1,201 - 1,400
- 1,401 - 1,600

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

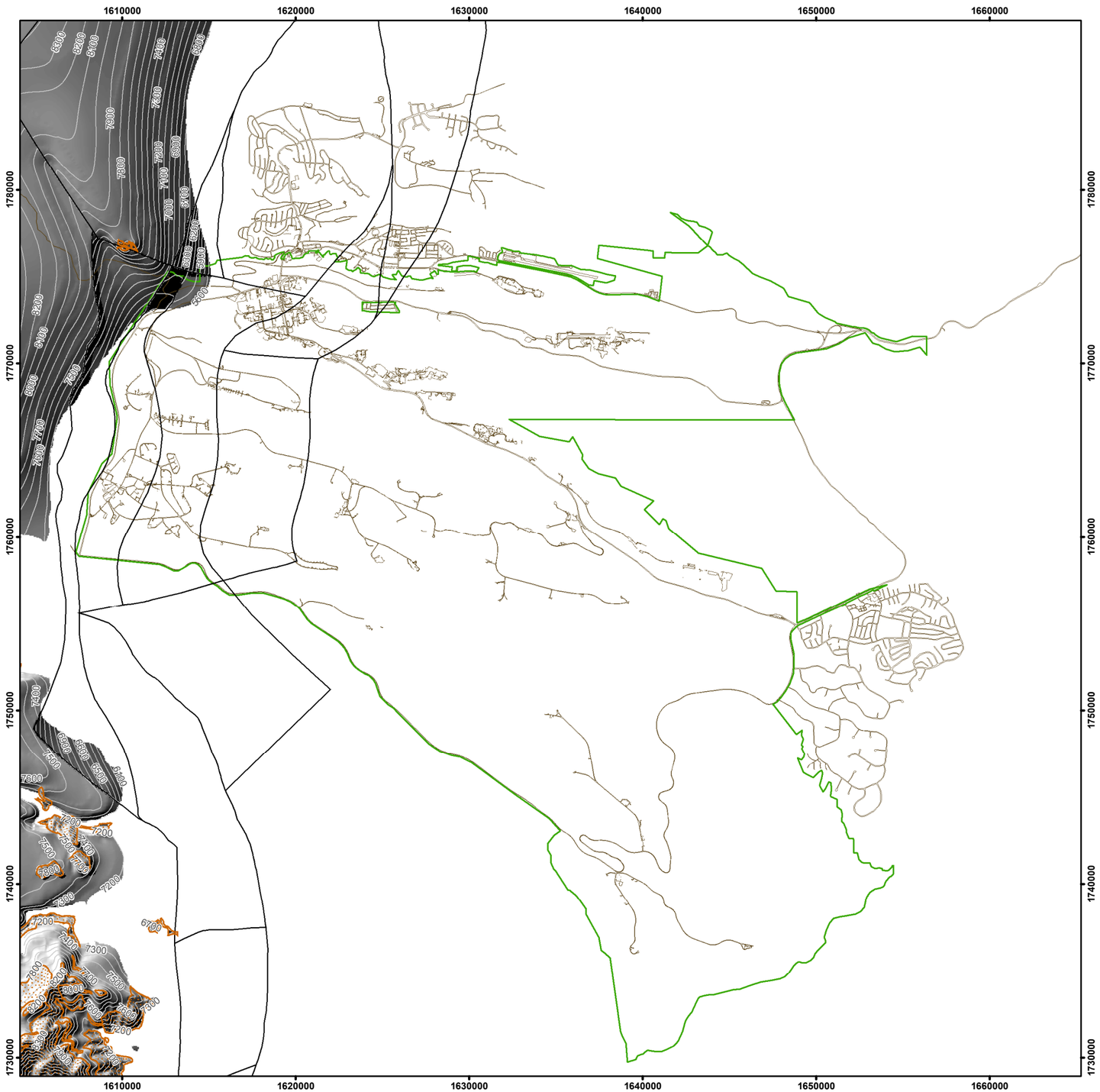
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Date: April, 2006

Plate 4-7. Thickness of the Guaje Canyon basalt (Tb1)



LEGEND

- Elevation of the top of Tk (100' Contours)
- Outcrop of Tk
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

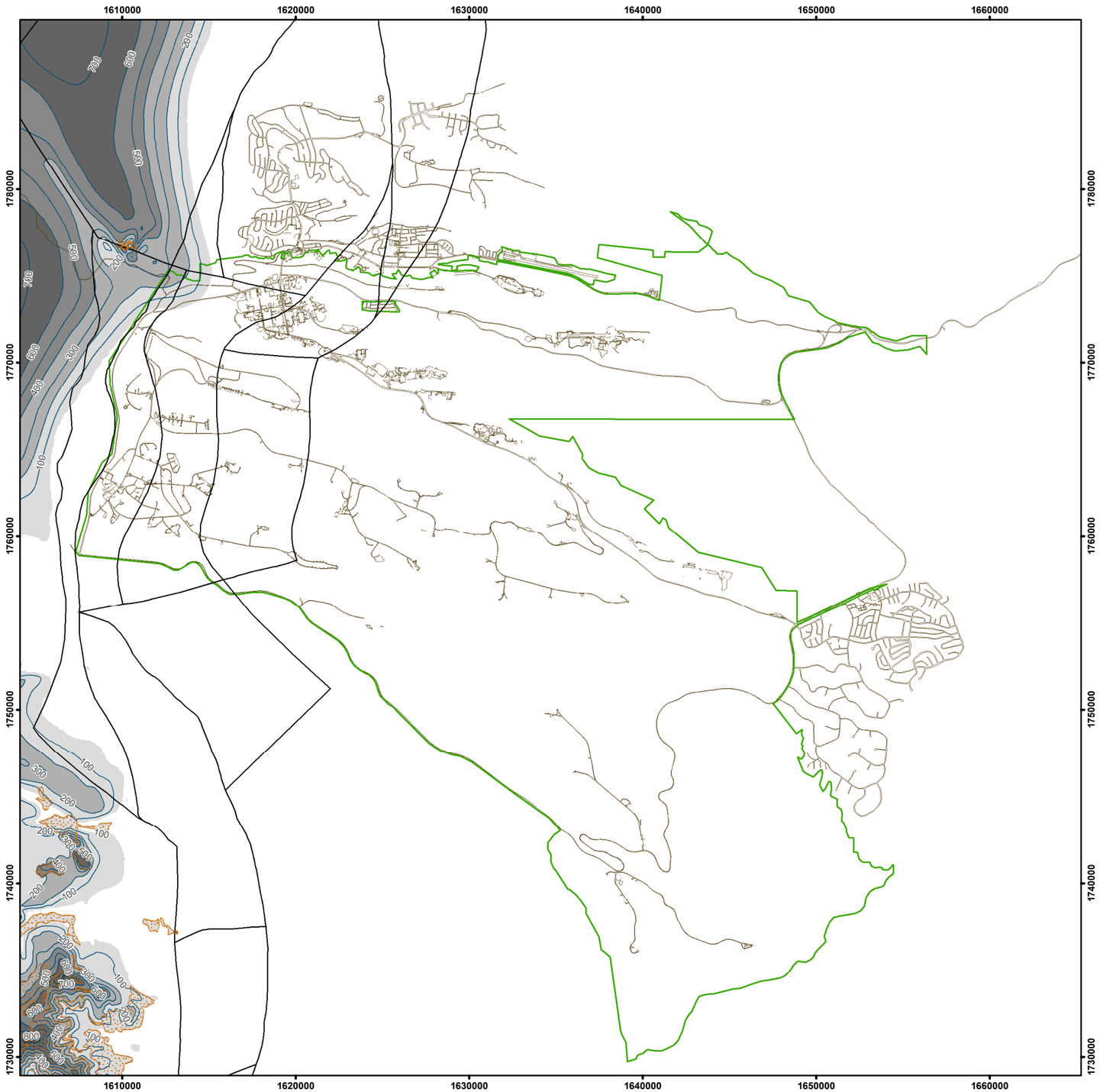
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-8. Structure contours of the top of the Keres Group (Tk)



LEGEND

- Thickness of Tk (100' Contours)
- Outcrop of Tk
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 200
- 201 - 400
- 401 - 600
- 601 - 800
- 801 - 1,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

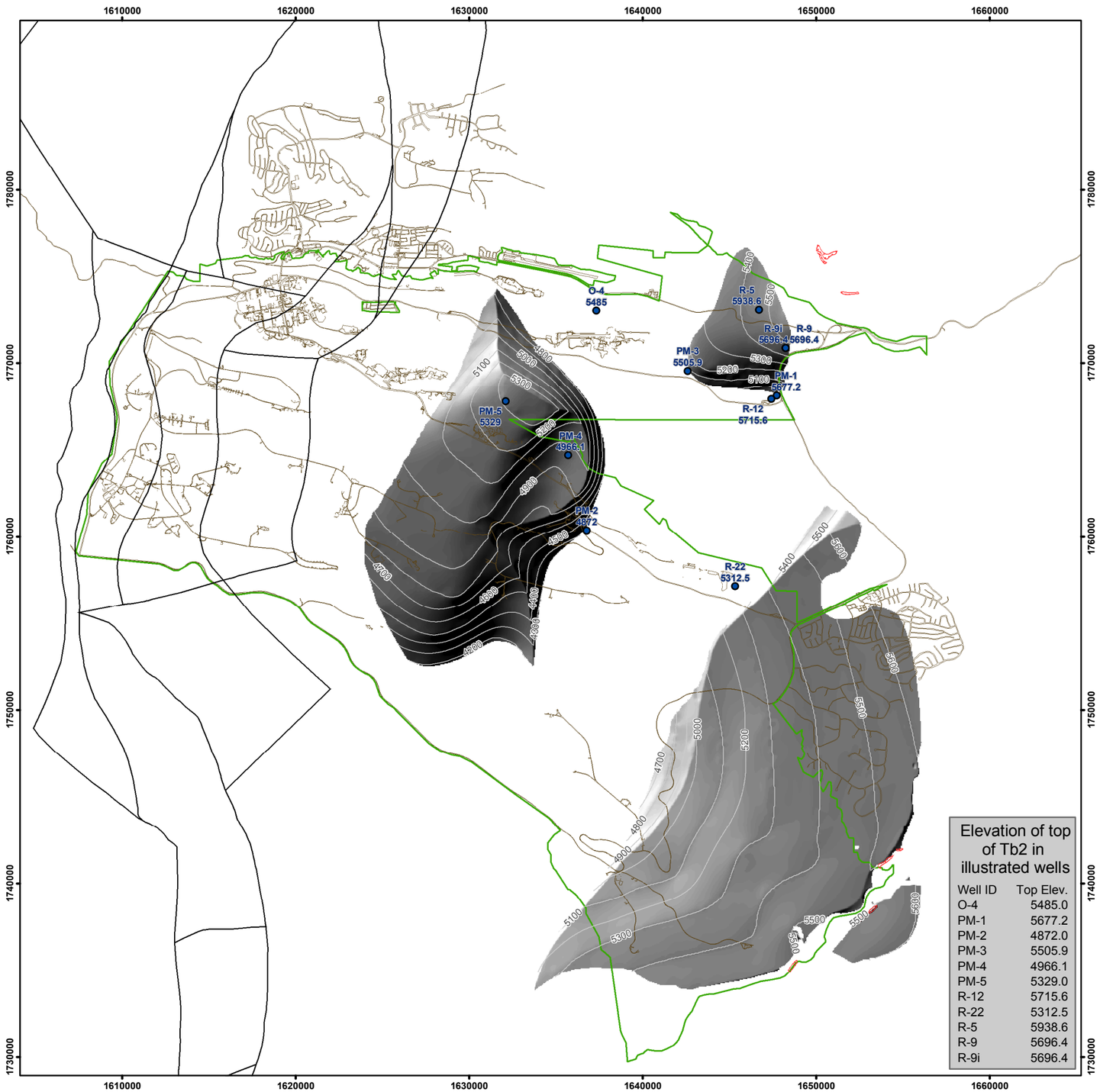
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-9. Thickness of the Keres Group (Tk)



LEGEND

- Wells Intersecting Tb2
- Elevation of the top of Tb2-lower (100' Contours)
- Outcrop of Tb2
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

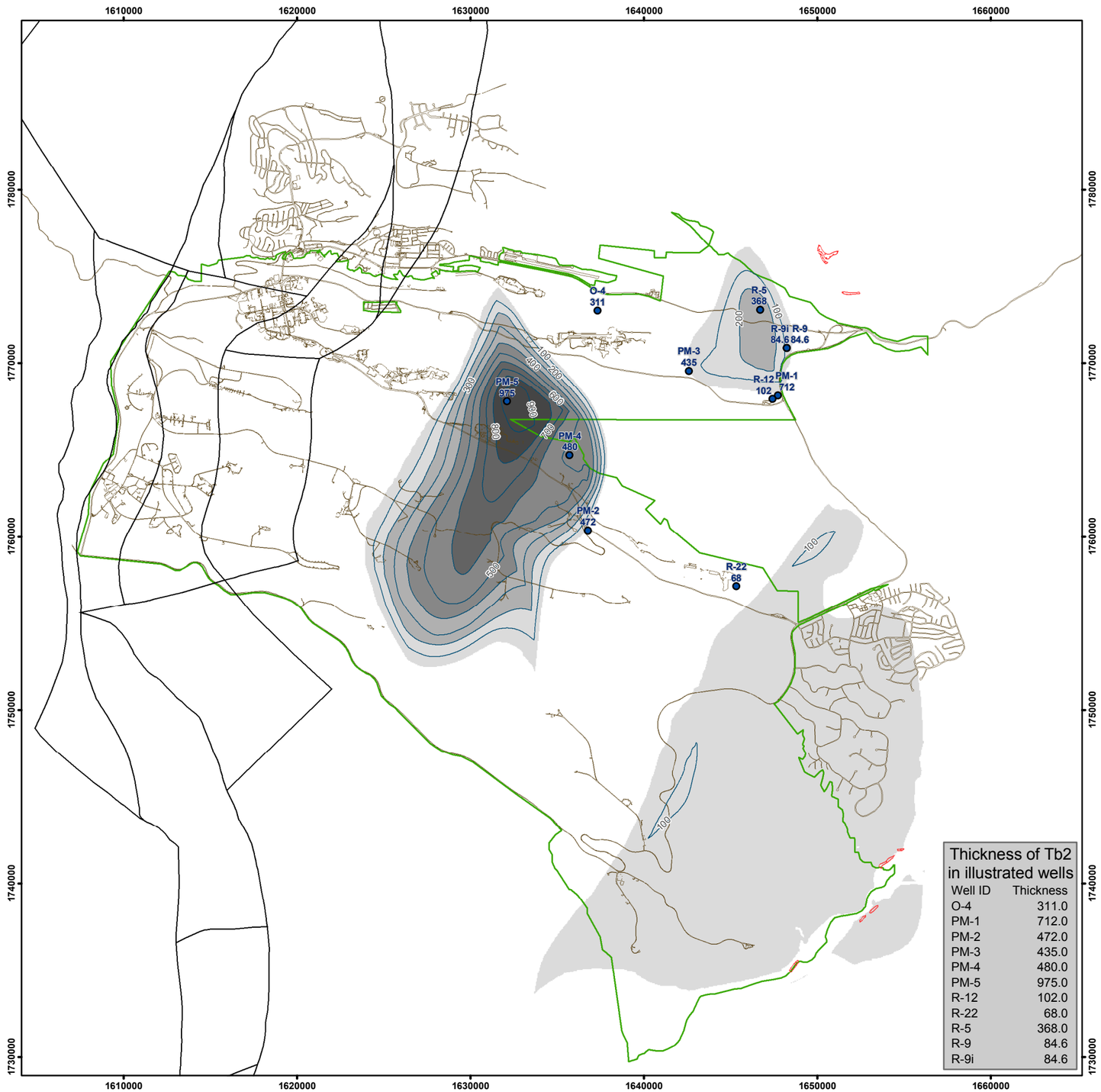
Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Elevation of top of Tb2 in illustrated wells

Well ID	Top Elev.
O-4	5485.0
PM-1	5677.2
PM-2	4872.0
PM-3	5505.9
PM-4	4966.1
PM-5	5329.0
R-12	5715.6
R-22	5312.5
R-5	5938.6
R-9	5696.4
R-9i	5696.4

Plate 4-10. Structure contours of the top of the lower portion of the Bayo Canyon basalt (Tb2-lower)



Thickness of Tb2 in illustrated wells	
Well ID	Thickness
O-4	311.0
PM-1	712.0
PM-2	472.0
PM-3	435.0
PM-4	480.0
PM-5	975.0
R-12	102.0
R-22	68.0
R-5	368.0
R-9	84.6
R-9i	84.6

LEGEND

- Wells Intersecting Tb2
- Thickness of Tb2-lower (100' Contours)
- Outcrop of Tb2
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 200
- 201 - 400
- 401 - 600
- 601 - 800
- 801 - 1,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

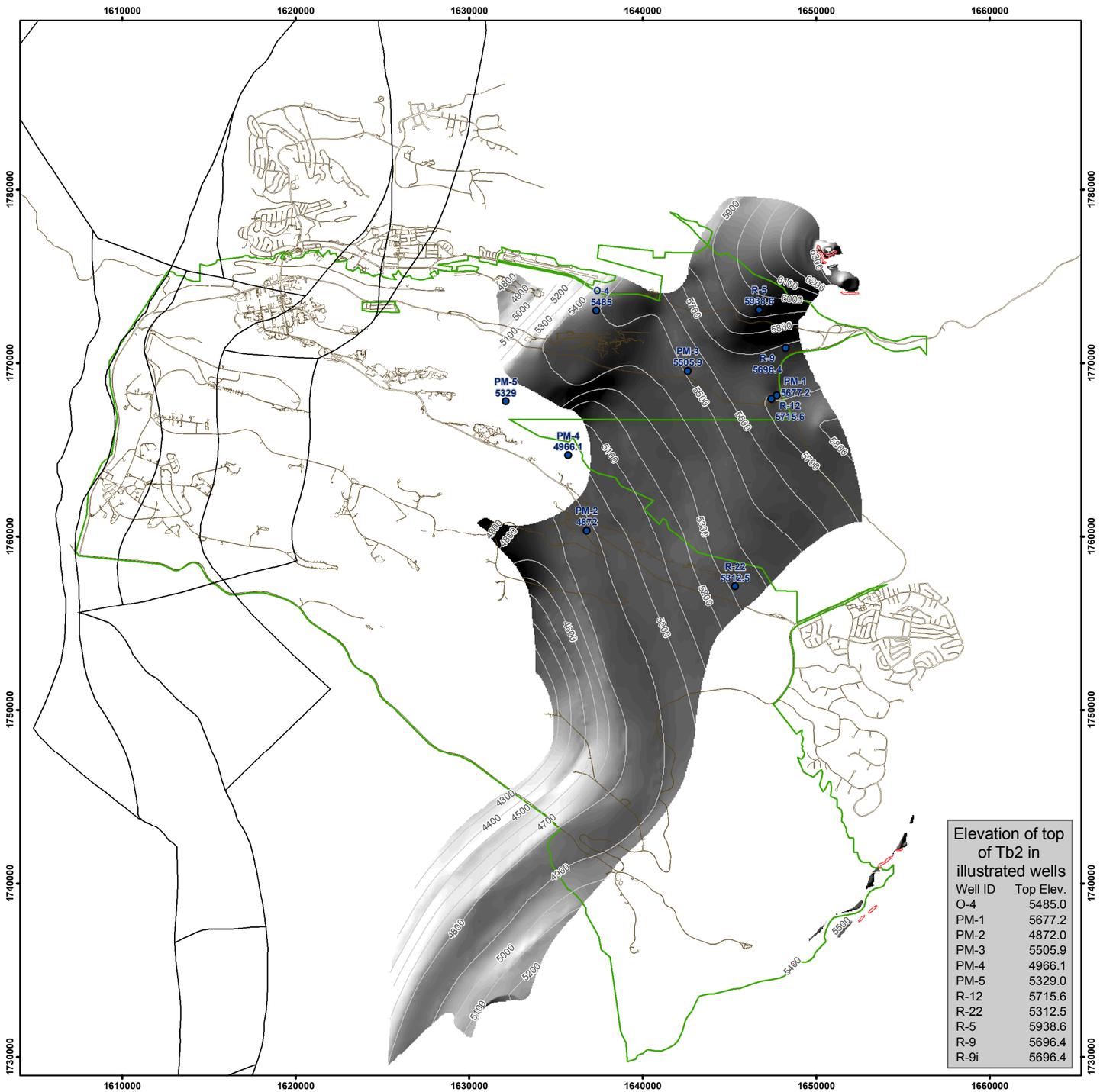
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-11. Thickness of the lower portion of the Bayo Canyon basalt (Tb2-lower)



Elevation of top of Tb2 in illustrated wells

Well ID	Top Elev.
O-4	5485.0
PM-1	5677.2
PM-2	4872.0
PM-3	5505.9
PM-4	4966.1
PM-5	5329.0
R-12	5715.6
R-22	5312.5
R-5	5938.6
R-9	5696.4
R-9i	5696.4

LEGEND

- Wells Intersecting Tb2
- Elevation of the top of Tb2-upper (100' Contours)
- Outcrop of Tb2
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

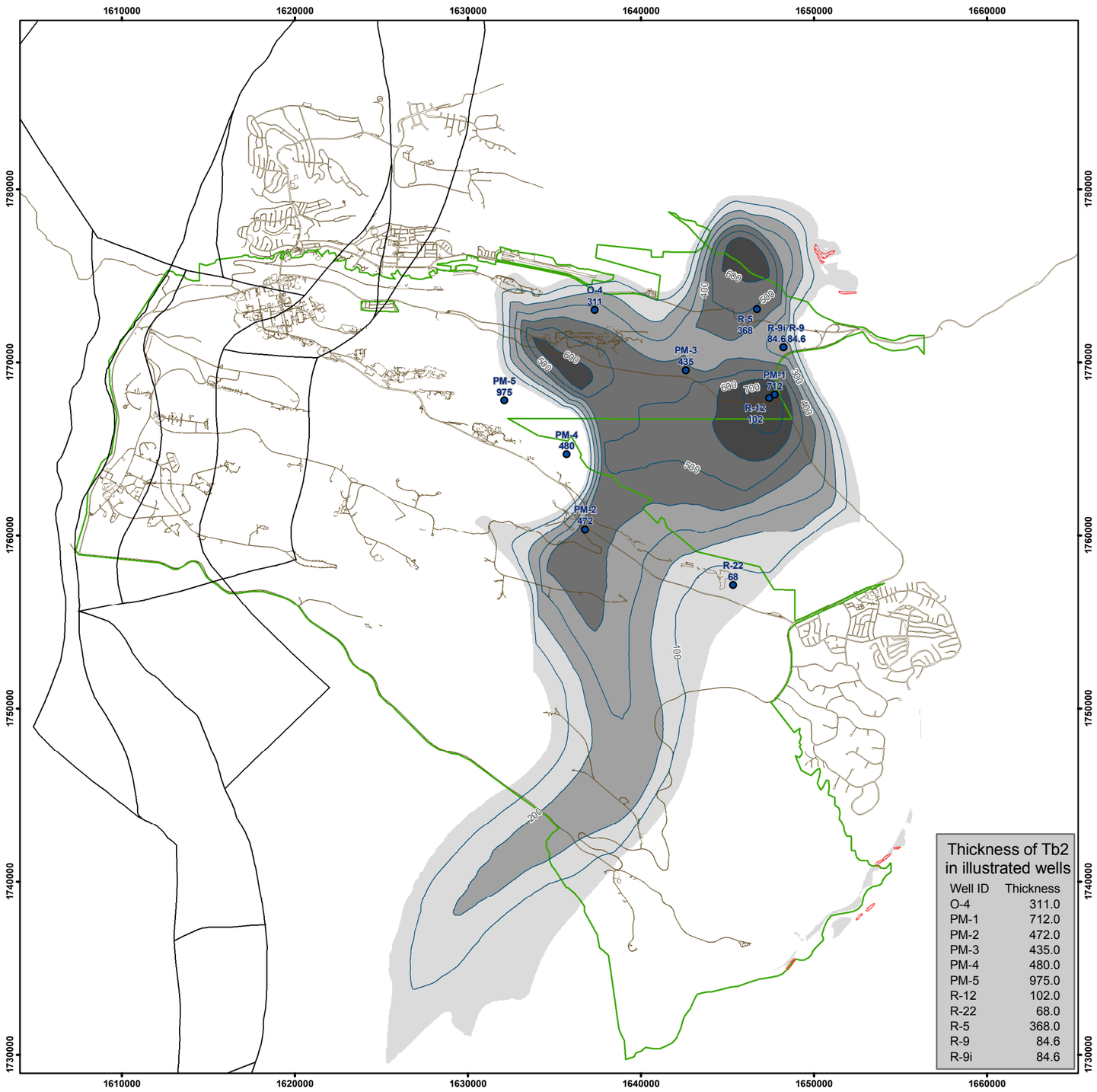
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-12. Structure contours of the top of the upper portion of the Bayo Canyon basalt (Tb2-upper)



Thickness of Tb2 in illustrated wells

Well ID	Thickness
O-4	311.0
PM-1	712.0
PM-2	472.0
PM-3	435.0
PM-4	480.0
PM-5	975.0
R-12	102.0
R-22	68.0
R-5	368.0
R-9	84.6
R-9i	84.6

LEGEND

- Wells Intersecting Tb2
- Thickness of Tb2-upper (100' Contours)
- Outcrop of Tb2
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 200
- 201 - 400
- 401 - 600
- 601 - 800

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

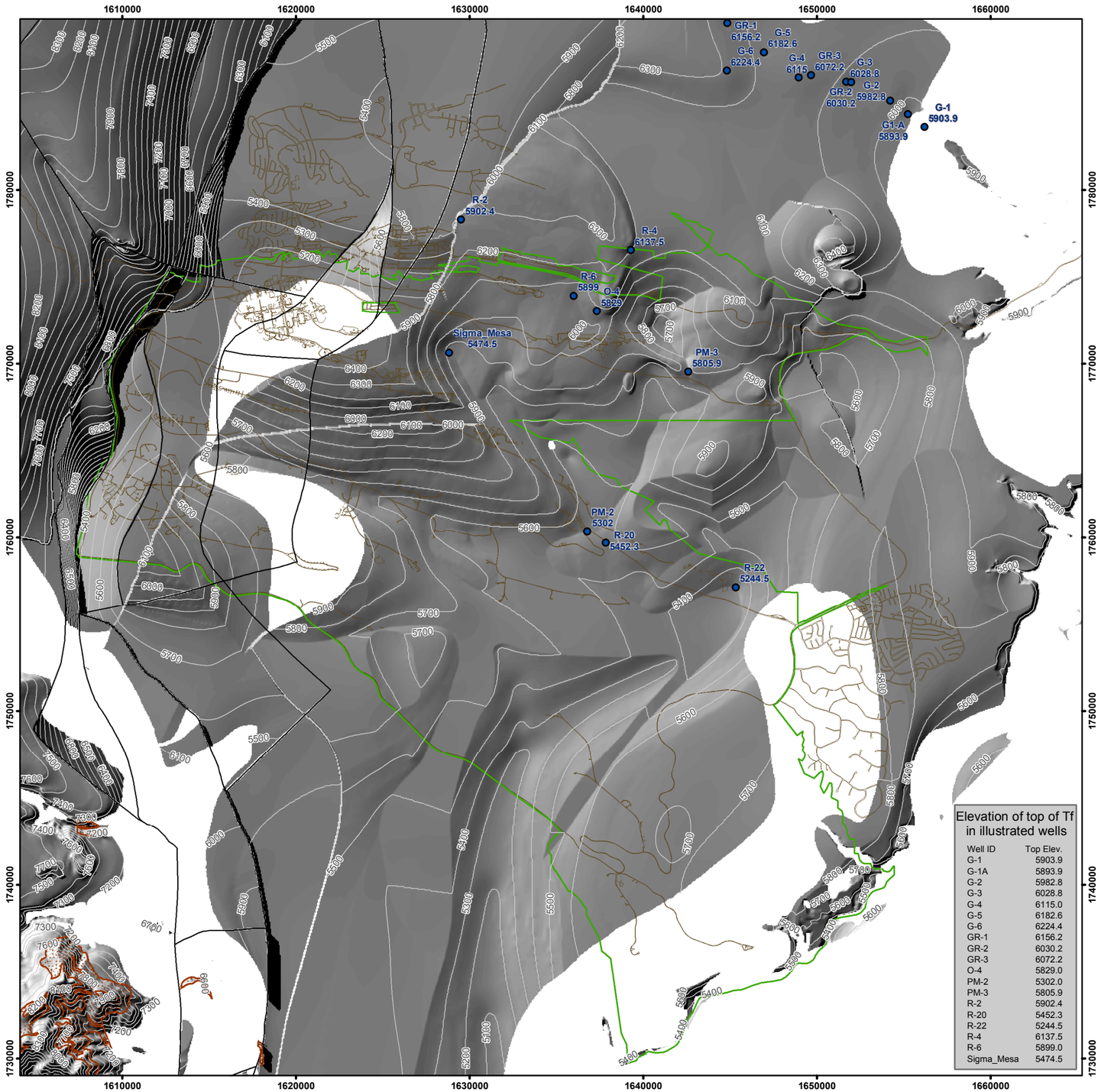
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-13. Thickness of the upper portion of the Bayo Canyon basalt (Tb2-upper)



Elevation of top of Tf in illustrated wells

Well ID	Top Elev.
G-1	5903.9
G-1A	5893.9
G-2	5982.8
G-3	6028.8
G-4	6115.0
G-5	6182.6
G-6	6224.4
GR-1	6156.2
GR-2	6030.2
GR-3	6072.2
O-4	5829.0
PM-2	5302.0
PM-3	5805.9
R-2	5902.4
R-20	5452.3
R-22	5244.5
R-4	6137.5
R-6	5899.0
Sigma_Mesa	5474.5

LEGEND

- Wells Intersecting Tf
- Elevation of the top of Tf (100' Contours)
- Outcrop of Tf
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

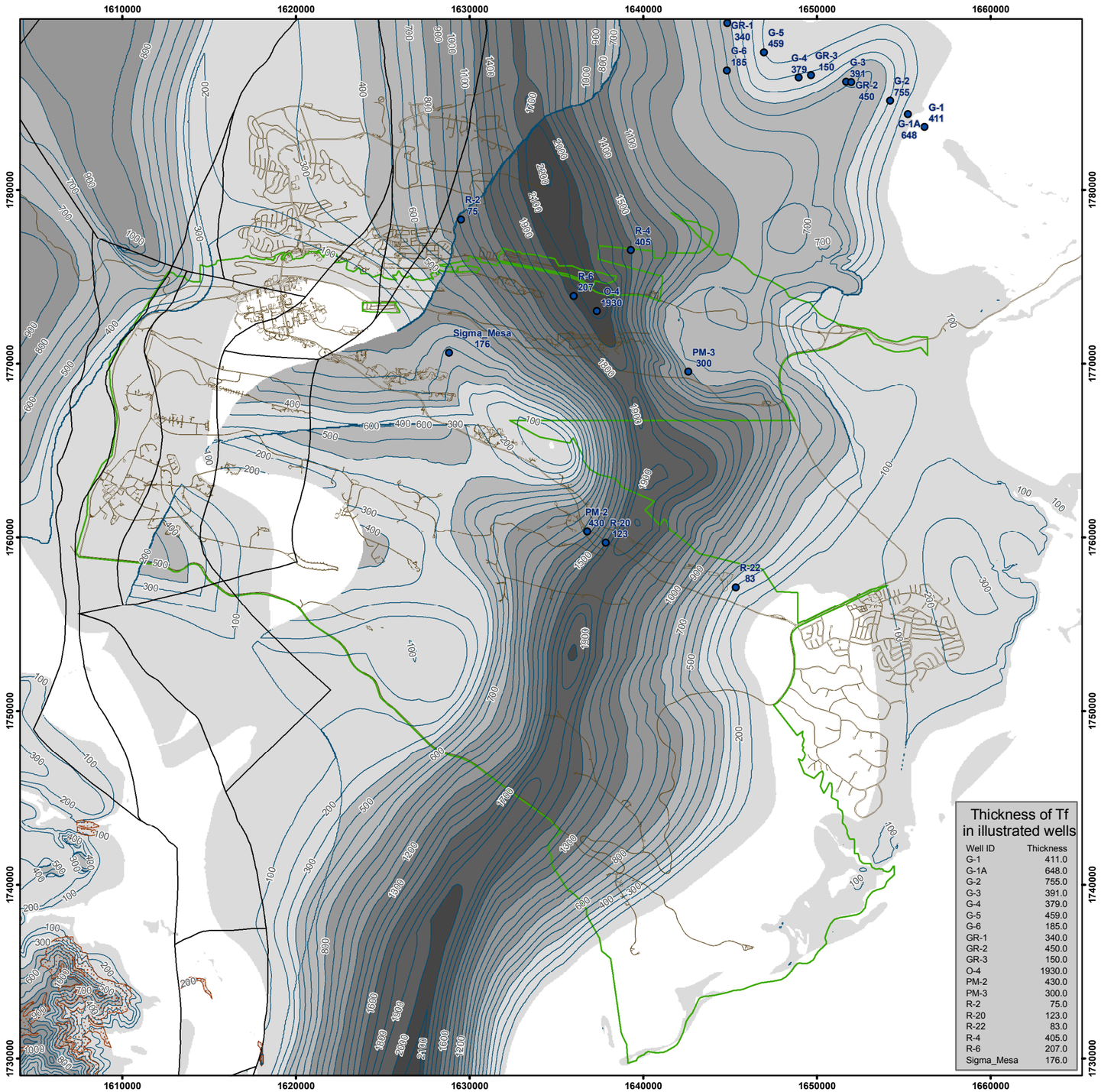
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-14. Structure contours of the top of the older Fanglomerate unit (Tf)



Thickness of Tf in illustrated wells

Well ID	Thickness
G-1	411.0
G-1A	648.0
G-2	755.0
G-3	391.0
G-4	379.0
G-5	459.0
G-6	185.0
GR-1	340.0
GR-2	450.0
GR-3	150.0
O-4	1930.0
PM-2	430.0
PM-3	300.0
R-2	75.0
R-20	123.0
R-22	83.0
R-4	405.0
R-6	207.0
Sigma_Mesa	176.0

LEGEND

- Wells Intersecting Tf
- Thickness of Tf (100' Contours)
- Outcrop of Tf
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 400
- 401 - 800
- 801 - 1,200
- 1,201 - 1,600
- 1,601 - 2,000
- 2,001 - 2,400

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

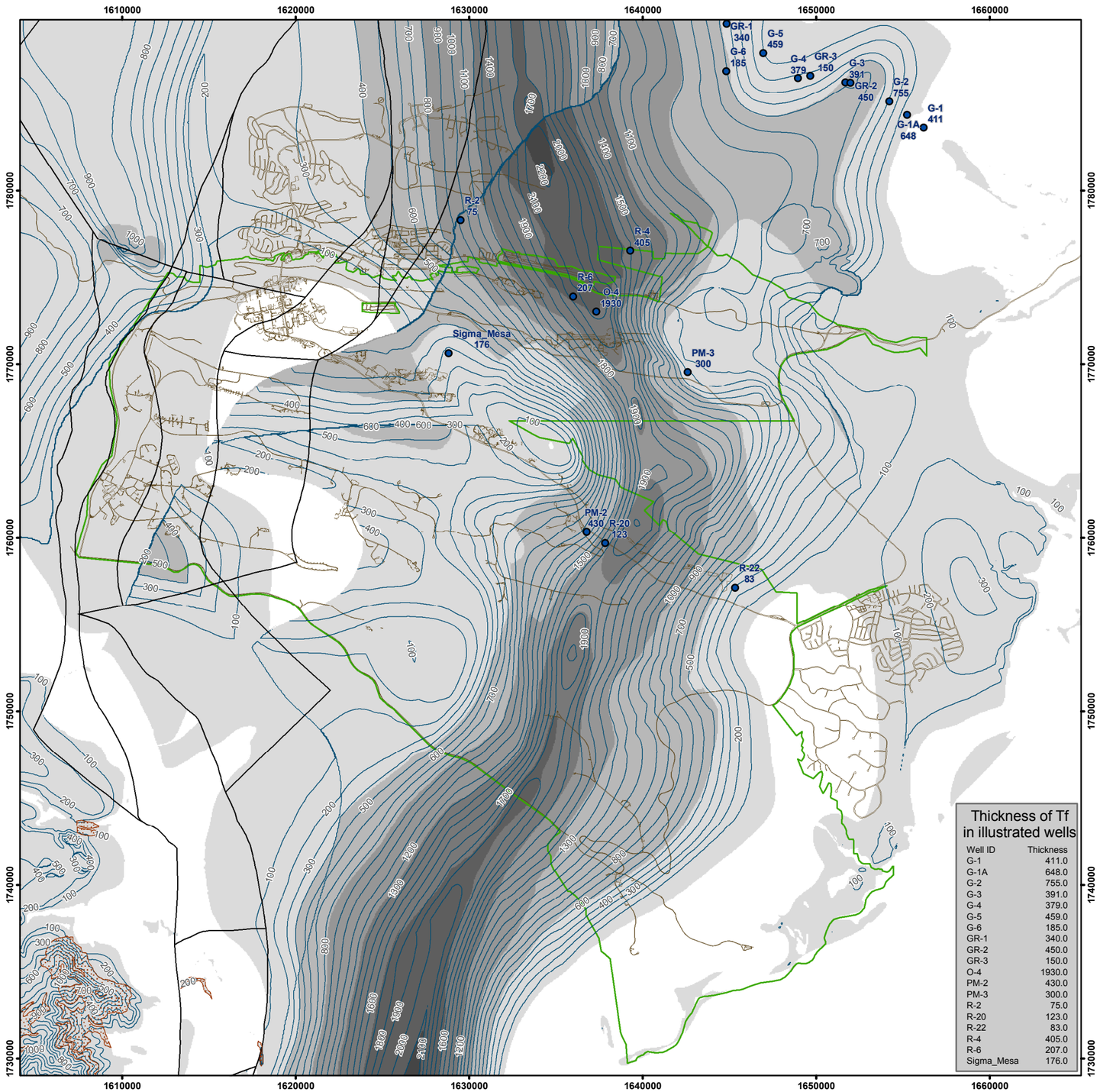
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-15. Thickness of the older Fanglomerate Unit (Tf), including interior flow and facies units



Thickness of Tf in illustrated wells

Well ID	Thickness
G-1	411.0
G-1A	648.0
G-2	755.0
G-3	391.0
G-4	379.0
G-5	459.0
G-6	185.0
GR-1	340.0
GR-2	450.0
GR-3	150.0
O-4	1930.0
PM-2	430.0
PM-3	300.0
R-2	75.0
R-20	123.0
R-22	83.0
R-4	405.0
R-6	207.0
Sigma_Mesa	176.0

LEGEND

- Wells Intersecting Tf
- Thickness of Tf (100' Contours)
- Outcrop of Tf
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 400
- 401 - 800
- 801 - 1,200
- 1,201 - 1,600
- 1,601 - 2,000
- 2,001 - 2,400

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

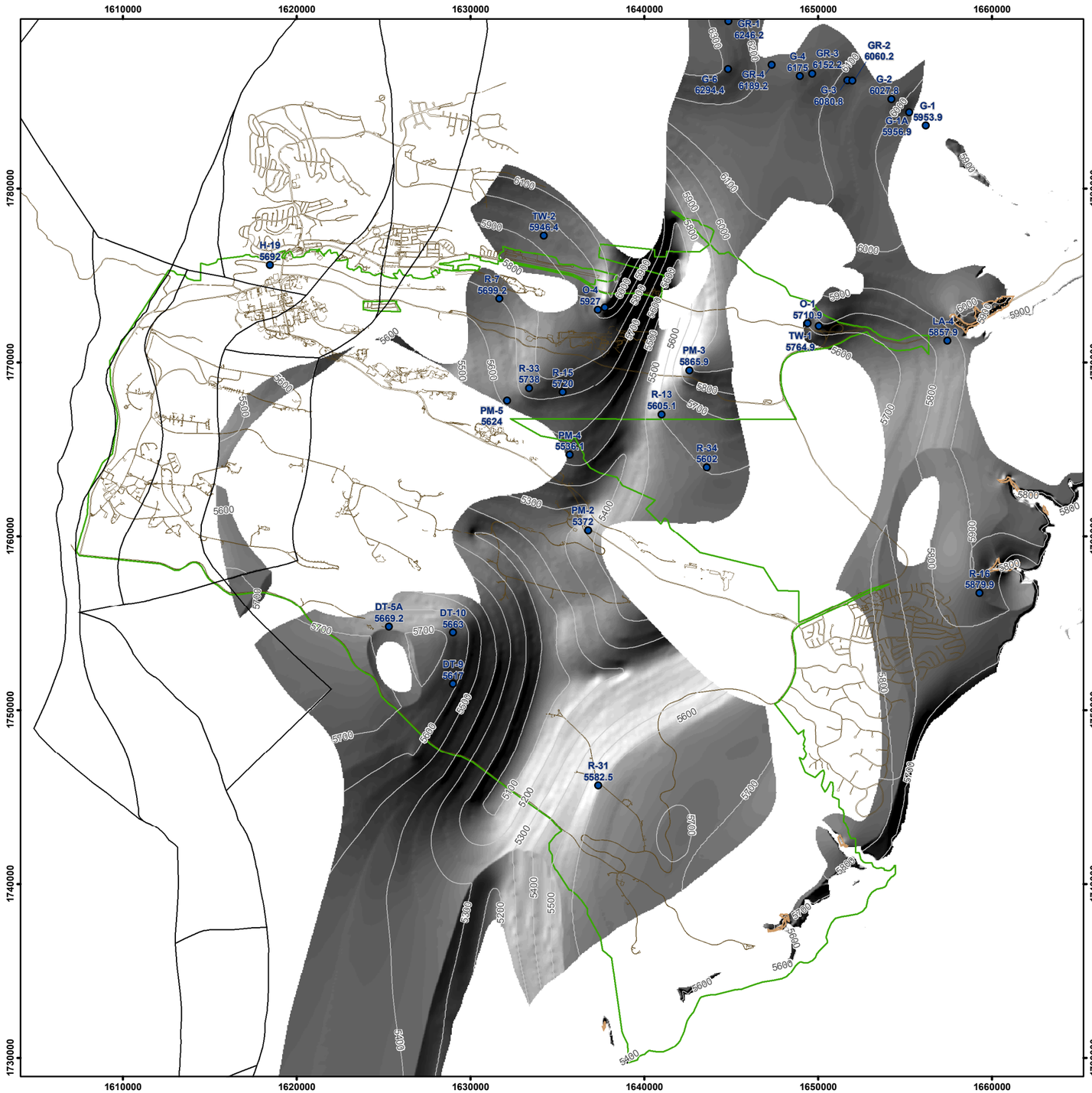
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-16. Adjusted thickness of the older fanglomerate unit (Tf), with thicknesses of interior flow and facies units subtracted



Elevation of top of Tpt in illustrated wells

Well ID	Top Elev.
DT-10	5663.0
DT-5A	5669.2
DT-9	5617.0
G-1	5953.9
G-1A	5956.9
G-2	6027.8
G-3	6080.8
G-4	6175.0
G-6	6294.4
GR-1	6246.2
GR-2	6060.2
GR-3	6152.2
GR-4	6189.2
H-19	5692.0
LA-4	5857.9
O-1	5710.9
O-4	5927.0
PM-2	5372.0
PM-3	5865.9
PM-4	5536.1
PM-5	5624.0
R-13	5605.1
R-15	5720.0
R-16	5879.9
R-31	5582.5
R-33	5738.0
R-34	5602.0
R-7	5699.2
TW-1	5764.9
TW-2	5946.4
TW-3	6006.9

LEGEND

- Wells Intersecting Tpt
- Elevation of the top of Tpt-lower (100' Contours)
- Outcrop of Tpt
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

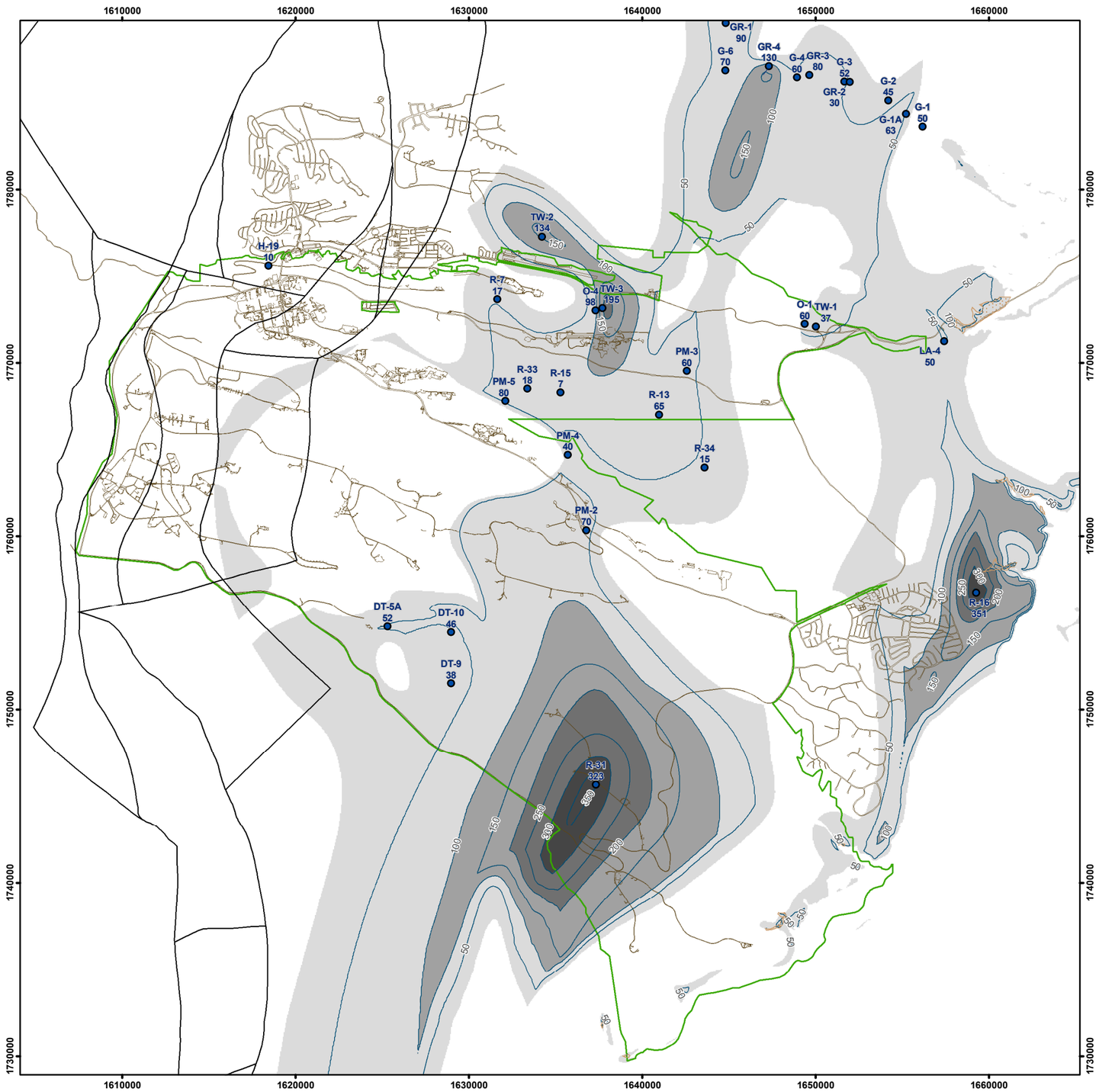
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-17. Structure contours of the top of the lower portion of the river gravels (Tpt-lower)



Thickness of Tpt in illustrated wells

Well ID	Thickness
DT-10	46.0
DT-5A	52.0
DT-9	38.0
G-1	50.0
G-1A	63.0
G-2	45.0
G-3	52.0
G-4	60.0
G-6	70.0
GR-1	90.0
GR-2	30.0
GR-3	80.0
GR-4	130.0
H-19	10.0
LA-4	50.0
O-1	60.0
O-4	98.0
PM-2	70.0
PM-3	60.0
PM-4	40.0
PM-5	80.0
R-13	65.0
R-15	7.0
R-16	351.0
R-31	323.0
R-33	18.0
R-34	15.0
R-7	17.0
TW-1	37.0
TW-2	134.0
TW-3	195.0

LEGEND

- Wells Intersecting Tpt
- Thickness of Tpt-lower (50' Contours)
- Outcrop of Tpt
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 100
- 101 - 200
- 201 - 300
- 301 - 400

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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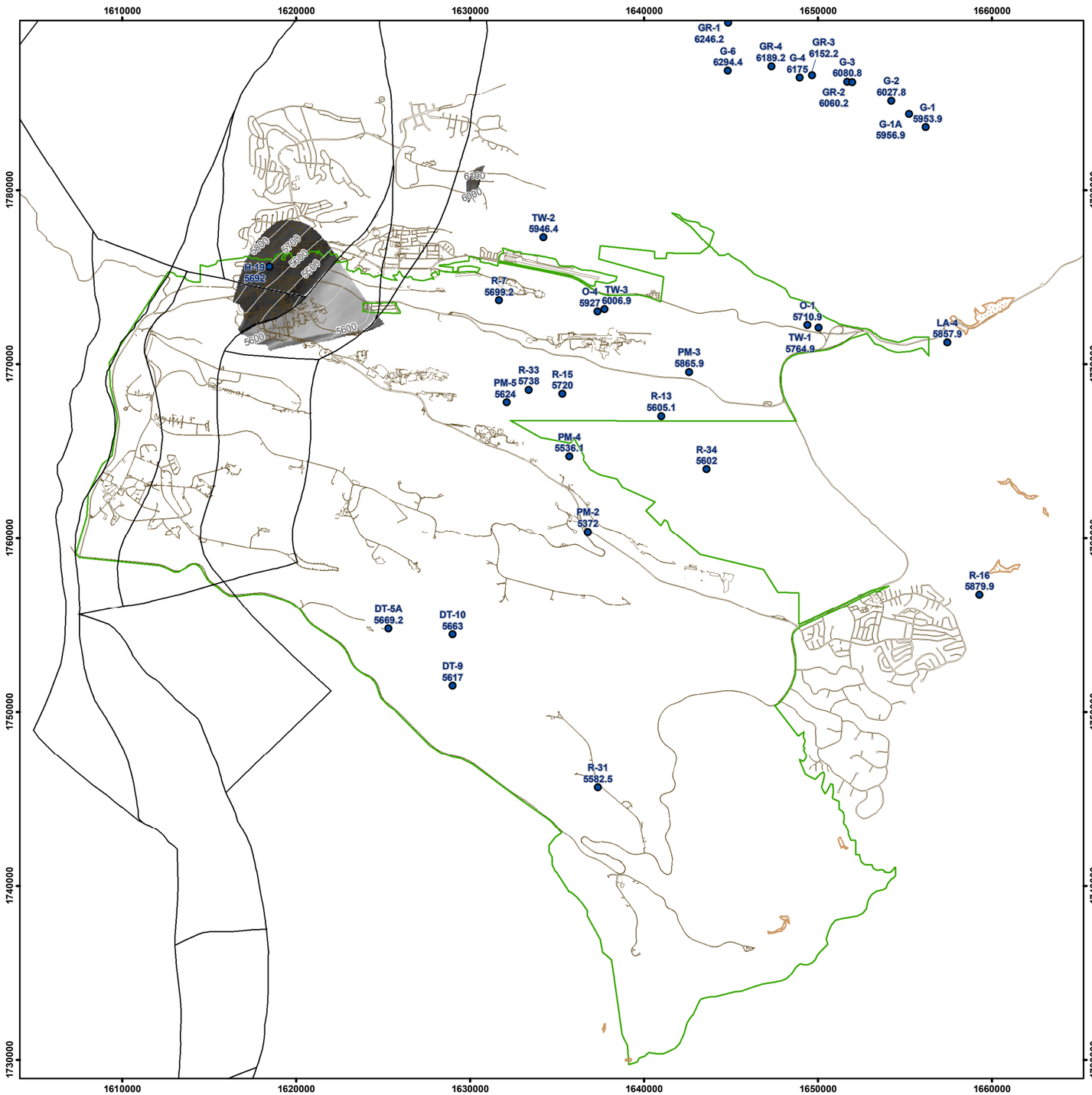
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-18. Thickness of the lower portion of the river gravels (Tpt-lower)



Elevation of top of Tpt in illustrated wells

Well ID	Top Elev.
DT-10	5663.0
DT-5A	5669.2
DT-9	5617.0
G-1	5953.9
G-1A	5956.9
G-2	6027.8
G-3	6080.8
G-4	6175.0
G-6	6294.4
GR-1	6246.2
GR-2	6060.2
GR-3	6152.2
GR-4	6189.2
H-19	5692.0
LA-4	5857.9
O-1	5710.9
O-4	5927.0
PM-2	5372.0
PM-3	5865.9
PM-4	5536.1
PM-5	5624.0
R-13	5605.1
R-15	5720.0
R-16	5879.9
R-31	5582.5
R-33	5738.0
R-34	5602.0
R-7	5699.2
TW-1	5764.9
TW-2	5946.4
TW-3	6006.9

LEGEND

- Wells Intersecting Tpt
- Elevation of the top of Tpt-upper (100' Contours)
- Outcrop of Tpt
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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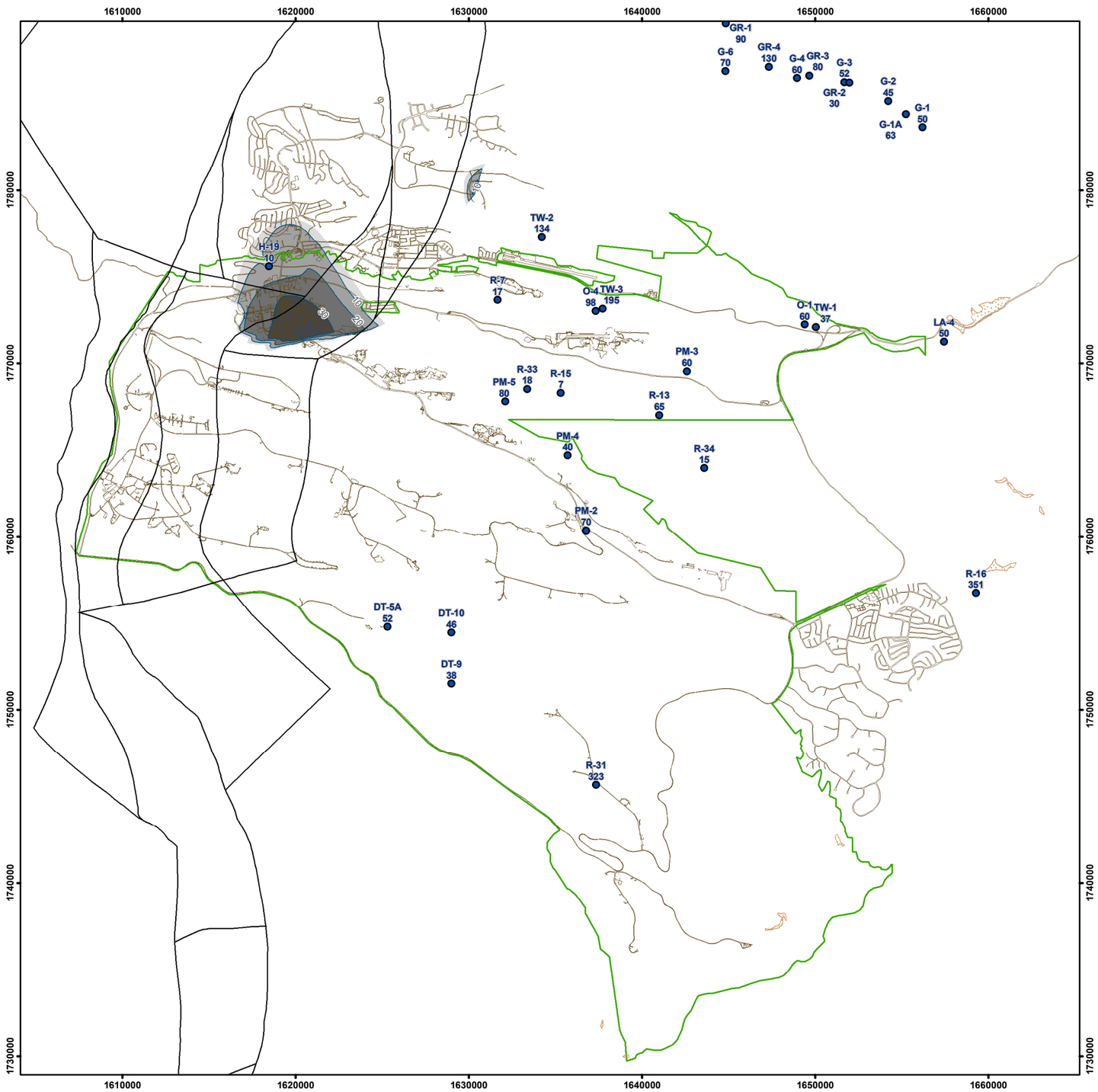
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-19. Structure contours of the top of the upper portion of the river gravels (Tpt-upper)



Thickness of Tpt in illustrated wells

Well ID	Thickness
DT-10	46.0
DT-5A	52.0
DT-9	38.0
G-1	50.0
G-1A	63.0
G-2	45.0
G-3	52.0
G-4	60.0
G-6	70.0
GR-1	90.0
GR-2	30.0
GR-3	80.0
GR-4	130.0
H-19	10.0
LA-4	50.0
O-1	60.0
O-4	98.0
PM-2	70.0
PM-3	60.0
PM-4	40.0
PM-5	80.0
R-13	65.0
R-15	7.0
R-16	351.0
R-31	323.0
R-33	18.0
R-34	15.0
R-7	17.0
TW-1	37.0
TW-2	134.0
TW-3	195.0

LEGEND

- Wells Intersecting Tpt
- Thickness of Tpt-upper (10' Contours)
- Outcrop of Tpt
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 10
- 11 - 20
- 21 - 30
- 31 - 40

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

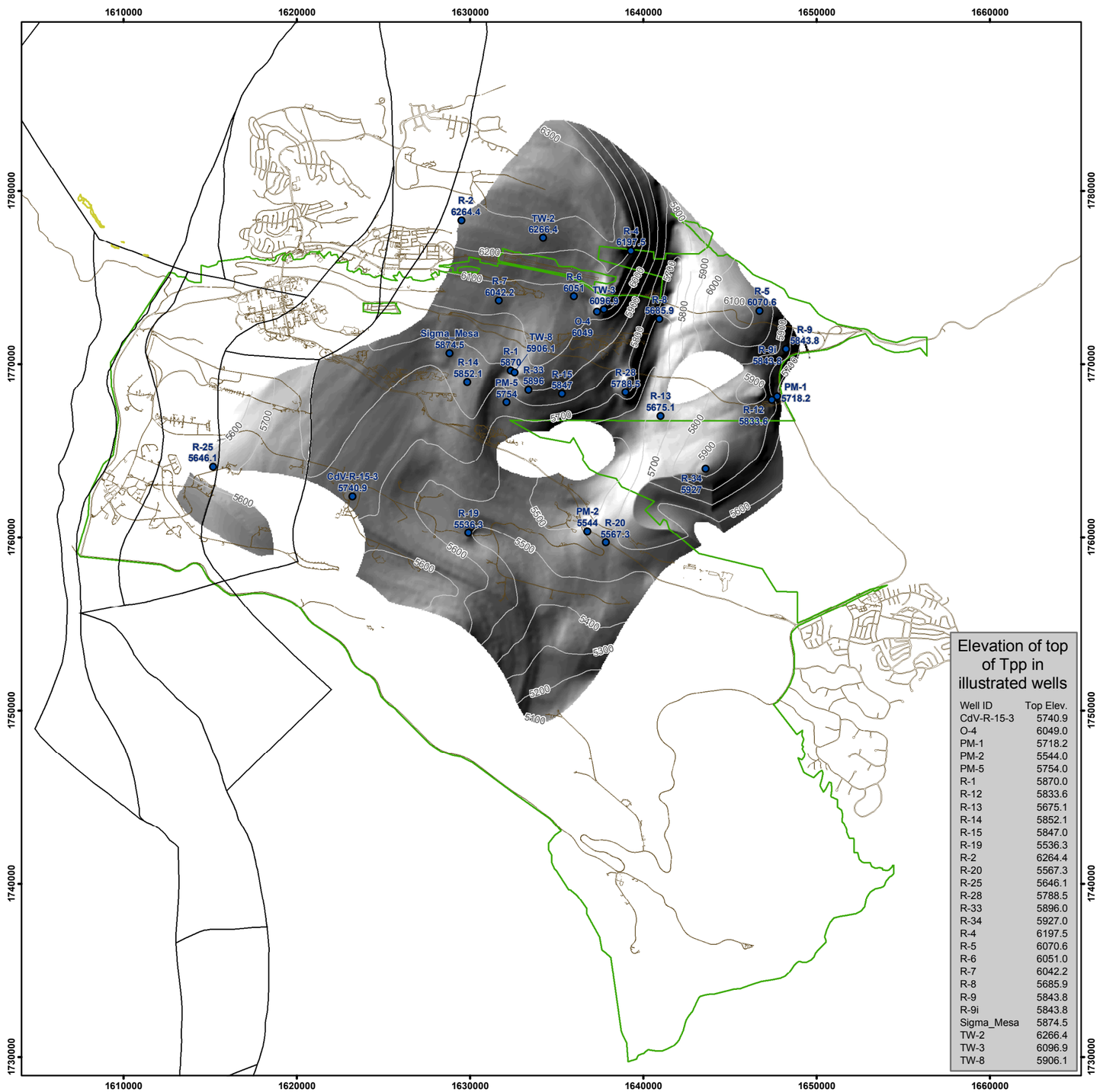
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-20. Thickness of the upper portion of the river gravels (Tpt-upper)



LEGEND

- Wells Intersecting Tpp
- Elevation of the top of Tpp-lower (100' Contours)
- Outcrop of Tpp
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Elevation of top of Tpp in illustrated wells

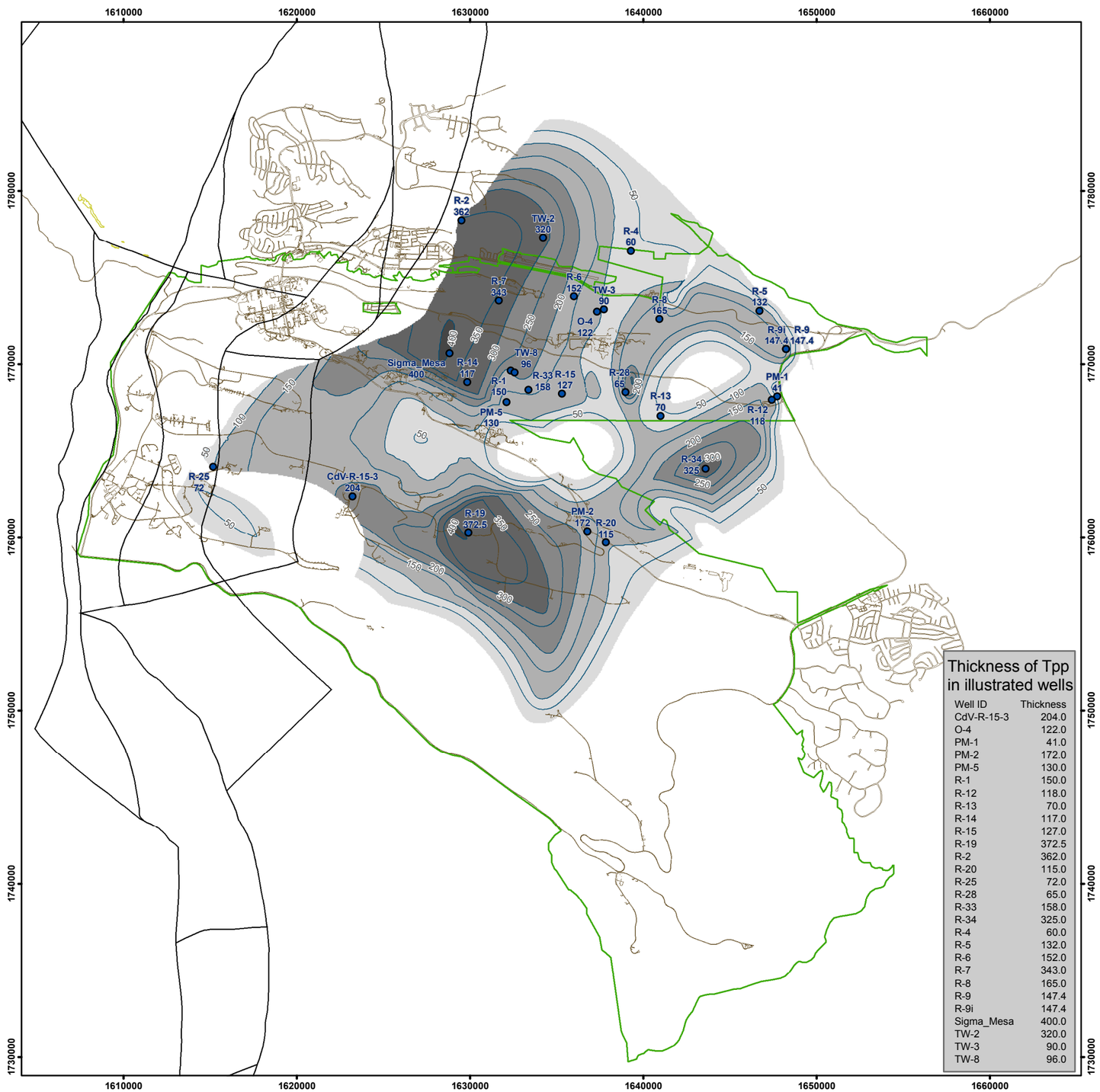
Well ID	Top Elev.
CdV-R-15-3	5740.9
O-4	6049.0
PM-1	5718.2
PM-2	5544.0
PM-5	5754.0
R-1	5870.0
R-12	5833.6
R-13	5675.1
R-14	5852.1
R-15	5847.0
R-19	5536.3
R-2	6264.4
R-20	5567.3
R-25	5646.1
R-28	5788.5
R-33	5896.0
R-34	5927.0
R-4	6197.5
R-5	6070.6
R-6	6051.0
R-7	6042.2
R-8	5685.9
R-9	5843.8
R-9i	5843.8
Sigma_Mesa	5874.5
TW-2	6266.4
TW-3	6096.9
TW-8	5906.1

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-21. Structure contours of the top of the lower portion of the pumice-rich volcaniclastic rocks (Tpp-lower)



LEGEND

- Wells Intersecting Tpp
- Thickness of Tpp-lower (50' Contours)
- Outcrop of Tpp
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 100
- 101 - 200
- 201 - 300
- 301 - 400
- 401 - 500

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

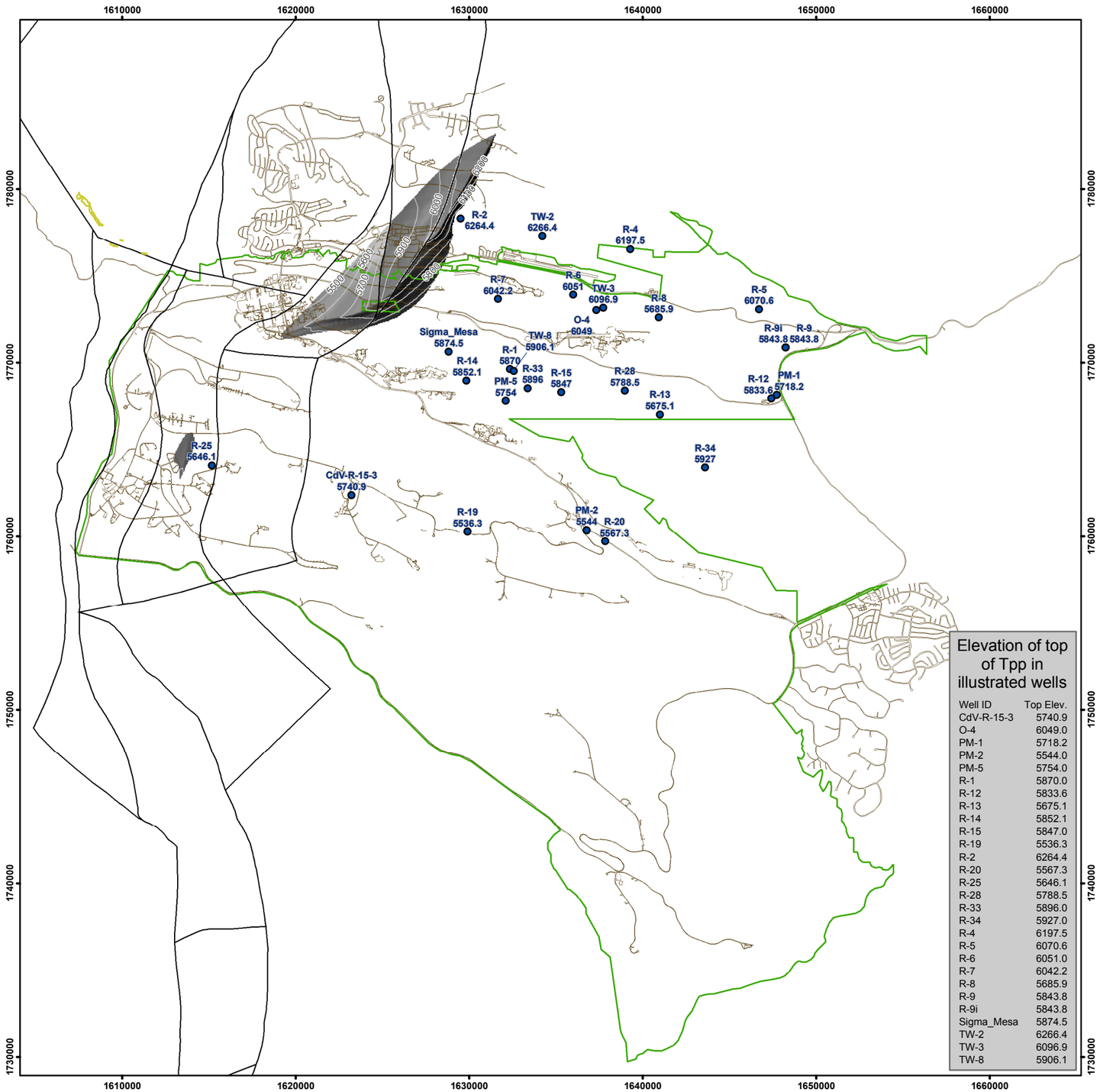
Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Thickness of Tpp in illustrated wells

Well ID	Thickness
CdV-R-15-3	204.0
O-4	122.0
PM-1	41.0
PM-2	172.0
PM-5	130.0
R-1	150.0
R-12	118.0
R-13	70.0
R-14	117.0
R-15	127.0
R-19	372.5
R-2	362.0
R-20	115.0
R-25	72.0
R-28	65.0
R-33	158.0
R-34	325.0
R-4	60.0
R-5	132.0
R-6	152.0
R-7	343.0
R-8	165.0
R-9	147.4
R-9i	147.4
Sigma_Mesa	400.0
TW-2	320.0
TW-3	90.0
TW-8	96.0

Plate 4-22. Thickness of the lower portion of the pumice-rich volcaniclastic rocks (Tpp-lower)



LEGEND

- Wells Intersecting Tpp
- Elevation of the top of Tpp-upper (100' Contours)
- Outcrop of Tpp
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

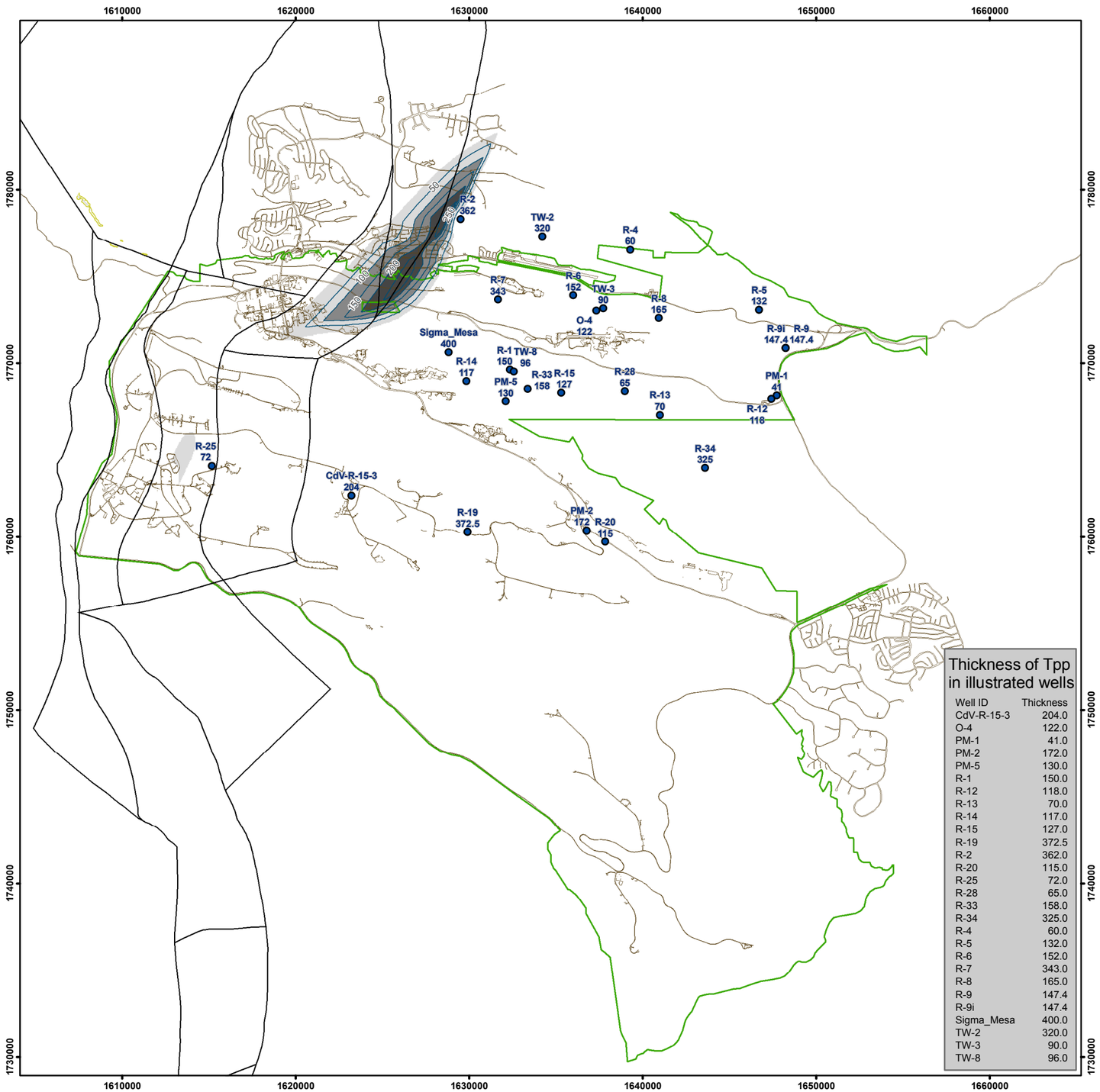
Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Elevation of top of Tpp in illustrated wells

Well ID	Top Elev.
CdV-R-15-3	5740.9
O-4	6049.0
PM-1	5718.2
PM-2	5544.0
PM-5	5754.0
R-1	5870.0
R-12	5833.6
R-13	5675.1
R-14	5852.1
R-15	5847.0
R-19	5536.3
R-2	6264.4
R-20	5567.3
R-25	5646.1
R-28	5788.5
R-33	5896.0
R-34	5927.0
R-4	6197.5
R-5	6070.6
R-6	6051.0
R-7	6042.2
R-8	5685.9
R-9	5843.8
R-9i	5843.8
Sigma_Mesa	5874.5
TW-2	6266.4
TW-3	6096.9
TW-8	5906.1

Plate 4-23. Structure contours of the top of the upper portion of the pumice-rich volcaniclastic rocks (Tpp-upper)



Thickness of Tpp in illustrated wells

Well ID	Thickness
CdV-R-15-3	204.0
O-4	122.0
PM-1	41.0
PM-2	172.0
PM-5	130.0
R-1	150.0
R-12	118.0
R-13	70.0
R-14	117.0
R-15	127.0
R-19	372.5
R-2	362.0
R-20	115.0
R-25	72.0
R-28	65.0
R-33	158.0
R-34	325.0
R-4	60.0
R-5	132.0
R-6	152.0
R-7	343.0
R-8	165.0
R-9	147.4
R-9i	147.4
Sigma_Mesa	400.0
TW-2	320.0
TW-3	90.0
TW-8	96.0

LEGEND

- Wells Intersecting Tpp
- Thickness of Tpp-upper (50' Contours)
- Outcrop of Tpp
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 100
- 101 - 200
- 201 - 300

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

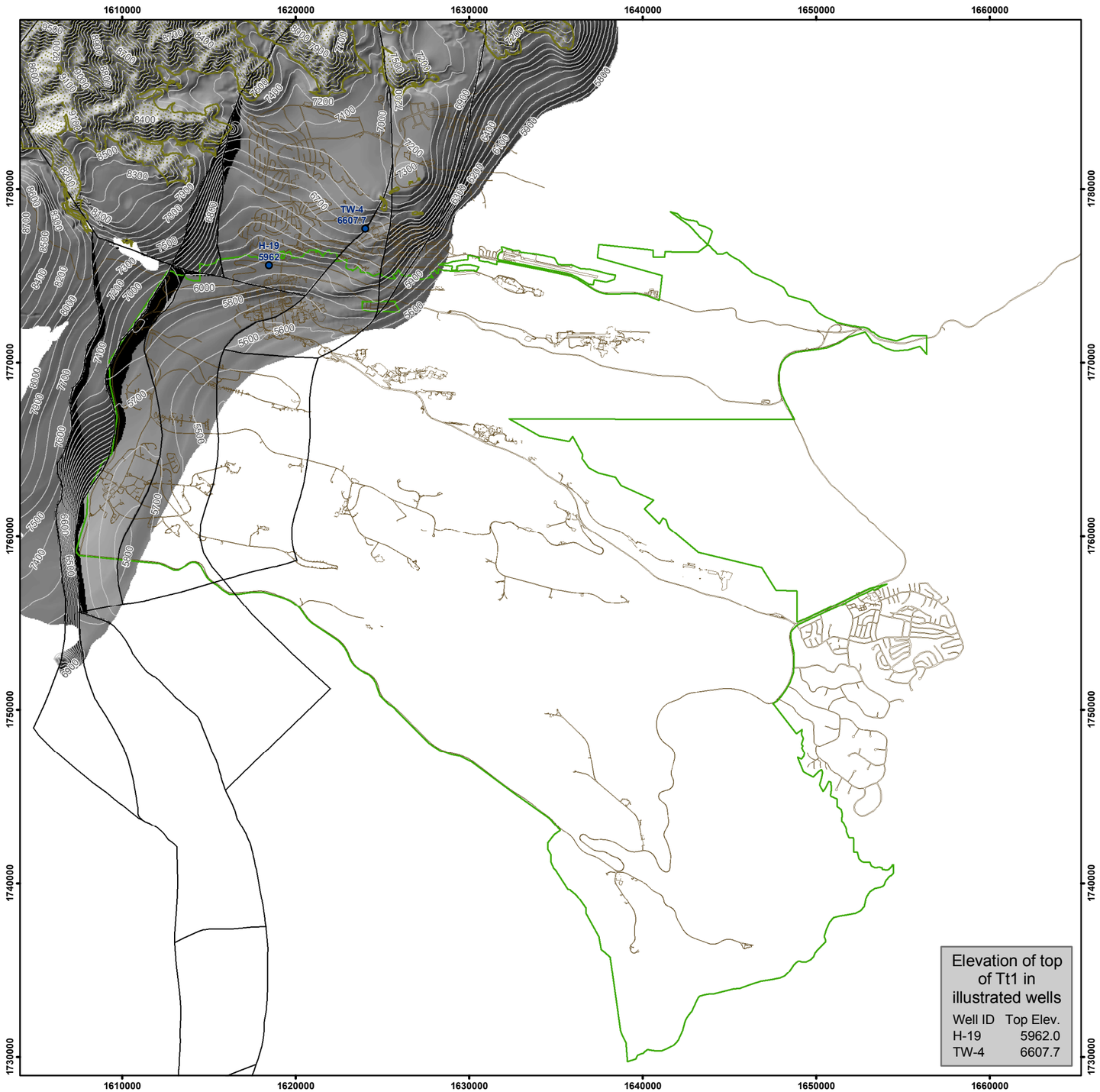
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-24. Thickness of the upper portion of the pumice-rich volcaniclastic rocks (Tpp-upper)



Elevation of top of Tt1 in illustrated wells

Well ID	Top Elev.
H-19	5962.0
TW-4	6607.7

LEGEND

- Wells Intersecting Tt1
- Elevation of the top of Tt1 (100' Contours)
- Outcrop of Tt1
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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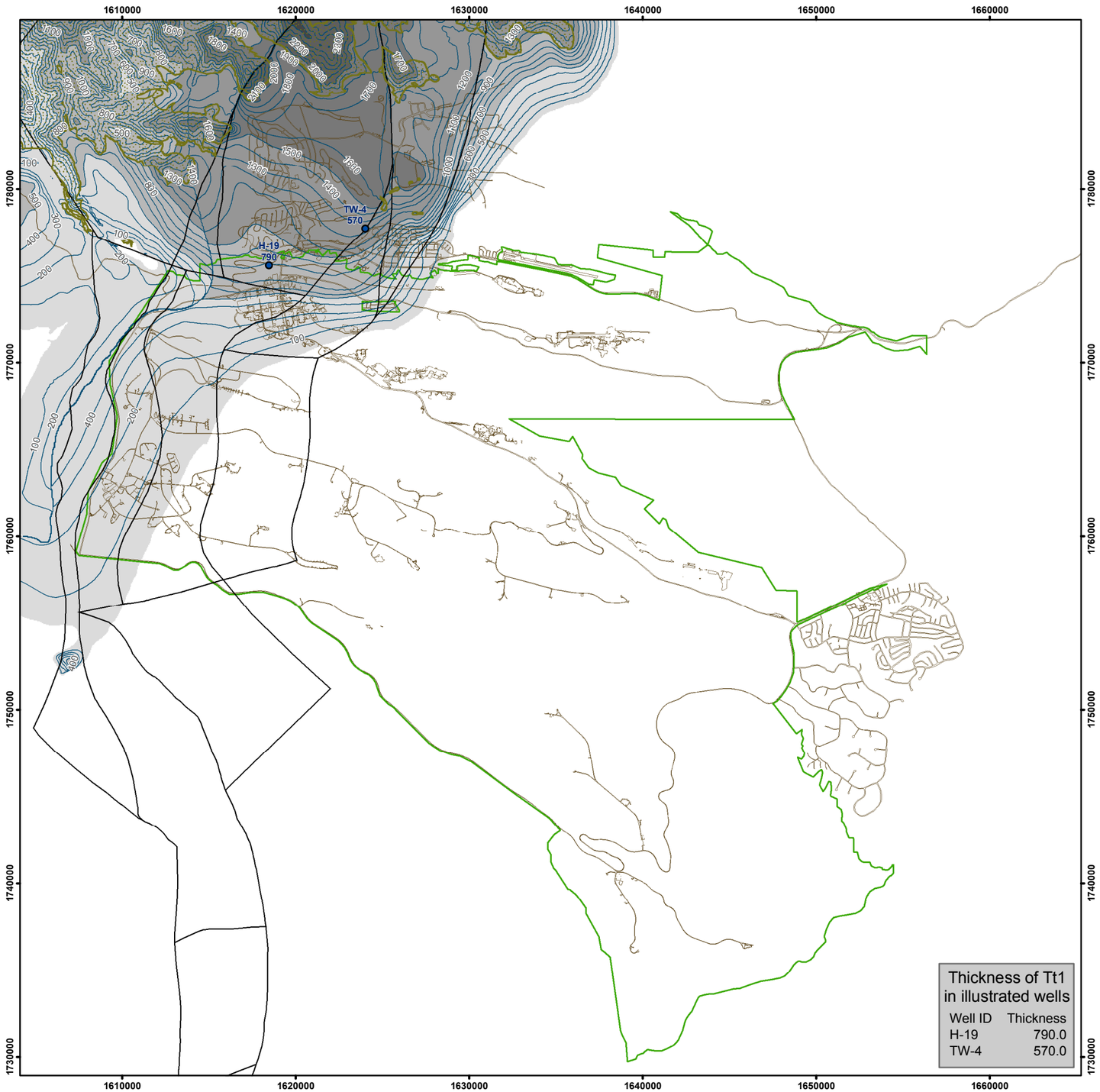
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-25. Structure contours of the top of the Tschicoma Formation, Rendija Canyon lobe (Tt1)



Thickness of Tt1 in illustrated wells

Well ID	Thickness
H-19	790.0
TW-4	570.0

LEGEND

- Wells Intersecting Tt1
- Thickness of Tt1 (100' Contours)
- Outcrop of Tt1
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 500
- 501 - 1,000
- 1,001 - 1,500
- 1,501 - 2,000
- 2,001 - 2,500
- 2,501 - 3,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

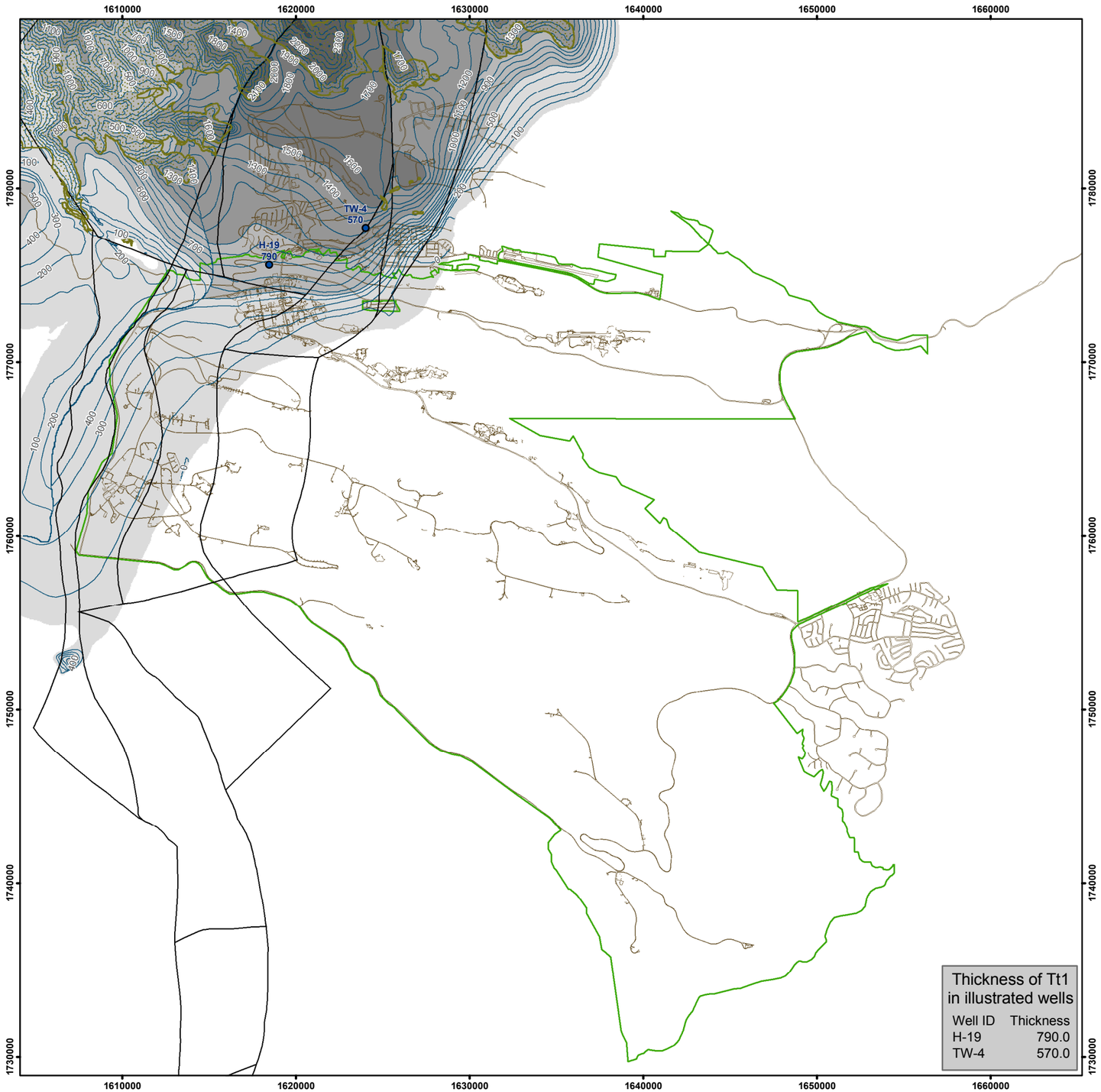
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-26. Thickness of the Tschicoma Formation, Rendija Canyon lobe (Tt1), including interior flows and facies



LEGEND

- Wells Intersecting Tt1
- Thickness of Tt1 (100' Contours)
- Outcrop of Tt1
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 500
- 501 - 1,000
- 1,001 - 1,500
- 1,501 - 2,000
- 2,001 - 2,500
- 2,501 - 3,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

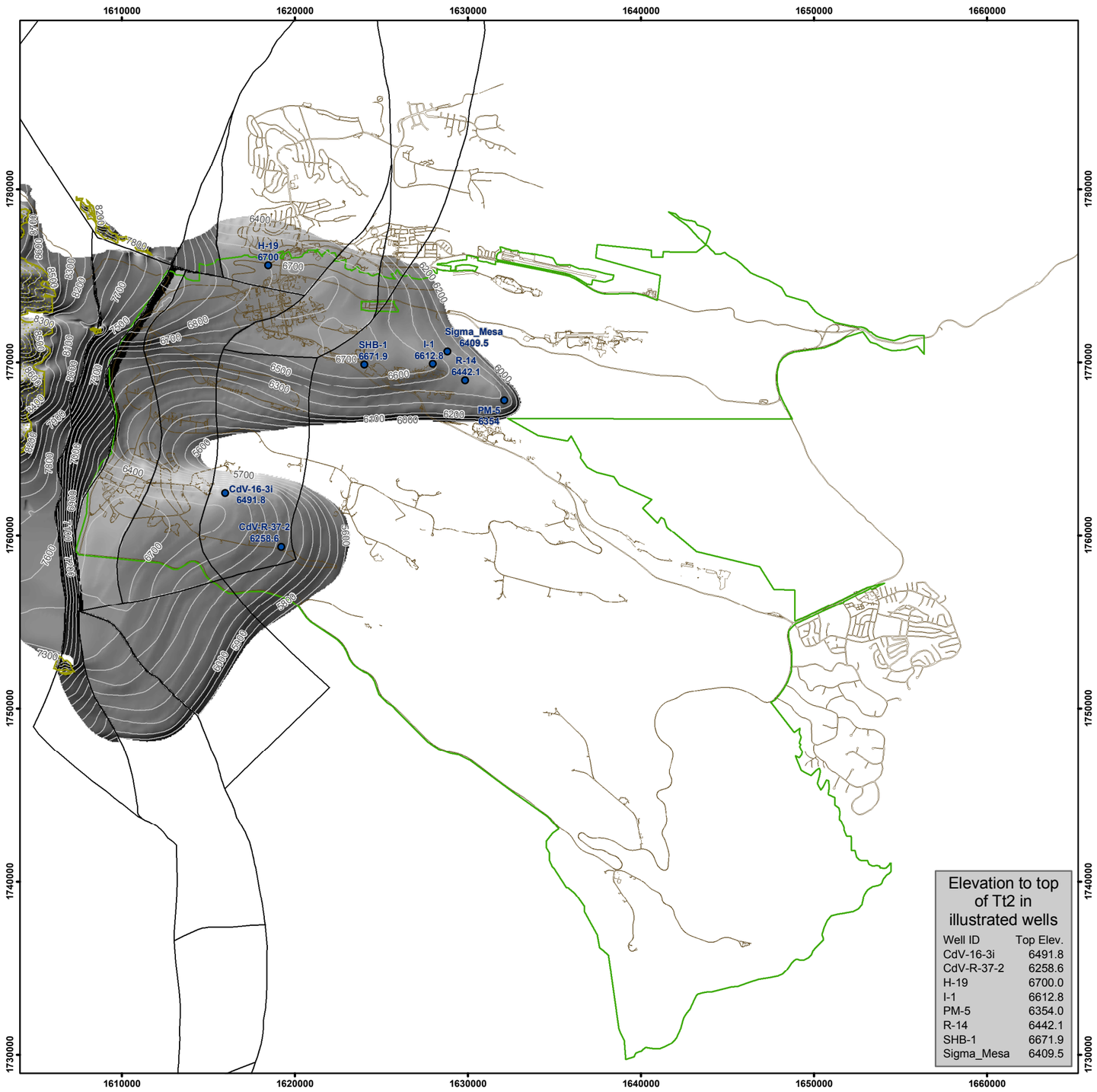
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-27. Adjusted thickness of the Tschicoma Formation, Rendija Canyon lobe (Tt1), with thicknesses of interior flow and facies units subtracted



Elevation to top of Tt2 in illustrated wells

Well ID	Top Elev.
CdV-16-3i	6491.8
CdV-R-37-2	6258.6
H-19	6700.0
I-1	6612.8
PM-5	6354.0
R-14	6442.1
SHB-1	6671.9
Sigma_Mesa	6409.5

LEGEND

- Wells Intersecting Tt2
- Elevation of the top of Tt2 (100' Contours)
- Outcrop of Tt2
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

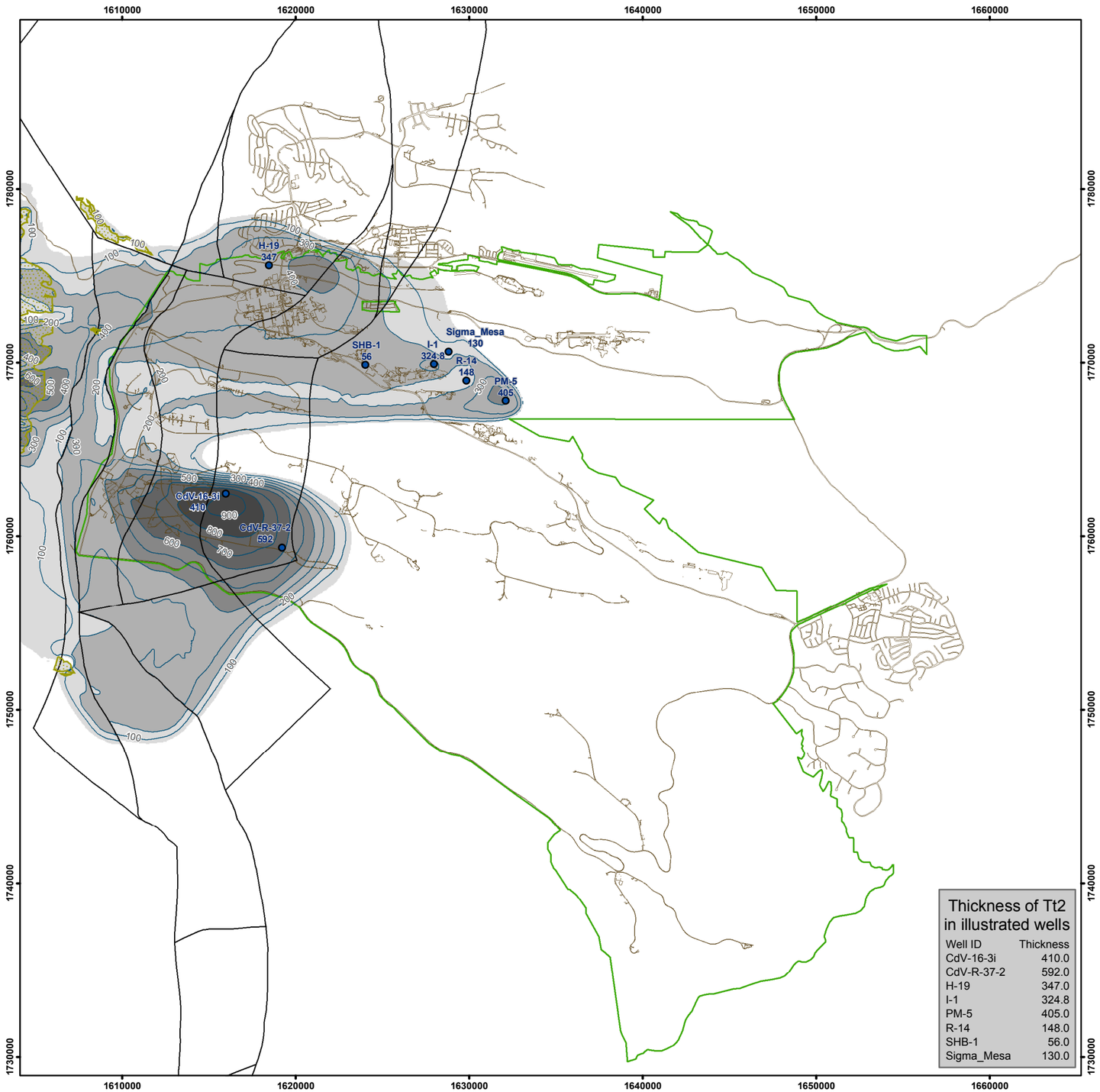
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-28. Structure contours of the top of the Tschicoma Formation, Pajarito Mountain, Cerro Grande, and Caballo Mountain lobes (Tt2)



LEGEND

- Wells Intersecting Tt2
- Thickness of Tt2 (100' Contours)
- Outcrop of Tt2
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 200
- 201 - 400
- 401 - 600
- 601 - 800
- 801 - 1,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

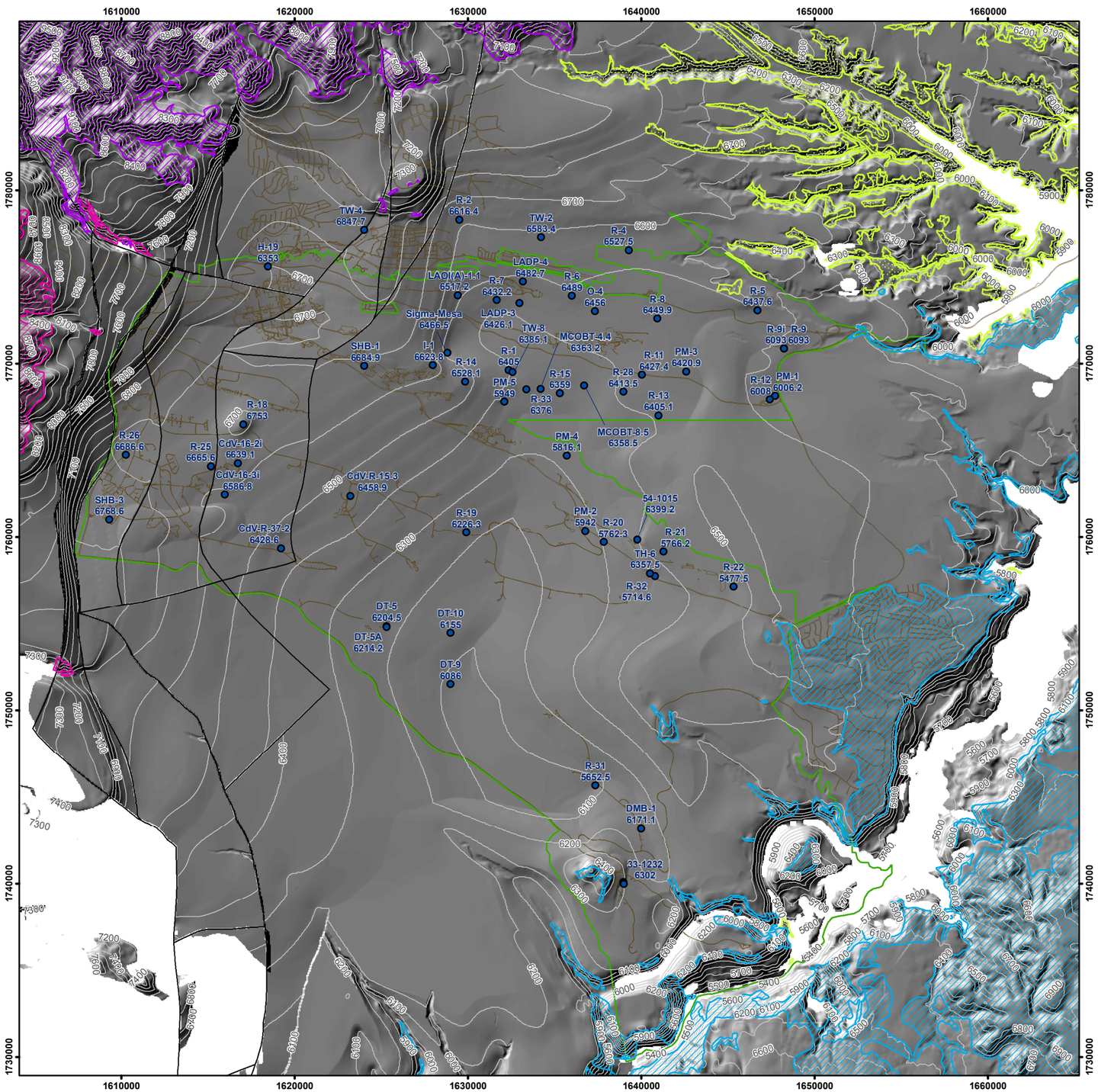
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-29. Thickness of the Tschicoma Formation, Pajarito Mountain, Cerro Grande, and Caballo Mountain lobes (Tt2)



Elevation of top of Tpf in illustrated wells

Well ID	Top Elev.
33-1230	6287.0
33-1231	6294.0
33-1232	6302.0
54-1015	6399.2
CdV-16-2i	6639.1
CdV-16-3i	6586.8
CdV-R-15-3	6458.9
CdV-R-37-2	6428.6
DMB-1	6171.1
DT-10	6155.0
DT-5	6204.5
DT-5A	6214.2
DT-9	6086.0
H-19	6353.0
I-1	6623.8
LADP-3	6426.1
LADP-4	6482.7
LAOI(A)-1.1	6517.2
MCOBT-4.4	6363.2
MCOBT-8.5	6358.5
O-4	6456.0
PM-1	6006.2
PM-2	5942.0
PM-3	6420.9
PM-4	5816.1
PM-5	5949.0
R-1	6405.0
R-11	6427.4
R-12	6008.0
R-13	6405.1
R-14	6528.1
R-15	6359.0
R-18	6753.0
R-19	6226.3
R-2	6616.4
R-20	5762.3
R-21	5766.2
R-22	5477.5
R-25	6665.6
R-26	6686.6
R-28	6413.5
R-31	5652.5
R-32	5714.6
R-33	6376.0
R-4	6527.5
R-5	6437.6
R-6	6489.0
R-7	6432.2
R-8	6449.9
R-9	6093.0
R-9i	6093.0
SHB-1	6684.9
SHB-3	6768.6
Sigma_Mesa	6466.5
TH-6	6357.5
TW-2	6583.4
TW-4	6847.7
TW-8	6385.1

LEGEND

- Wells Intersecting Tpf
- Elevation of the top of Tpf (100' Contours)
- Outcrop of Tpf
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Outcrop of Tb4
- Outcrop of Tt2
- Outcrop of Tt1

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

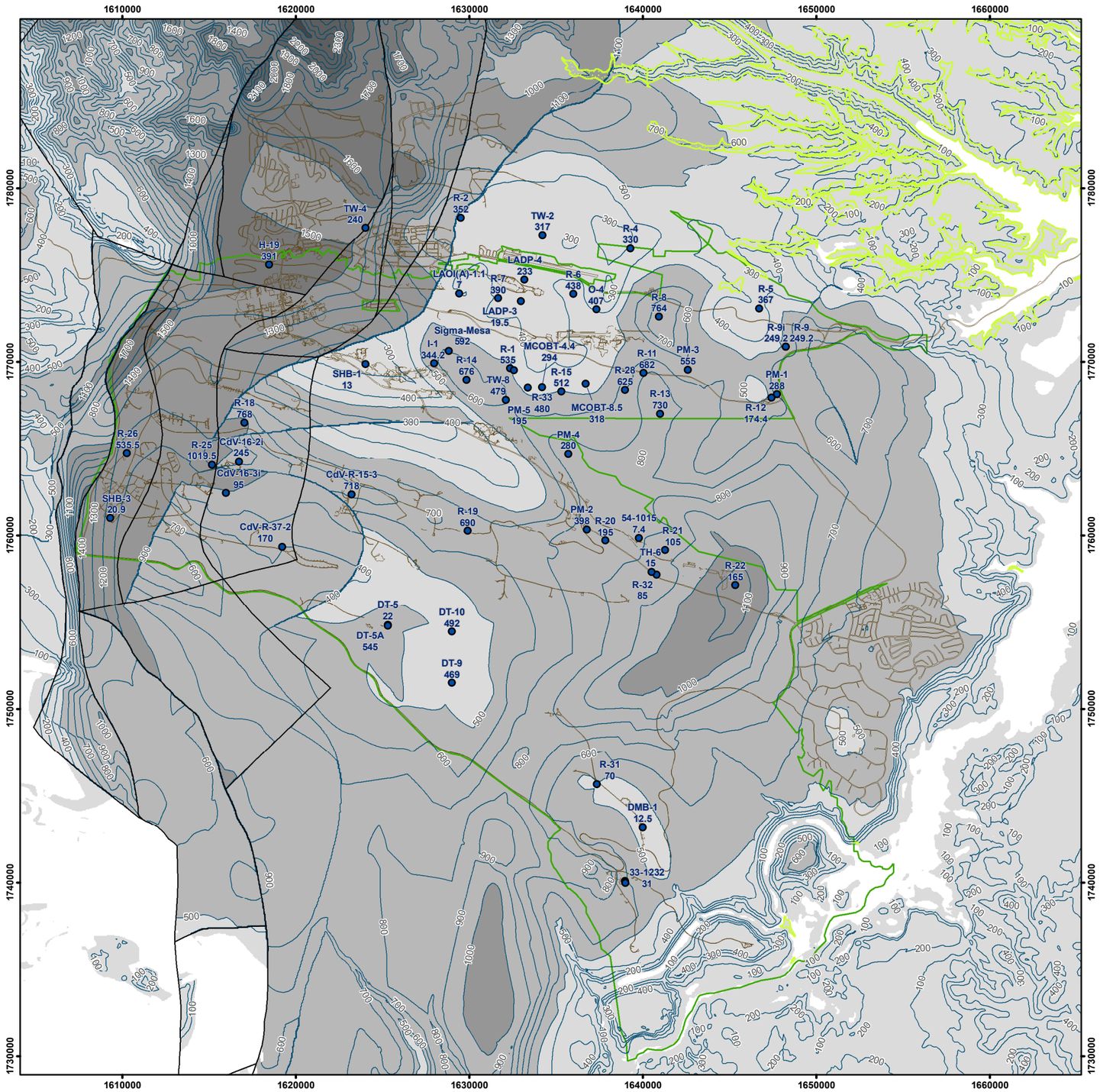
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-30. Structure contours of the top of the Puye Formation, fanglomerate (Tpf). Within the Puye Formation are flow units including the Tschicoma Formation (Tt1 and Tt2) and the Cerros del Rio basalt (Tb4). Where these flow units outcrop, the modeled top of the Puye is at topography, although there is a zero thickness of Puye above these flow units.



Thickness of Tpf in illustrated wells

Well ID	Thickness
33-1230	3.0
33-1231	46.0
33-1232	31.0
54-1015	7.4
CdV-16-2i	245.0
CdV-16-3i	95.0
CdV-R-15-3	718.0
CdV-R-37-2	170.0
DMB-1	12.5
DT-10	492.0
DT-5	22.0
DT-5A	545.0
DT-9	469.0
H-19	391.0
I-1	344.2
LADP-3	19.5
LADP-4	233.0
LAOI(A)-1.1	7.0
MCOBT-4.4	294.0
MCOBT-8.5	318.0
O-4	407.0
PM-1	288.0
PM-2	398.0
PM-3	555.0
PM-4	280.0
PM-5	195.0
R-1	535.0
R-11	682.0
R-12	174.4
R-13	730.0
R-14	676.0
R-15	512.0
R-18	768.0
R-19	690.0
R-2	352.0
R-20	195.0
R-21	105.0
R-22	165.0
R-25	1019.5
R-26	535.5
R-28	625.0
R-31	70.0
R-32	85.0
R-33	480.0
R-4	330.0
R-5	367.0
R-6	438.0
R-7	390.0
R-8	764.0
R-9	249.2
R-9i	249.2
SHB-1	13.0
SHB-3	20.9
Sigma_Mesa	592.0
TH-6	15.0
TW-2	317.0
TW-4	240.0
TW-8	479.0

LEGEND

- Wells Intersecting Tpf
- Thickness of Tpf (100' Contours)
- Outcrop of Tpf
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 500
- 501 - 1,000
- 1,001 - 1,500
- 1,501 - 2,000
- 2,001 - 2,500
- 2,501 - 3,000

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

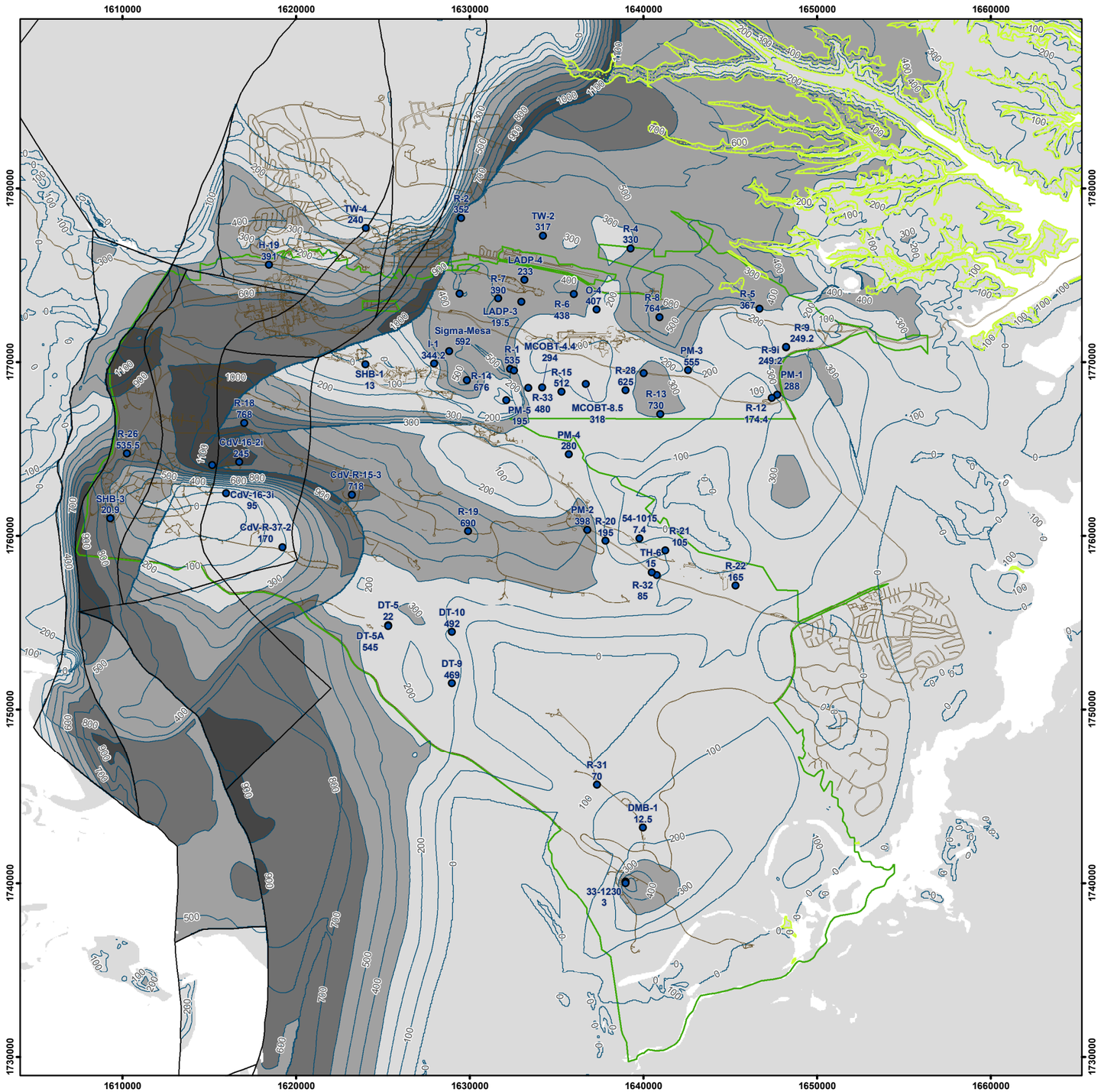
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-31. Thickness of the Puye Formation, fanglomerate (Tpf), including interior flow and facies units



Thickness of Tpf in illustrated wells

Well ID	Thickness
33-1230	3.0
33-1231	46.0
33-1232	31.0
54-1015	7.4
CdV-16-2i	245.0
CdV-16-3i	95.0
CdV-R-15-3	718.0
CdV-R-37-2	170.0
DMB-1	12.5
DT-10	492.0
DT-5	22.0
DT-5A	545.0
DT-9	469.0
H-19	391.0
I-1	344.2
LADP-3	19.5
LADP-4	233.0
LAOI(A)-1.1	7.0
MCOBT-4.4	294.0
MCOBT-8.5	318.0
O-4	407.0
PM-1	288.0
PM-2	398.0
PM-3	555.0
PM-4	280.0
PM-5	195.0
R-1	535.0
R-11	682.0
R-12	174.4
R-13	730.0
R-14	676.0
R-15	512.0
R-18	768.0
R-19	690.0
R-2	352.0
R-20	195.0
R-21	105.0
R-22	165.0
R-25	1019.5
R-26	535.5
R-28	625.0
R-31	70.0
R-32	85.0
R-33	480.0
R-4	330.0
R-5	367.0
R-6	438.0
R-7	390.0
R-8	764.0
R-9	249.2
R-9i	249.2
SHB-1	13.0
SHB-3	20.9
Sigma_Mesa	592.0
TH-6	15.0
TW-2	317.0
TW-4	240.0
TW-8	479.0

LEGEND

- Wells Intersecting Tpf
- Thickness of Tpf (100' Contours)
- Outcrop of Tpf
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 300
- 301 - 600
- 601 - 900
- 901 - 1,200

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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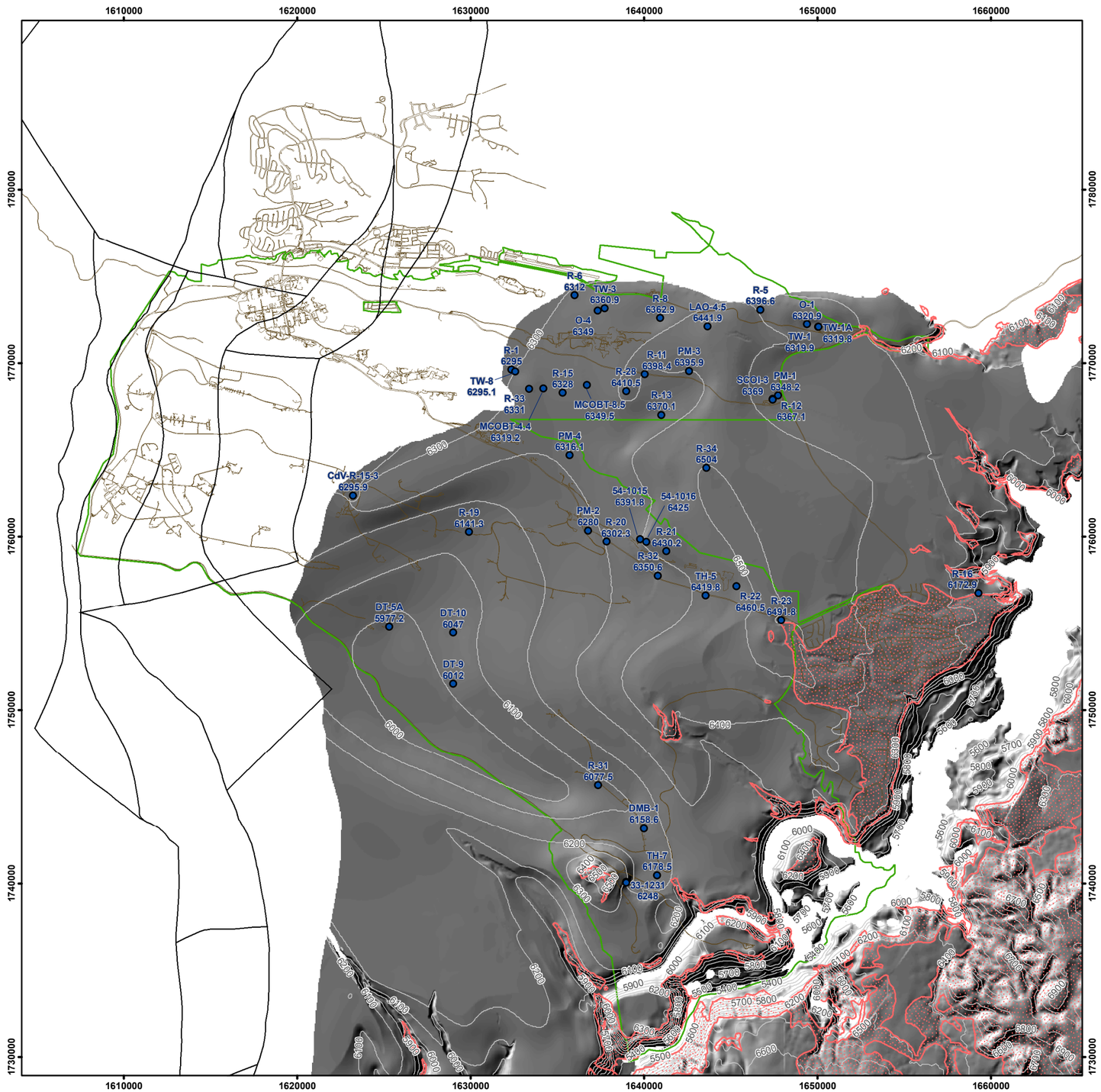
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-32. Adjusted thickness of the Puye Formation, fanglomerate (Tpf), thicknesses of interior flow and facies units subtracted



Elevation of top of Tb4 in illustrated wells

Well ID	Top Elev.
33-1230	6291.0
33-1231	6248.0
54-1015	6391.8
54-1016	6425.0
CdV-R-15-3	6295.9
DMB-1	6158.6
DT-10	6047.0
DT-5A	5977.2
DT-9	6012.0
LAO-4.5	6441.9
MCOBT-4.4	6319.2
MCOBT-8.5	6349.5
O-1	6320.9
O-4	6349.0
PM-1	6348.2
PM-2	6280.0
PM-3	6395.9
PM-4	6316.1
R-1	6295.0
R-11	6398.4
R-12	6367.1
R-13	6370.1
R-15	6328.0
R-16	6172.9
R-19	6141.3
R-20	6302.3
R-21	6430.2
R-22	6460.5
R-23	6491.8
R-28	6410.5
R-31	6077.5
R-32	6350.6
R-33	6331.0
R-34	6504.0
R-5	6396.6
R-6	6312.0
R-8	6362.9
SCOI-3	6369.0
TH-5	6419.8
TH-7	6178.5
TW-1	6319.9
TW-1A	6319.8
TW-3	6360.9
TW-8	6295.1

LEGEND

- Wells Intersecting Tb4
- Elevation of the top of Tb4 (100' Contours)
- Outcrop of Tb4
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

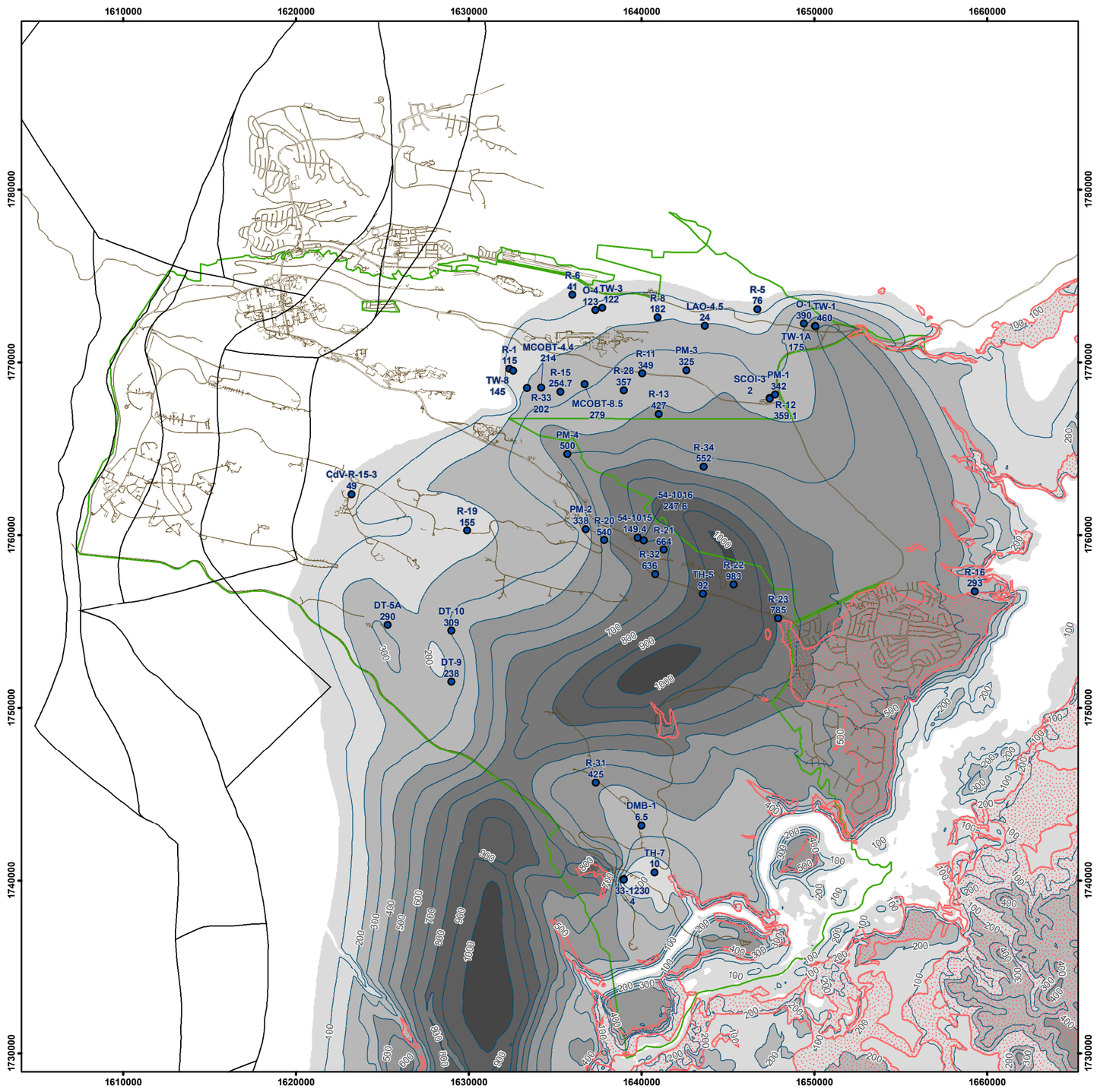
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-33. Structure contours of the top of the Cerros del Rio basalt (Tb4)



Thickness of Tb4 in illustrated wells

Well ID	Thickness
33-1230	4.0
33-1231	47.0
54-1015	149.4
54-1016	247.6
CdV-R-15-3	49.0
DMB-1	6.5
DT-10	309.0
DT-5A	290.0
DT-9	238.0
LAO-4.5	24.0
MCOBT-4.4	214.0
MCOBT-8.5	279.0
O-1	390.0
O-4	123.0
PM-1	342.0
PM-2	338.0
PM-3	325.0
PM-4	500.0
R-1	115.0
R-11	349.0
R-12	359.1
R-13	427.0
R-15	254.7
R-16	293.0
R-19	155.0
R-20	540.0
R-21	664.0
R-22	983.0
R-23	785.0
R-28	357.0
R-31	425.0
R-32	636.0
R-33	202.0
R-34	552.0
R-5	76.0
R-6	41.0
R-8	182.0
SCOI-3	2.0
TH-5	92.0
TH-7	10.0
TW-1	460.0
TW-1A	175.0
TW-3	122.0
TW-8	145.0

LEGEND

- Wells Intersecting Tb4
- Thickness of Tb4 (100' Contours)
- Outcrop of Tb4
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 200
- 201 - 400
- 401 - 600
- 601 - 800
- 801 - 1,000
- 1,001 - 1,200

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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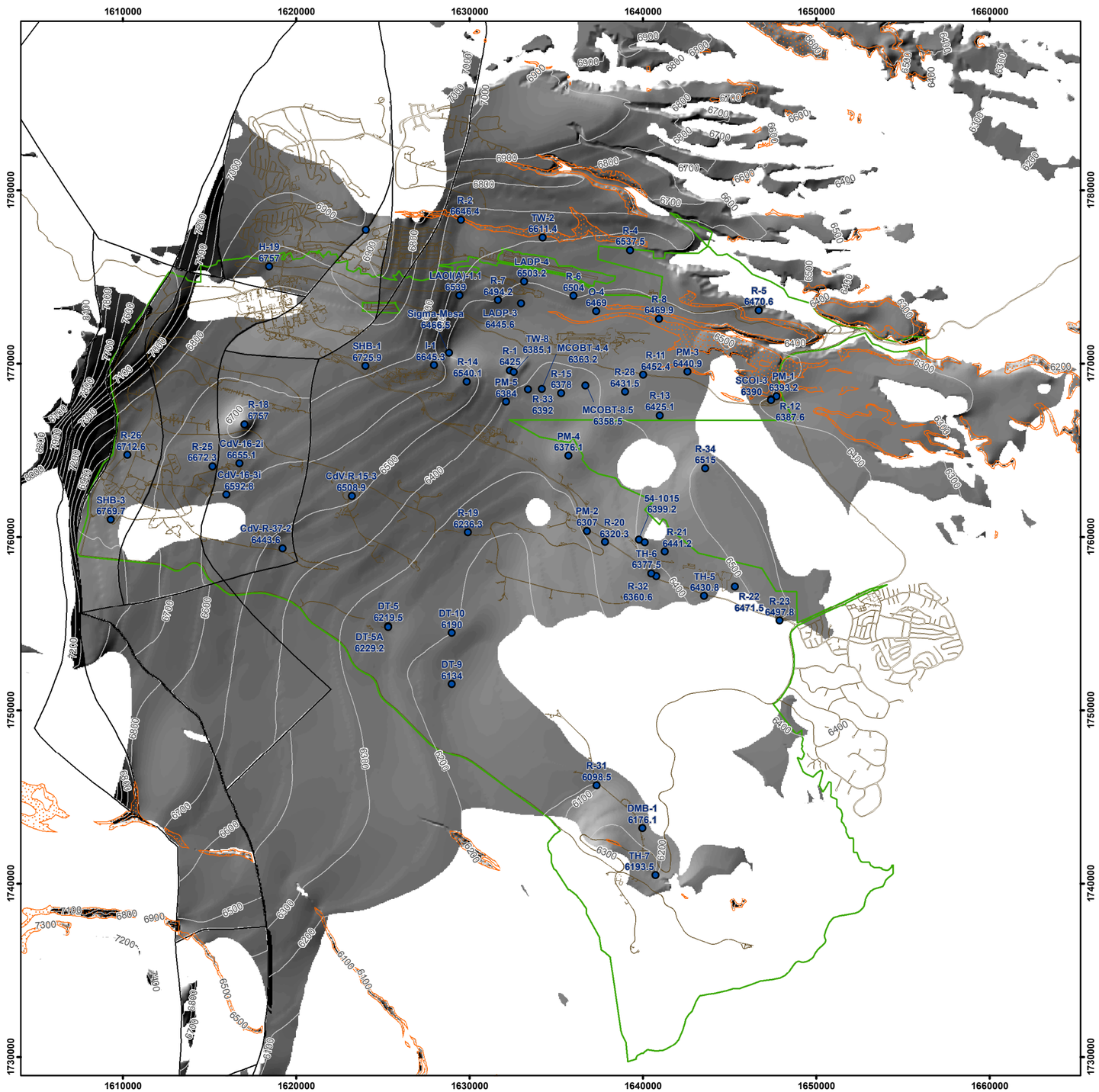
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-34. Thickness of the Cerros del Rio basalt (Tb4)



Elevation of top of Qbog in illustrated wells

Well ID	Top Elev.
54-1015	6410.0
54-1016	6433.1
CdV-16-2i	6655.1
CdV-16-3i	6592.8
CdV-R-15-3	6508.9
CdV-R-37-2	6443.6
DMB-1	6176.1
DT-10	6190.0
DT-5	6219.5
DT-5A	6229.2
DT-9	6134.0
H-19	6757.0
I-1	6645.3
LADP-3	6445.6
LADP-4	6503.2
LAOI(A)-1.1	6539.0
MCOBT-4.4	6378.2
MCOBT-8.5	6385.5
O-4	6469.0
PM-1	6393.2
PM-2	6307.0
PM-3	6440.9
PM-4	6376.1
PM-5	6384.0
R-1	6425.0
R-11	6452.4
R-12	6387.6
R-13	6425.1
R-14	6540.1
R-15	6378.0
R-18	6757.0
R-19	6236.3
R-2	6646.4
R-20	6320.3
R-21	6441.2
R-22	6471.5
R-23	6497.8
R-25	6672.3
R-26	6712.6
R-28	6431.5
R-31	6098.5
R-32	6360.6
R-33	6392.0
R-34	6515.0
R-4	6537.5
R-5	6470.6
R-6	6504.0
R-7	6494.2
R-8	6469.9
SCOI-3	6390.0
SHB-1	6725.9
SHB-3	6769.7
Sigma_Mesa	6467.5
TH-5	6430.8
TH-6	6377.5
TH-7	6193.5
TW-2	6611.4
TW-4	6874.7
TW-8	6430.1

LEGEND

- Wells Intersecting Qbog
- Elevation of the top of Qbog (100' Contours)
- Outcrop of Qbog and Qbof
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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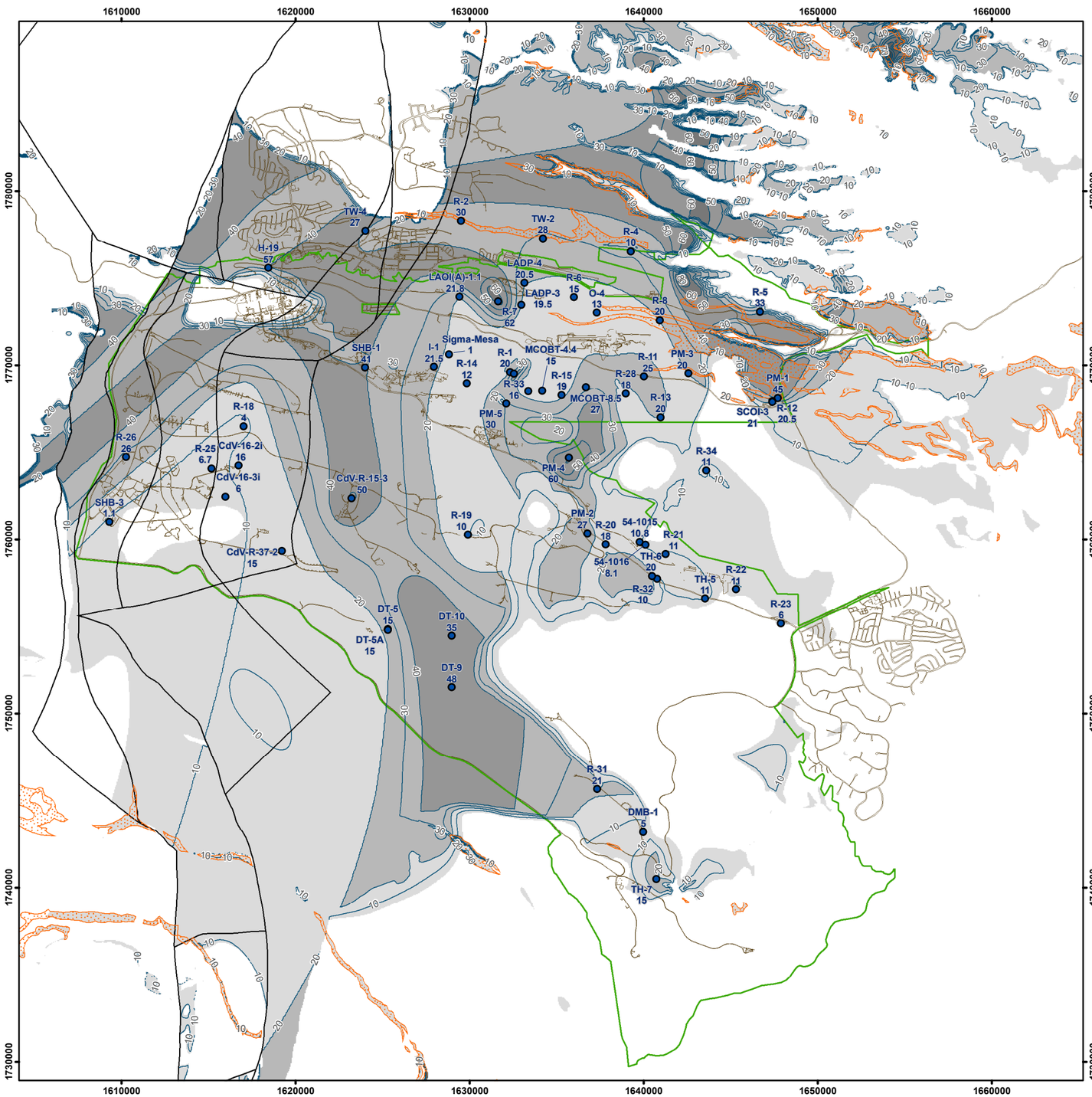
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-35. Structure contours of the top of the Guaje Pumice Bed of the Bandelier Tuff (Qbog)



Thickness of Qbog in illustrated wells

Well ID	Thickness
54-1015	10.8
54-1016	8.1
CdV-16-2i	16.0
CdV-16-3i	6.0
CdV-R-15-3	50.0
CdV-R-37-2	15.0
DMB-1	5.0
DT-10	35.0
DT-5	15.0
DT-5A	15.0
DT-9	48.0
H-19	57.0
I-1	21.5
LADP-3	19.5
LADP-4	20.5
LAOI(A)-1.1	21.8
MCOBT-4.4	15.0
MCOBT-8.5	27.0
O-4	13.0
PM-1	45.0
PM-2	27.0
PM-3	20.0
PM-4	60.0
PM-5	30.0
R-1	20.0
R-11	25.0
R-12	20.5
R-13	20.0
R-14	12.0
R-15	19.0
R-18	4.0
R-19	10.0
R-2	30.0
R-20	18.0
R-21	11.0
R-22	11.0
R-23	6.0
R-25	6.7
R-26	26.0
R-28	18.0
R-31	21.0
R-32	10.0
R-33	16.0
R-34	11.0
R-4	10.0
R-5	33.0
R-6	15.0
R-7	62.0
R-8	20.0
SCOI-3	21.0
SHB-1	41.0
SHB-3	1.1
Sigma_Mesa	1.0
TH-5	11.0
TH-6	20.0
TH-7	15.0
TW-2	28.0
TW-4	27.0
TW-8	45.0

LEGEND

- Wells Intersecting Qbog
- Thickness of Qbog (10' Contours)
- Outcrop of Qbog and Qbof
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100
- 101 - 120

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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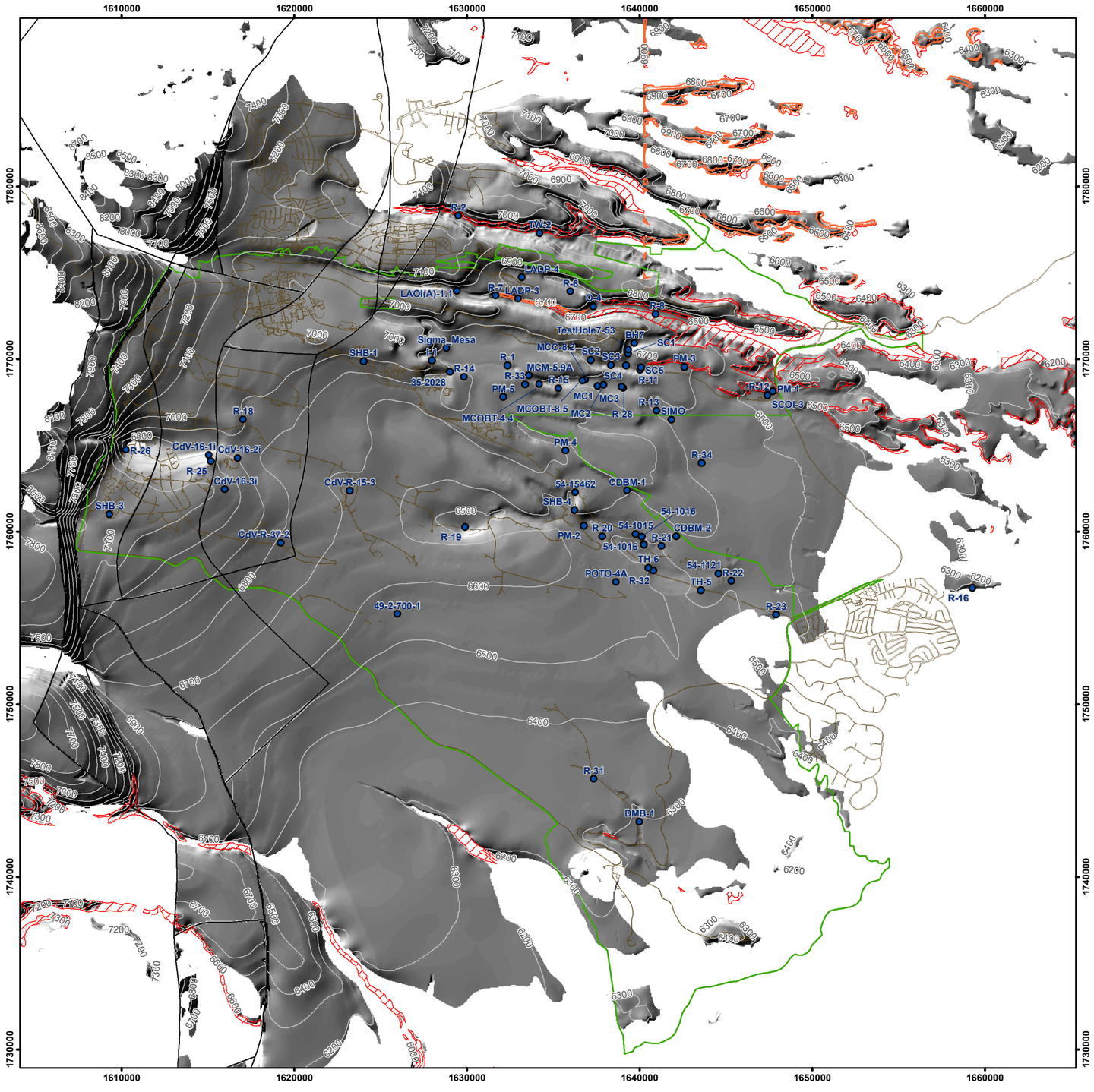
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-36. Thickness of the Guaje Pumice Bed of the Bandelier Tuff (Qbog)



Well ID	Top Elev.
35-2028	6806.4
49-2-700-1	6536.4
54-1004	6493.2
54-1015	6507.8
54-1016	6491.0
54-1018	6490.2
54-1121	6530.5
54-15462	6615.0
BH7	6627.5
CDBM-1	6626.6
CDBM-2	6579.6
CdV-16-1i	6925.2
CdV-16-2i	6887.1
CdV-16-3i	7056.8
CdV-R-15-3	6676.9
CdV-R-37-2	6781.6
DMB-1	6249.6
I-1	6878.8
LADP-3	6691.6
LADP-4	6755.2
LAOI(A)-1.1	6818.2
MC1	6683.5
MC2	6637.0
MC3	6623.0
MCC-8.2	6671.2
MCM-5.9A	6732.2
MCOBT-4.4	6734.2
MCOBT-8.5	6668.5
O-4	6611.0
PM-1	6513.2
PM-2	6532.0
PM-3	6580.9
PM-4	6696.1
PM-5	6759.0
POTO-4A	6518.0
R-1	6750.0
R-11	6574.4
R-12	6468.3
R-13	6593.1
R-14	6818.1
R-15	6700.0
R-16	6251.9
R-18	6910.0
R-19	6420.3
R-2	6770.4
R-20	6511.3
R-21	6505.2
R-22	6522.5
R-23	6517.8
R-25	7007.1
R-26	6774.6
R-28	6598.5
R-31	6338.5
R-32	6463.6
R-33	6770.0
R-34	6556.0
R-6	6737.0
R-7	6754.2
R-8	6513.9
SC1	6669.0
SC2	6658.0
SC3	6607.0
SC4	6630.5
SC5	6611.0
SCOI-3	6471.0
SHB-1	6868.9
SHB-3	7183.7
SHB-4	6627.7
SIMO	6591.4
Sigma_Mesa	6789.5
TH-5	6550.8
TH-6	6557.5
TW-2	6635.4
TestHole7-53	6658.0

LEGEND

- Wells Intersecting Qbof
- Elevation of the top of Qbof (100' Contours)
- Outcrop of Qbof
- Outcrop of Qbog and Qbof
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Elevation of top of Qbof in illustrated wells

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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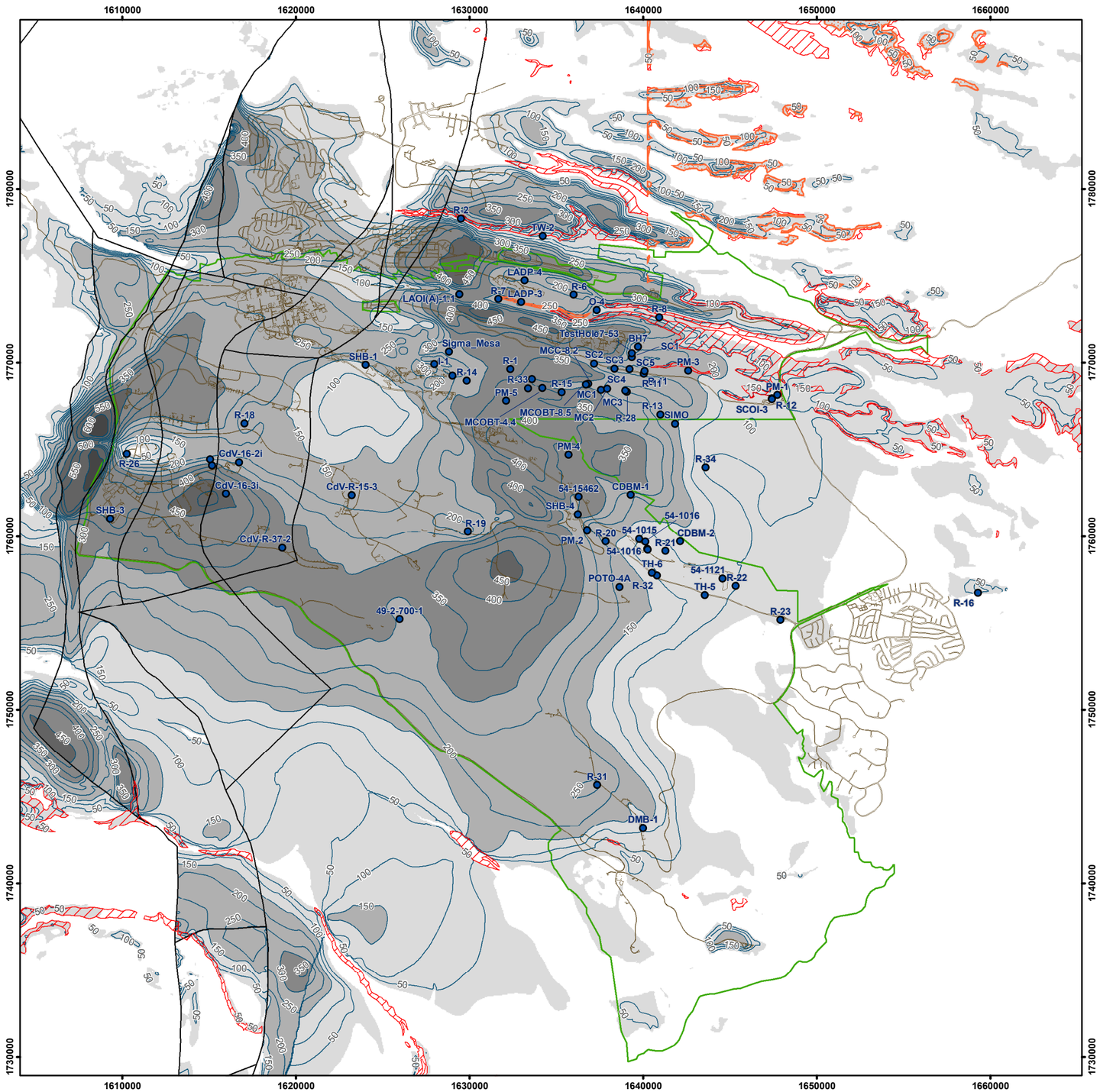
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-37. Structure contours of the top of the Otowi Member of the Bandelier Tuff (Qbof)



Thickness of Qbof in illustrated wells

Well ID	Thickness
35-2028	3.0
49-2-700-1	102.5
54-1004	45.0
54-1015	97.8
54-1016	57.9
54-1018	30.5
54-1121	5.0
54-15462	35.0
BH7	16.5
CDBM-1	94.0
CDBM-2	44.5
CdV-16-1i	226.0
CdV-16-2i	232.0
CdV-16-3i	464.0
CdV-R-15-3	168.0
CdV-R-37-2	338.0
DMB-1	73.5
I-1	233.5
LADP-3	246.0
LADP-4	252.0
LAOI(A)-1.1	279.2
MC1	103.5
MC2	57.0
MC3	40.5
MCC-8.2	80.0
MCM-5.9A	76.0
MCOBT-4.4	356.0
MCOBT-8.5	283.0
O-4	142.0
PM-1	120.0
PM-2	225.0
PM-3	140.0
PM-4	320.0
PM-5	375.0
POTO-4A	70.0
R-1	325.0
R-11	122.0
R-12	80.7
R-13	168.0
R-14	278.0
R-15	322.0
R-16	79.0
R-18	153.0
R-19	184.0
R-2	124.0
R-20	191.0
R-21	64.0
R-22	51.0
R-23	20.0
R-25	334.8
R-26	62.0
R-28	167.0
R-31	240.0
R-32	103.0
R-33	378.0
R-34	41.0
R-6	233.0
R-7	260.0
R-8	44.0
SC1	90.5
SC2	78.0
SC3	28.5
SC4	52.0
SC5	31.0
SCOI-3	81.0
SHB-1	143.0
SHB-3	414.0
SHB-4	80.0
SIMO	40.0
Sigma_Mesa	1.0
TH-5	120.0
TH-6	180.0
TW-2	24.0
TestHole7-53	37.0

LEGEND

- Wells Intersecting Qbof
- Thickness of Qbof (50' Contours)
- Outcrop of Qbof
- Outcrop of Qbog and Qbof
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 150
- 151 - 300
- 301 - 450
- 451 - 600
- 601 - 750

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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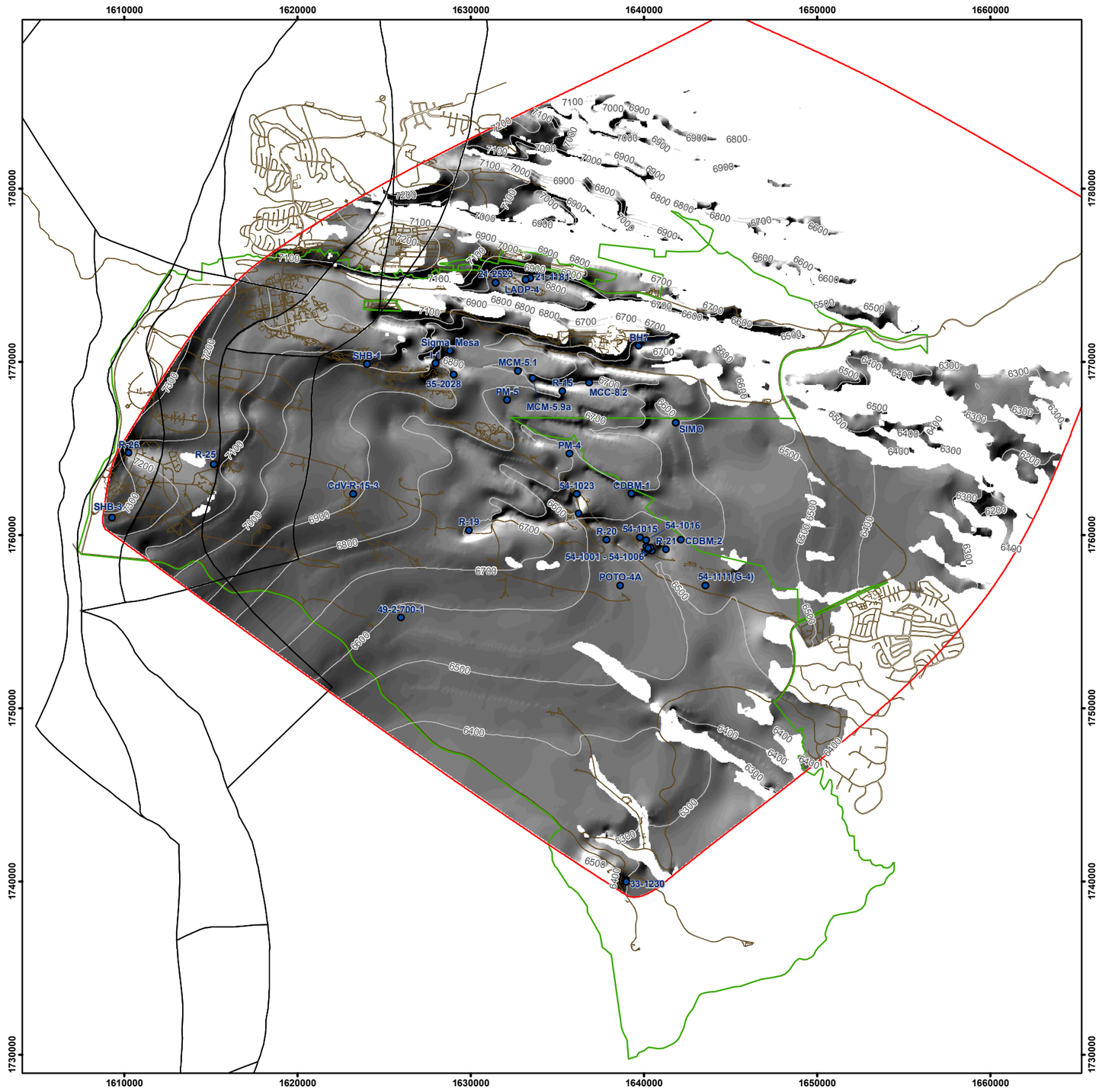
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-38. Thickness of the Otowi Member of the Bandelier Tuff (Qbof)



Elevation of top of Qbtt in illustrated wells

Well ID	Top Elev.
21-1811	6779.0
21-2523	6861.3
33-1230	6292.0
33-1231	6300.0
33-1232	6303.0
35-2028	6885.9
49-2-700-1	6576.9
54-1001	6528.0
54-1002	6530.2
54-1003	6529.7
54-1004	6533.7
54-1005	6537.6
54-1006	6532.3
54-1015	6544.7
54-1016	6541.9
54-1018	6530.2
54-1023	6629.5
54-1111(G-4)	6536.6
BH7	6666.5
CDBM-1	6639.6
CDBM-2	6583.6
CdV-R-15-3	6908.9
I-1	6922.0
LADP-4	6803.2
MCC-8.2	6691.2
MCM-5.1	6777.8
MCM-5.9A	6752.2
PM-4	6697.1
PM-5	6760.0
POTO-4A	6538.0
R-15	6755.0
R-19	6687.3
R-20	6529.3
R-21	6515.2
R-25	7134.3
R-26	7166.6
SHB-1	7013.9
SHB-3	7286.7
SHB-4	6630.7
SIMO	6608.4
Sigma_Mesa	6845.5

LEGEND

- Wells Intersecting Qbtt
- Elevation of the top of Qbtt (100' Contours)
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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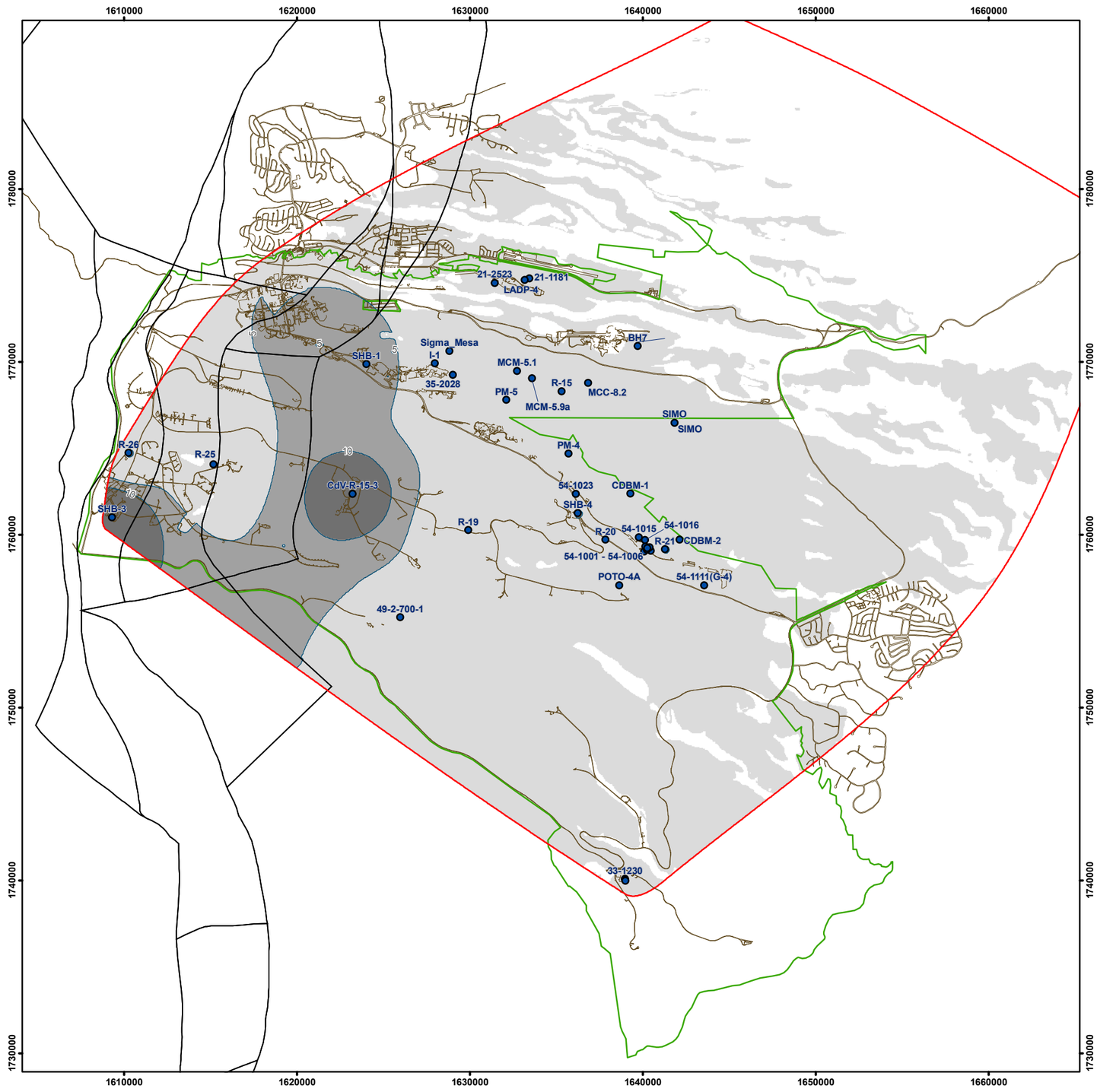
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Date: April, 2006

Plate 4-39. Structure contours of the top of the Tsankawi Pumice Bed (Qbtt)



Elevation of top of Qbtt in illustrated wells

Well ID	Thickness
21-1811	0.4
21-2523	2.3
33-1230	1.0
33-1231	1.0
33-1232	1.0
35-2028	2.0
49-2-700-1	4.0
54-1001	0.9
54-1002	2.3
54-1003	3.0
54-1004	0.5
54-1005	6.5
54-1006	1.8
54-1015	2.6
54-1016	2.6
54-1018	1.5
54-1023	1.2
54-1111(G-4)	2.0
BH7	1.5
CDBM-1	3.0
CDBM-2	2.0
CdV-R-15-3	12.0
I-1	3.2
LADP-4	4.5
MCC-8.2	3.0
MCM-5.1	3.0
MCM-5.9A	3.0
PM-4	1.0
PM-5	1.0
POTO-4A	3.0
R-15	1.0
R-19	1.0
R-20	1.0
R-21	5.0
R-25	2.2
R-26	1.0
SHB-1	8.0
SHB-3	14.0
SHB-4	3.0
SIMO	3.0
Sigma_Mesa	1.0

LEGEND

- Wells Intersecting Qbtt
- Thickness of Qbtt (5' Contours)
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 5
- 6 - 10
- 11 - 15
- 16 - 20

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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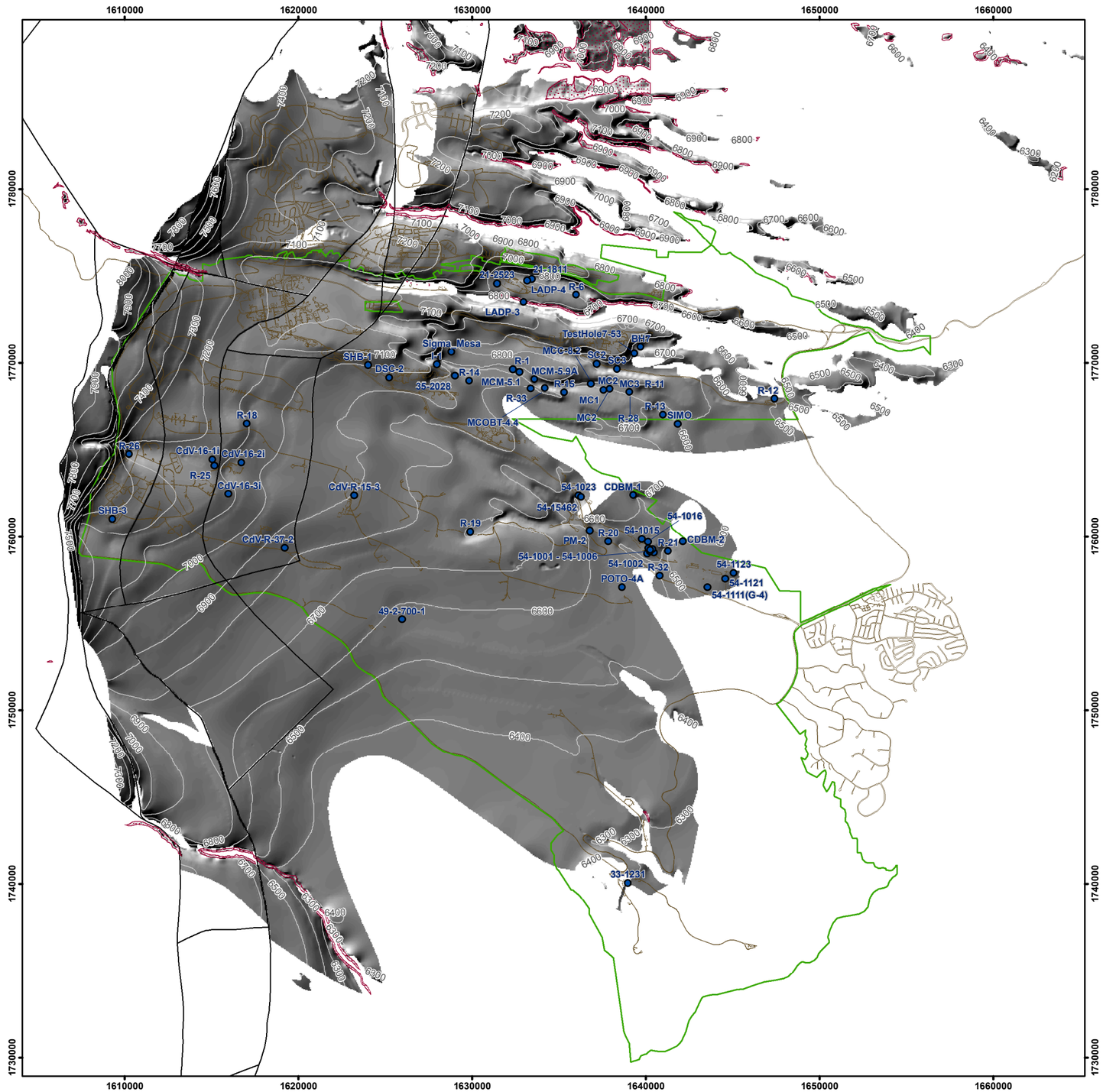
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Date: April, 2006

Plate 4-40. Thickness of the Tsankawi Pumice Bed (Qbtt)



Elevation of top of Qct in illustrated wells

Well ID	Top Elev.
21-1811	6778.6
21-2523	6859.0
33-1231	6299.0
35-2028	6883.9
49-2-700-1	6572.9
54-1001	6527.1
54-1002	6527.9
54-1003	6526.7
54-1004	6533.2
54-1005	6531.1
54-1006	6530.5
54-1015	6542.1
54-1016	6539.3
54-1018	6528.7
54-1023	6628.3
54-1111(G-4)	6534.6
54-1121	6553.5
54-1123	6575.8
54-15462	6625.0
BH7	6665.0
CDBM-1	6636.6
CDBM-2	6581.6
CdV-16-1i	7142.2
CdV-16-2i	7062.1
CdV-16-3i	7127.8
CdV-R-15-3	6896.9
CdV-R-37-2	6841.6
DSC-2	6970.9
I-1	6918.8
LADP-3	6755.6
LADP-4	6798.7
MC1	6710.0
MC2	6670.5
MC3	6663.0
MCC-8.2	6688.2
MCM-5.1	6774.8
MCM-5.9A	6749.2
MCOBT-4.4	6772.7
PM-2	6582.0
POTO-4A	6535.0
R-1	6795.0
R-12	6487.1
R-13	6600.1
R-14	6842.1
R-15	6754.0
R-18	7106.0
R-19	6686.3
R-20	6528.3
R-21	6510.2
R-25	7132.1
R-26	7165.6
R-32	6499.6
R-33	6794.0
R-6	6797.0
SC2	6671.0
SC3	6642.0
SHB-1	7005.9
SHB-3	7272.7
SIMO	6605.4
Sigma_Mesa	6844.5
TestHole7-53	6677.0

LEGEND

- Wells Intersecting Qct
- Elevation of the top of Qct (100' Contours)
- Outcrop of Qct
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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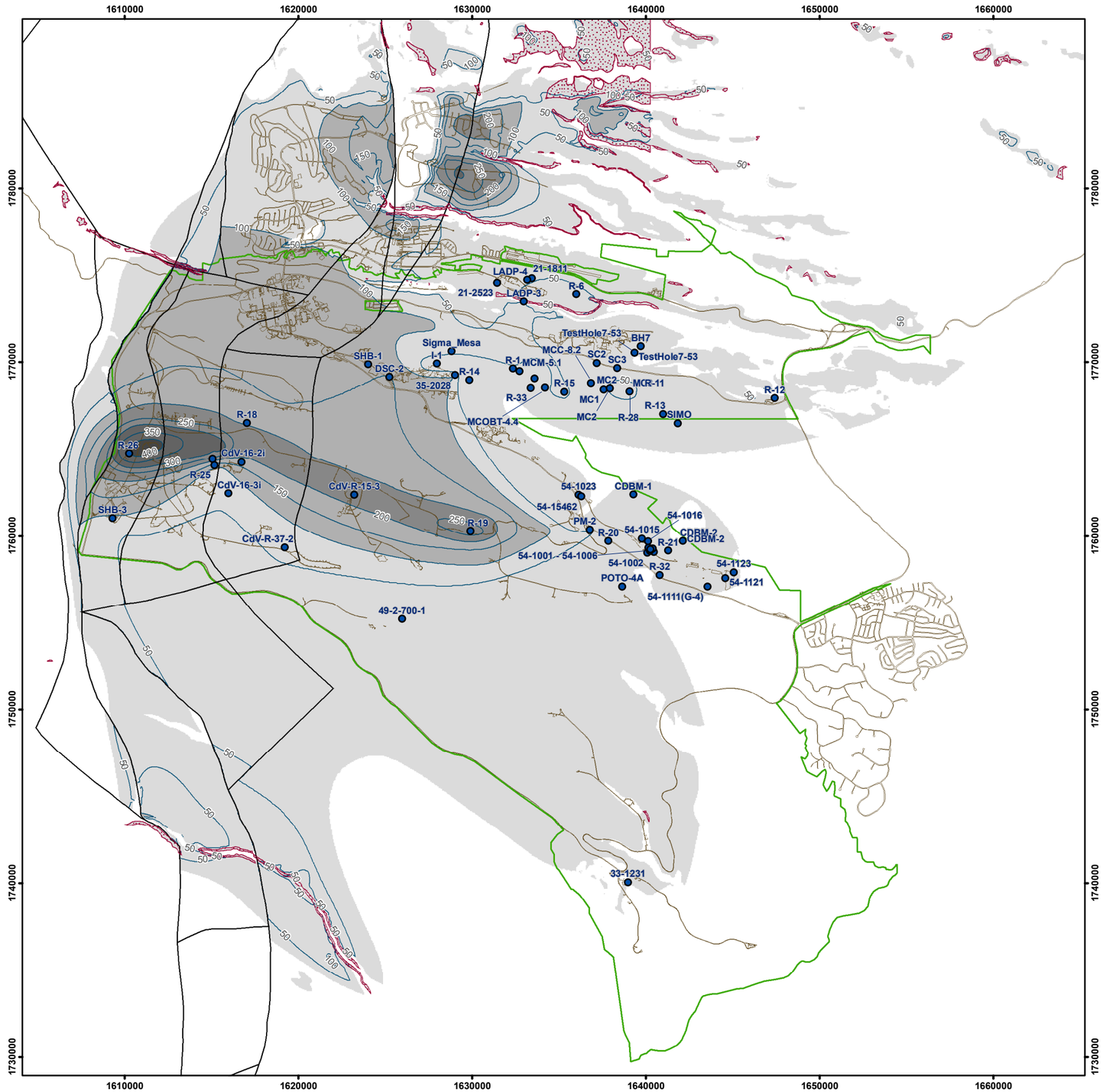
Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-41. Structure contours of the top of the Cerro Toledo interval (Qct)



Thickness of Qct in illustrated wells

Well ID	Thickness
21-1811	6.1
21-2523	20.0
33-1231	5.0
35-2028	77.5
49-2-700-1	36.5
54-1001	27.3
54-1002	28.0
54-1003	34.0
54-1004	40.0
54-1005	24.3
54-1006	30.2
54-1015	34.3
54-1016	48.3
54-1018	38.5
54-1023	4.0
54-1111(G-4)	13.0
54-1121	23.0
54-1123	10.5
54-15462	10.0
BH7	37.5
CDBM-1	10.0
CDBM-2	2.0
CdV-16-1i	217.0
CdV-16-2i	175.0
CdV-16-3i	71.0
CdV-R-15-3	220.0
CdV-R-37-2	60.0
DSC-2	90.9
I-1	40.0
LADP-3	64.0
LADP-4	43.5
MC1	26.5
MC2	33.5
MC3	40.0
MCC-8.2	17.0
MCM-5.1	15.5
MCM-5.9A	17.0
MCOBT-4.4	38.5
PM-2	50.0
POTO-4A	17.0
R-1	45.0
R-12	18.8
R-13	7.0
R-14	24.0
R-15	54.0
R-18	196.0
R-19	266.0
R-20	17.0
R-21	5.0
R-25	125.0
R-26	391.0
R-32	36.0
R-33	24.0
R-6	60.0
SC2	13.0
SC3	35.0
SHB-1	137.0
SHB-3	89.0
SIMO	14.0
Sigma_Mesa	55.0
TestHole7-53	19.0

LEGEND

- Wells Intersecting Qct
- Thickness of Qct (50' Contours)
- Outcrop of Qct
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 100
- 101 - 200
- 201 - 300
- 301 - 400
- 401 - 500

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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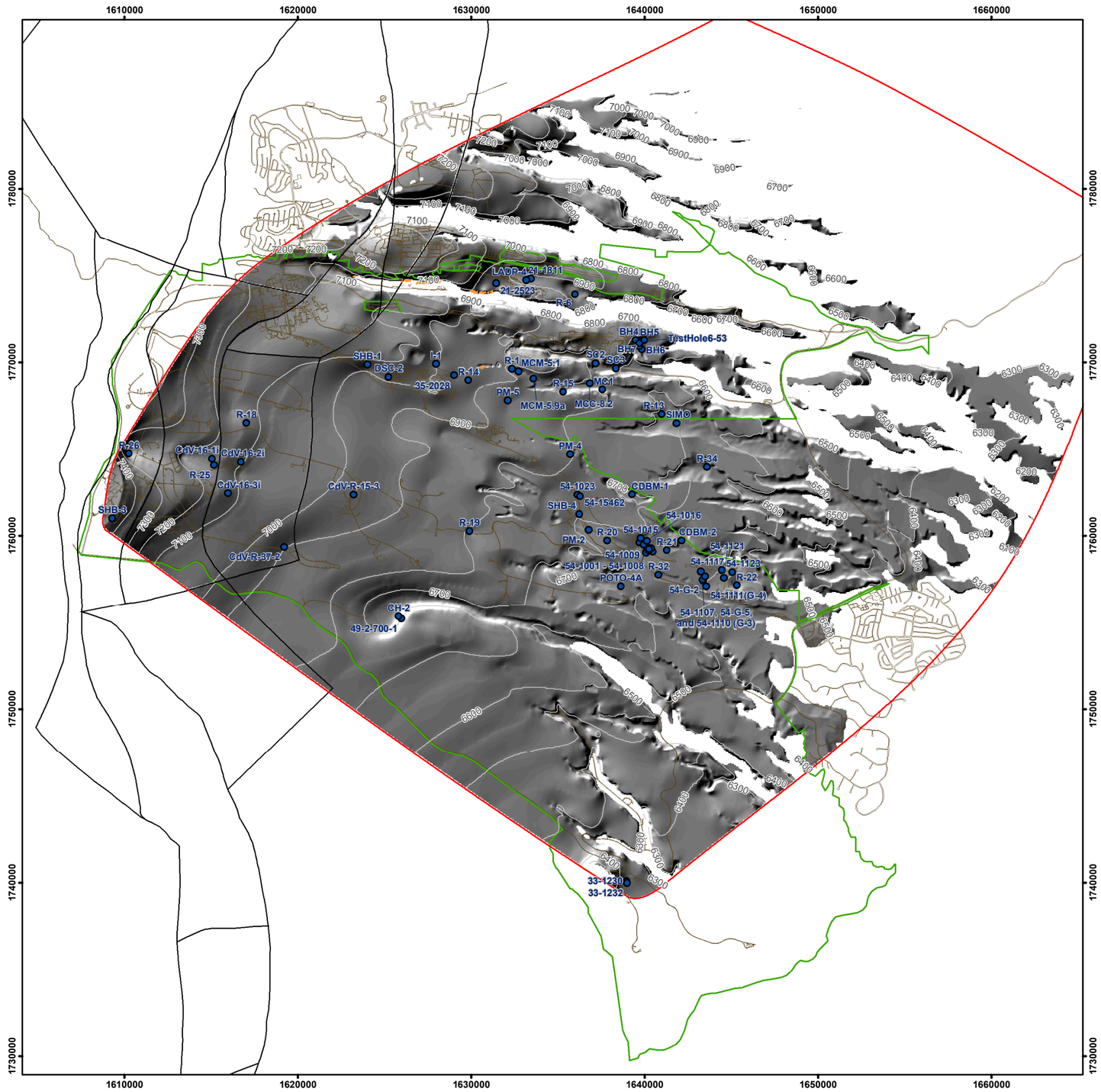
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-42. Thickness of the Cerro Toledo interval (Qct)



Elevation of top of Qbt1g in illustrated wells

Well ID	Top Elev.
21-1811	6892.5
21-2523	6937.0
33-1230	6344.0
33-1231	6346.0
33-1232	6343.0
35-2028	6955.4
49-2-700-1	6754.9
54-1001	6656.4
54-1002	6656.3
54-1003	6657.7
54-1004	6657.2
54-1005	6654.3
54-1006	6661.2
54-1007	6659.3
54-1008	6666.6
54-1009	6660.5
54-1015	6669.9
54-1016	6668.1
54-1018	6656.7
54-1023	6738.0
54-1107	6616.1
54-1110(G-3)	6606.2
54-1111(G-4)	6594.6
54-1117	6598.7
54-1121	6596.0
54-1123	6597.8
54-15462	6734.0
54-G-2	6607.6
54-G-5	6604.1
BH4	6769.8
BH5	6760.2
BH6	6761.9
BH7	6763.0
CDBM-1	6714.6
CDBM-2	6620.1
CH-2	6648.3
CdV-16-1i	7159.2
CdV-16-2i	7109.1
CdV-16-3i	7141.8
CdV-R-15-3	6968.9
CdV-R-37-2	6906.6
DSC-2	7020.0
I-1	6995.3
LADP-4	6891.7
MC1	6752.0
MCC-8.2	6699.2
MCM-5.1	6839.8
MCM-5.9A	6812.2
PM-2	6682.0
PM-4	6697.2
PM-5	6760.1
POTO-4A	6622.0
R-1	6852.0
R-13	6635.1
R-14	6933.1
R-15	6803.5
R-18	7137.0
R-19	6781.3
R-20	6539.3
R-21	6639.2
R-22	6573.5
R-25	7154.6
R-26	7176.6
R-32	6590.6
R-34	6634.0
R-6	6839.0
SC2	6700.0
SC3	6651.0
SHB-1	7045.9
SHB-3	7457.7
SHB-4	6707.7
SIMO	6644.4
TestHole6-53	6788.2

LEGEND

- Wells Intersecting Qbt1g
- Elevation of the top of Qbt1g (100' Contours)
- Outcrop of Qbt1g
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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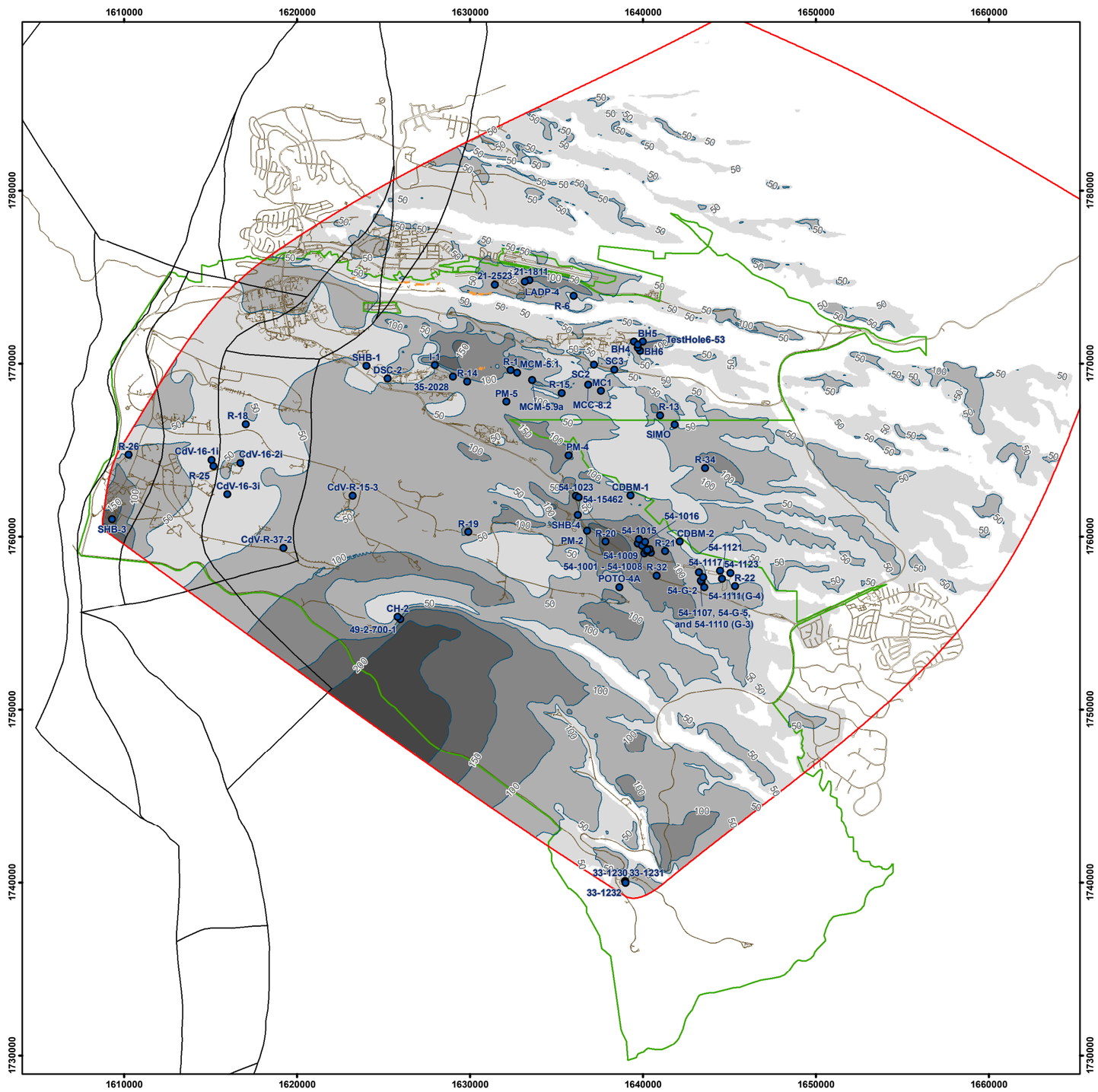
Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-43. Structure contours of the top of the Tshirege Member unit 1, glassy portion (Qbt1g)



Thickness of Qbt1g in illustrated wells

Well ID	Thickness
21-1811	113.5
21-2523	75.7
33-1230	52.0
33-1231	46.0
33-1232	40.0
35-2028	69.5
49-2-700-1	178.0
54-1001	128.4
54-1002	126.1
54-1003	128.0
54-1004	123.5
54-1005	116.7
54-1006	128.9
54-1007	19.0
54-1008	20.0
54-1009	18.5
54-1015	125.2
54-1016	126.2
54-1018	126.5
54-1023	108.5
54-1107	28.0
54-1110(G-3)	18.0
54-1111(G-4)	58.0
54-1117	11.5
54-1121	42.5
54-1123	22.0
54-15462	109.0
54-G-2	15.5
54-G-5	18.0
BH4	40.5
BH5	46.5
BH6	50.0
BH7	96.5
CDBM-1	75.0
CDBM-2	36.5
CH-2	14.0
CdV-16-1i	17.0
CdV-16-2i	47.0
CdV-16-3i	14.0
CdV-R-15-3	60.0
CdV-R-37-2	65.0
DSC-2	49.1
I-1	73.3
LADP-4	88.5
MC1	42.0
MCC-8.2	8.0
MCM-5.1	62.0
MCM-5.9A	60.0
PM-2	100.0
PM-4	0.1
PM-5	0.1
POTO-4A	84.0
R-1	57.0
R-13	35.0
R-14	91.0
R-15	48.5
R-18	31.0
R-19	94.0
R-20	10.0
R-21	124.0
R-22	51.0
R-25	20.3
R-26	10.0
R-32	91.0
R-34	78.0
R-6	42.0
SC2	29.0
SC3	9.0
SHB-1	32.0
SHB-3	171.0
SHB-4	77.0
SIMO	36.0
TestHole6-53	17.0

LEGEND

- Wells Intersecting Qbt1g
- Thickness of Qbt1g (50' Contours)
- Outcrop of Qbt1g
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 250

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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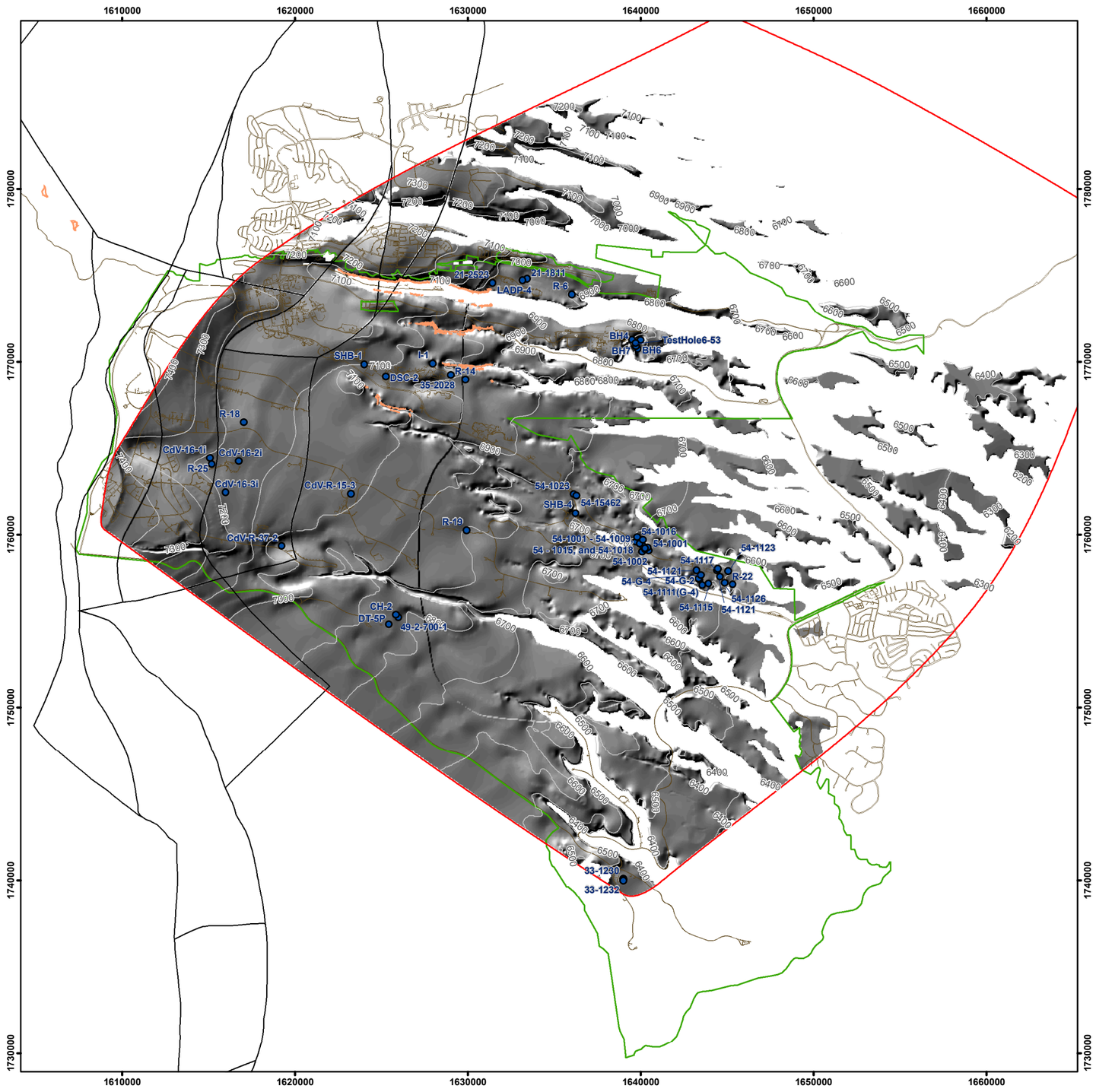
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-44. Thickness of the Tshirege Member unit 1, glassy portion (Qbt1g)



Elevation of top of Qbt1vc in illustrated wells

Well ID	Top Elev.
21-1811	6892.6
21-2523	6937.1
33-1230	6344.1
33-1231	6346.1
33-1232	6343.1
35-2028	6955.5
49-2-700-1	6755.0
54-1001	6676.5
54-1002	6672.6
54-1003	6677.7
54-1004	6683.2
54-1005	6687.0
54-1006	6685.3
54-1007	6679.3
54-1008	6688.6
54-1009	6682.0
54-1015	6707.3
54-1016	6699.6
54-1018	6682.7
54-1023	6755.0
54-1107	6628.1
54-1110(G-3)	6621.2
54-1111(G-4)	6615.6
54-1115	6607.1
54-1116	6613.5
54-1117	6613.7
54-1121	6607.5
54-1123	6602.8
54-1126	6606.5
54-15462	6750.0
54-G-2	6607.7
54-G-5	6604.2
BH4	6784.2
BH5	6773.8
BH6	6774.4
BH7	6772.5
CH-2	6648.4
CdV-16-1i	7159.3
CdV-16-2i	7109.2
CdV-16-3i	7141.9
CdV-R-15-3	6969.0
CdV-R-37-2	6906.7
DSC-2	7020.1
DT-5P	6651.9
I-1	6995.4
LADP-4	6891.8
R-14	6933.2
R-18	7137.1
R-19	6781.4
R-22	6573.6
R-25	7154.7
R-6	6839.1
SHB-1	7046.0
SHB-4	6708.7
TestHole6-53	6788.3

LEGEND

- Wells Intersecting Qbt1vc
- Elevation of the top of Qbt1vc (100' Contours)
- Outcrop of Qbt1vc
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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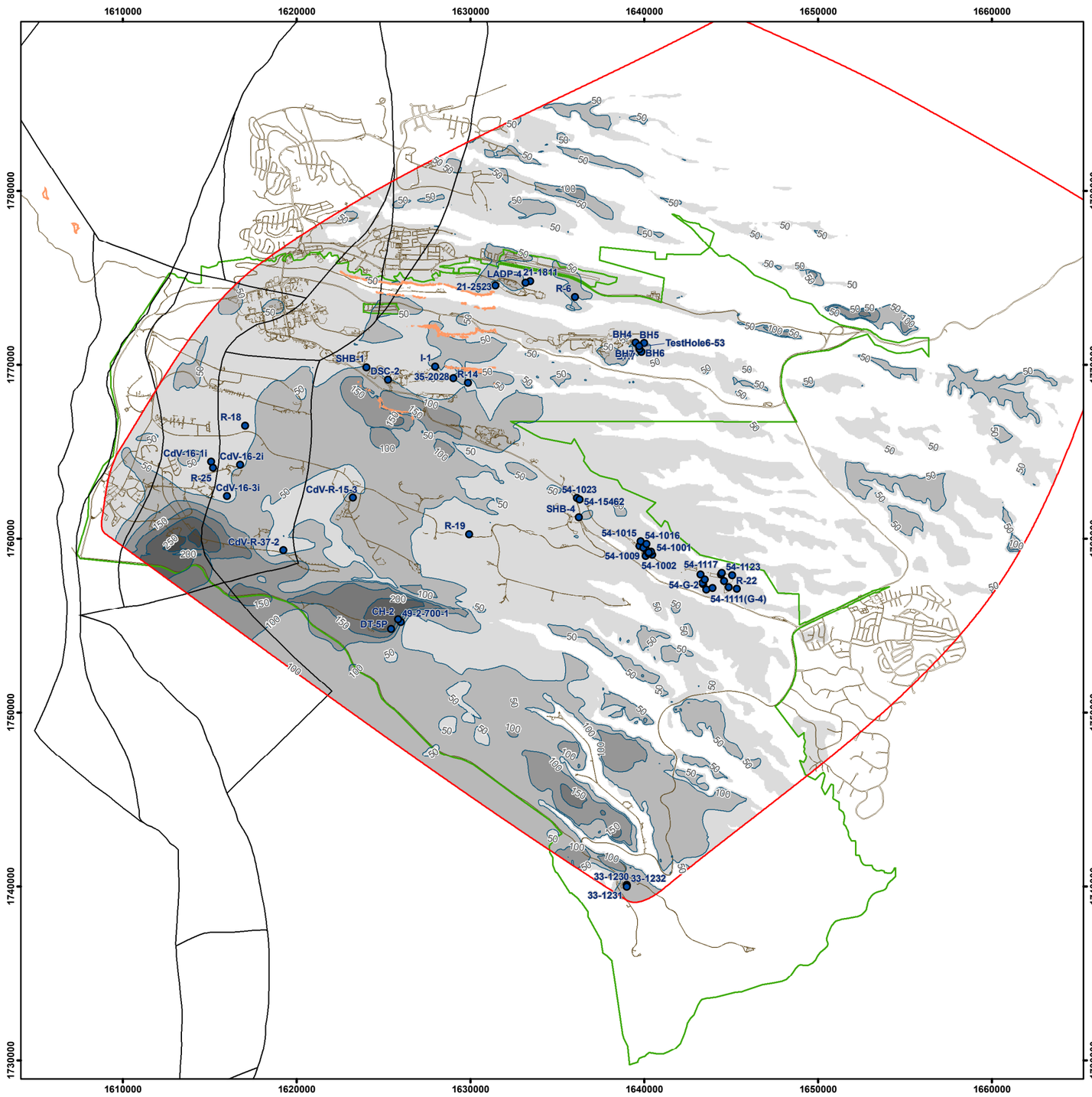
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-45. Structure contours of the top of the Tshirege Member, unit 1, colonnade vapor-phase portion (Qbt1vc)



Thickness of Qbt1vc in illustrated wells

Well ID	Thickness
21-1811	0.1
21-2523	0.1
33-1230	0.1
33-1231	0.1
33-1232	0.1
35-2028	0.1
49-2-700-1	0.1
54-1001	20.1
54-1002	16.3
54-1003	20.0
54-1004	26.0
54-1005	32.7
54-1006	24.1
54-1007	20.0
54-1008	22.0
54-1009	21.5
54-1015	37.4
54-1016	31.5
54-1018	26.0
54-1023	17.0
54-1107	12.0
54-1110(G-3)	15.0
54-1111(G-4)	21.0
54-1115	6.6
54-1116	20.0
54-1117	15.0
54-1121	11.5
54-1123	5.0
54-1126	1.7
54-15462	16.0
54-G-2	0.1
54-G-5	0.1
BH4	14.5
BH5	13.5
BH6	12.5
BH7	9.5
CH-2	0.1
CdV-16-1i	0.1
CdV-16-2i	0.1
CdV-16-3i	0.1
CdV-R-15-3	0.1
CdV-R-37-2	0.1
DSC-2	0.1
DT-5P	0.1
I-1	0.1
LADP-4	0.1
R-14	0.1
R-18	0.1
R-19	0.1
R-22	0.1
R-25	0.1
R-6	0.1
SHB-1	0.1
SHB-4	1.0
TestHole6-53	0.1

LEGEND

- Wells Intersecting Qbt1vc
- Thickness of Qbt1vc (50' Contours)
- Outcrop of Qbt1vc
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 250
- 251 - 300

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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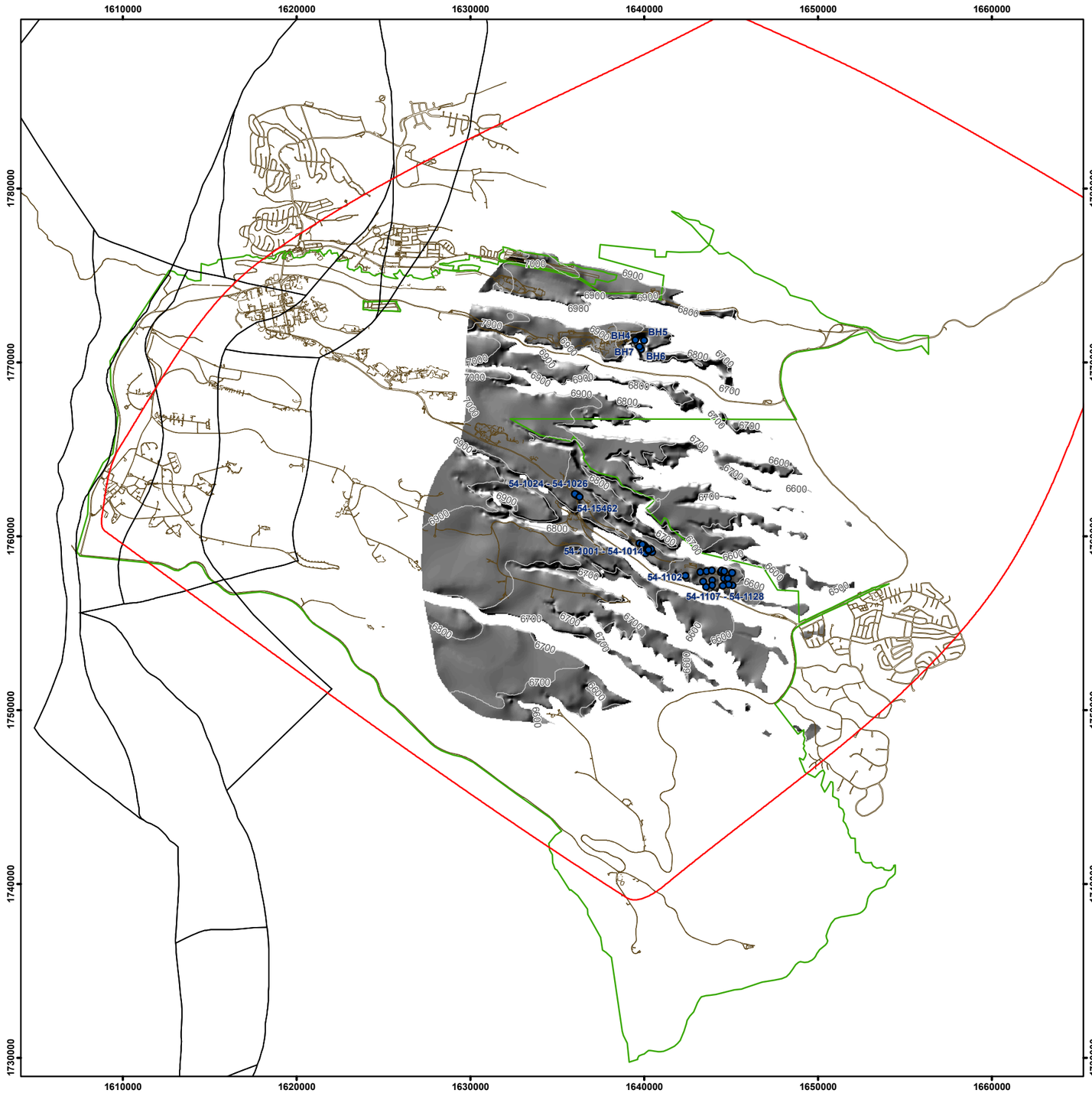
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-46. Thickness of the Tshirege Member, unit 1, colonnade vapor-phase portion (Qbt1vc)



Elevation of top of Qbt1vu in illustrated wells

Well ID	Top Elev.
54-1001	6744.1
54-1002	6747.3
54-1003	6751.7
54-1004	6750.7
54-1005	6745.8
54-1006	6754.0
54-1007	6753.3
54-1008	6757.6
54-1009	6757.0
54-1010	6749.9
54-1011	6754.5
54-1012	6755.4
54-1013	6757.6
54-1014	6757.9
54-1018	6747.7
54-1023	6849.3
54-1024	6848.0
54-1025	6855.0
54-1026	6855.2
54-1102	6677.7
54-1107	6661.1
54-1108	6660.8
54-1110(G-3)	6643.2
54-1111(G-4)	6634.6
54-1112	6654.9
54-1114	6640.8
54-1115	6631.2
54-1116	6644.7
54-1117	6649.7
54-1120	6650.8
54-1121	6649.5
54-1123	6637.3
54-1124	6605.1
54-1125	6631.4
54-1126	6627.5
54-1128	6633.2
54-15462	6843.0
BH4	6814.2
BH5	6806.6
BH6	6810.3
BH7	6810.4

LEGEND

- Wells Intersecting Qbt1vu
- Elevation of the top of Qbt1vu (100' Contours)
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

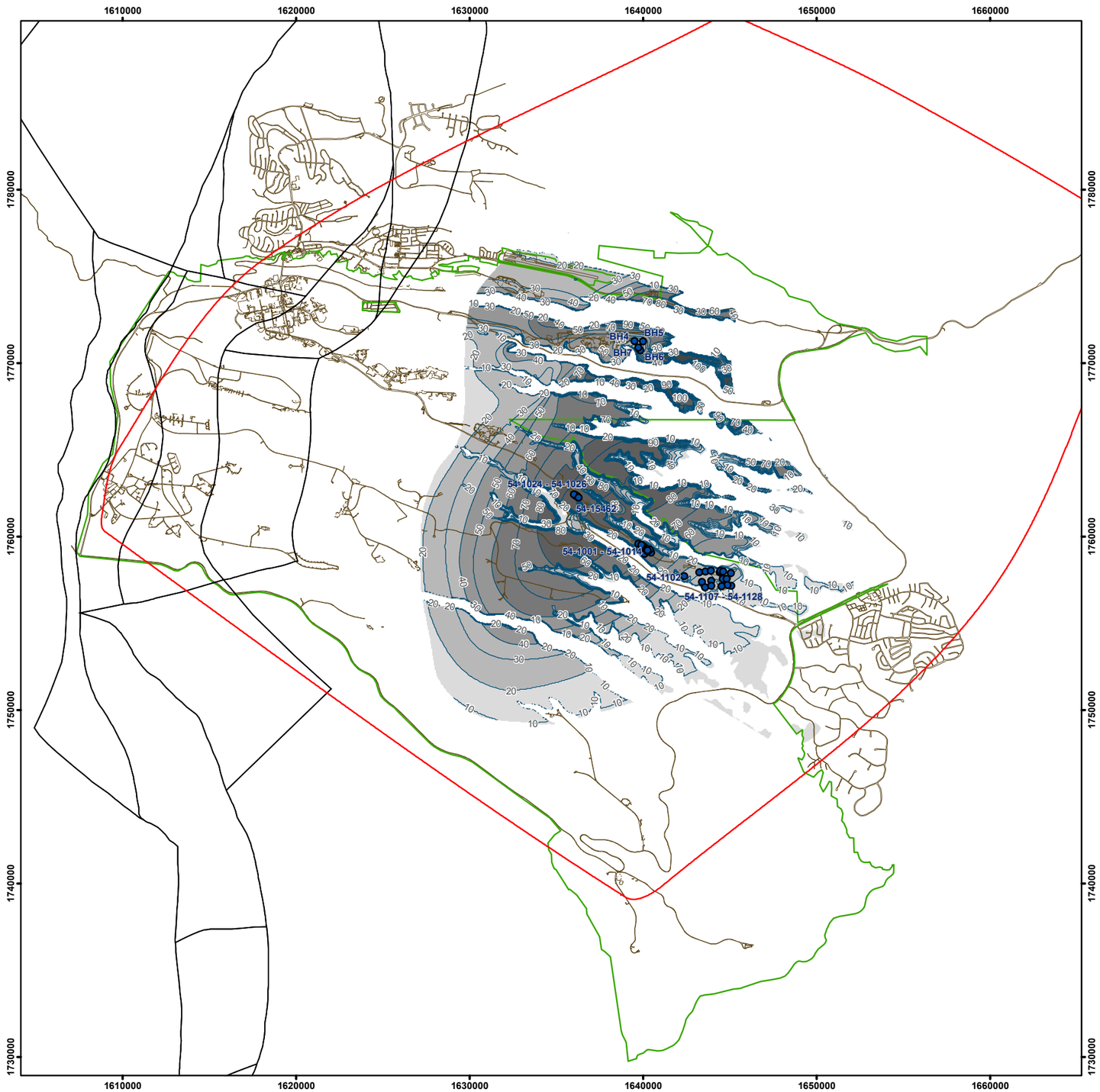
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-47. Structure contours of the top of the Tshirege Member, unit 1, upper vapor-phase portion (Qbt1vu)



Thickness of Qbt1vu in illustrated wells

Well ID	Thickness
54-1001	67.6
54-1002	74.7
54-1003	74.0
54-1004	67.5
54-1005	58.8
54-1006	68.7
54-1007	74.0
54-1008	69.0
54-1009	75.0
54-1010	1.7
54-1011	3.3
54-1012	3.3
54-1013	5.0
54-1014	5.1
54-1018	65.0
54-1023	94.3
54-1024	53.0
54-1025	55.5
54-1026	55.6
54-1102	21.5
54-1107	33.0
54-1108	11.7
54-1110(G-3)	22.0
54-1111(G-4)	19.0
54-1112	22.2
54-1114	15.3
54-1115	24.1
54-1116	31.2
54-1117	36.0
54-1120	12.0
54-1121	42.0
54-1123	34.5
54-1124	7.5
54-1125	25.5
54-1126	21.0
54-1128	21.2
54-15462	93.0
BH4	30.0
BH5	32.9
BH6	35.9
BH7	37.9

LEGEND

- Wells Intersecting Qbt1vu
- Thickness of Qbt1vu (10' Contours)
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100
- 101 - 120

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

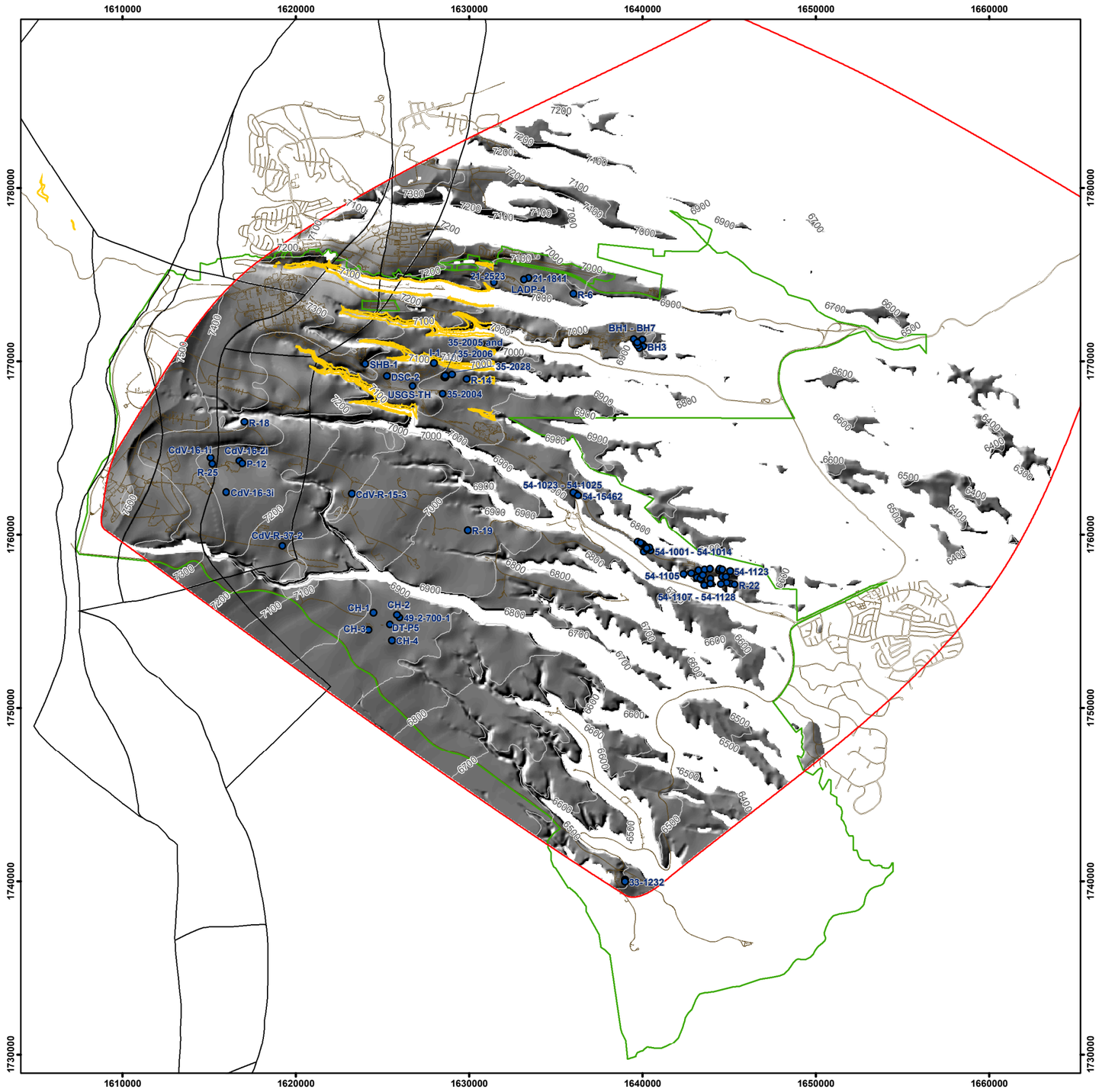
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-48. Thickness of the Tshirege Member, unit 1, upper vapor-phase portion (Qbt1vu)



Well ID	Top Elev.
21-1811	7026.0
21-2523	7070.0
33-1230	6512.7
33-1231	6506.0
33-1232	6507.0
35-2004	7094.2
35-2005	7082.7
35-2006	7084.9
35-2007	7083.5
35-2008	7082.5
35-2009	7084.3
35-2011	7082.3
35-2013	7085.1
35-2028	7078.4
49-2-700-1	6951.9
54-1001	6780.7
54-1002	6787.4
54-1003	6789.6
54-1004	6786.7
54-1005	6777.6
54-1006	6789.2
54-1007	6790.2
54-1008	6795.6
54-1009	6790.5
54-1010	6789.8
54-1011	6790.4
54-1012	6791.1
54-1013	6791.1
54-1014	6792.7
54-1018	6786.7
54-1023	6881.5
54-1024	6875.0
54-1025	6886.2
54-1026	6888.9
54-1102	6720.3
54-1105	6710.5
54-1106	6699.0
54-1107	6718.1
54-1108	6699.1
54-1110(G-3)	6691.2
54-1111(G-4)	6674.6
54-1112	6690.4
54-1114	6666.5
54-1115	6671.6
54-1116	6682.5
54-1117	6675.7
54-1120	6687.6
54-1121	6672.5
54-1123	6665.3
54-1124	6635.1
54-1125	6668.4
54-1126	6655.5
54-1128	6653.0
54-15462	6880.0
54-G-2	6694.1
54-G-5	6699.1
BH1	6907.5
BH2	6909.4
BH3	6896.4
BH4	6914.5
BH5	6903.8
BH6	6911.0
BH7	6909.8
CH-1	7170.6
CH-2	6944.3
CH-3	7169.9
CH-4	7118.2
CdV-16-1i	7297.2
CdV-16-2i	7262.1
CdV-16-3i	7279.8
CdV-R-15-3	7106.9
CdV-R-37-2	7121.6
DSC-2	7165.0
DT-5P	6954.8
I-1	7122.8
LADP-4	7035.7
P-12	7256.6
R-14	7059.1
R-18	7403.0
R-19	6948.8
R-22	6650.5
R-25	7287.1
R-6	6995.0
SHB-1	7195.9
TestHole6-53	6918.2
USGS-TH	7117.4

LEGEND

- Wells Intersecting Qbt2
- Elevation of the Top of Qbt2 (50' Contours)
- Outcrop of Qbt2
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

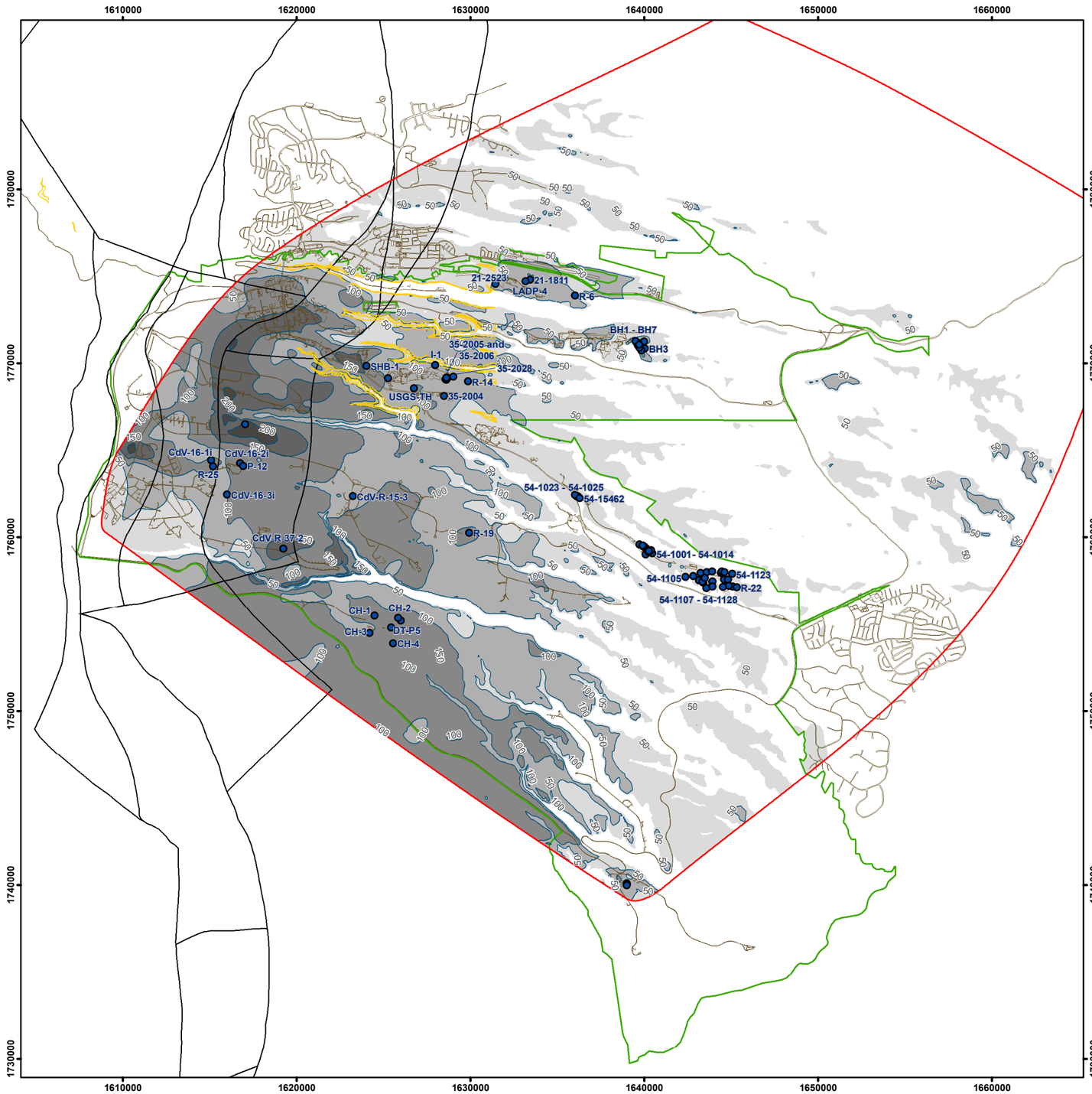
Elevation of the top of
Qbt2 in illustrated wells

Constructed from the 2005
LANL Sitewide Geologic
Model (Cole et al., 2006)

Outcrops are derived from the
surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-49. Structure contours of the top of the Tshirege Member, unit 2 (Qbt2)



Thickness of Qbt2 in illustrated wells

Well ID	Thickness
21-1811	87.0
21-2523	71.0
33-1230	70.7
33-1231	63.0
33-1232	66.0
35-2004	14.0
35-2005	12.0
35-2006	5.0
35-2007	1.0
35-2008	10.5
35-2009	19.0
35-2011	15.5
35-2013	14.0
35-2028	65.0
49-2-700-1	132.0
54-1001	36.6
54-1002	40.1
54-1003	37.9
54-1004	36.0
54-1005	31.8
54-1006	35.2
54-1007	36.9
54-1008	38.0
54-1009	33.5
54-1010	39.9
54-1011	35.9
54-1012	35.7
54-1013	33.5
54-1014	34.8
54-1018	39.0
54-1023	32.2
54-1024	27.0
54-1025	31.2
54-1026	33.7
54-1102	42.6
54-1105	48.1
54-1106	50.6
54-1107	57.0
54-1108	38.3
54-1110(G-3)	48.0
54-1111(G-4)	40.0
54-1112	35.5
54-1114	25.7
54-1115	40.4
54-1116	37.8
54-1117	26.0
54-1120	36.8
54-1121	23.0
54-1123	28.0
54-1124	30.0
54-1125	37.0
54-1126	28.0
54-1128	19.8
54-15462	37.0
54-G-2	52.0
54-G-5	55.0
BH1	41.8
BH2	43.0
BH3	50.0
BH4	100.2
BH5	97.1
BH6	100.7
BH7	99.4
CH-1	284.0
CH-2	101.0
CH-3	295.0
CH-4	288.0
CdV-16-1i	110.0
CdV-16-2i	110.0
CdV-16-3i	103.0
CdV-R-15-3	84.0
CdV-R-37-2	190.0
DSC-2	90.0
DT-5P	100.0
I-1	100.5
LADP-4	68.0
P-12	5.0
R-14	77.0
R-18	232.0
R-19	112.5
R-22	44.0
R-25	103.0
R-6	78.0
SHB-1	95.0
TestHole6-53	65.0
USGS-TH	100.0

LEGEND

- Wells Intersecting Qbt2
- Thickness of Qbt2 (50' Contours)
- Outcrop of Qbt2
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 250

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

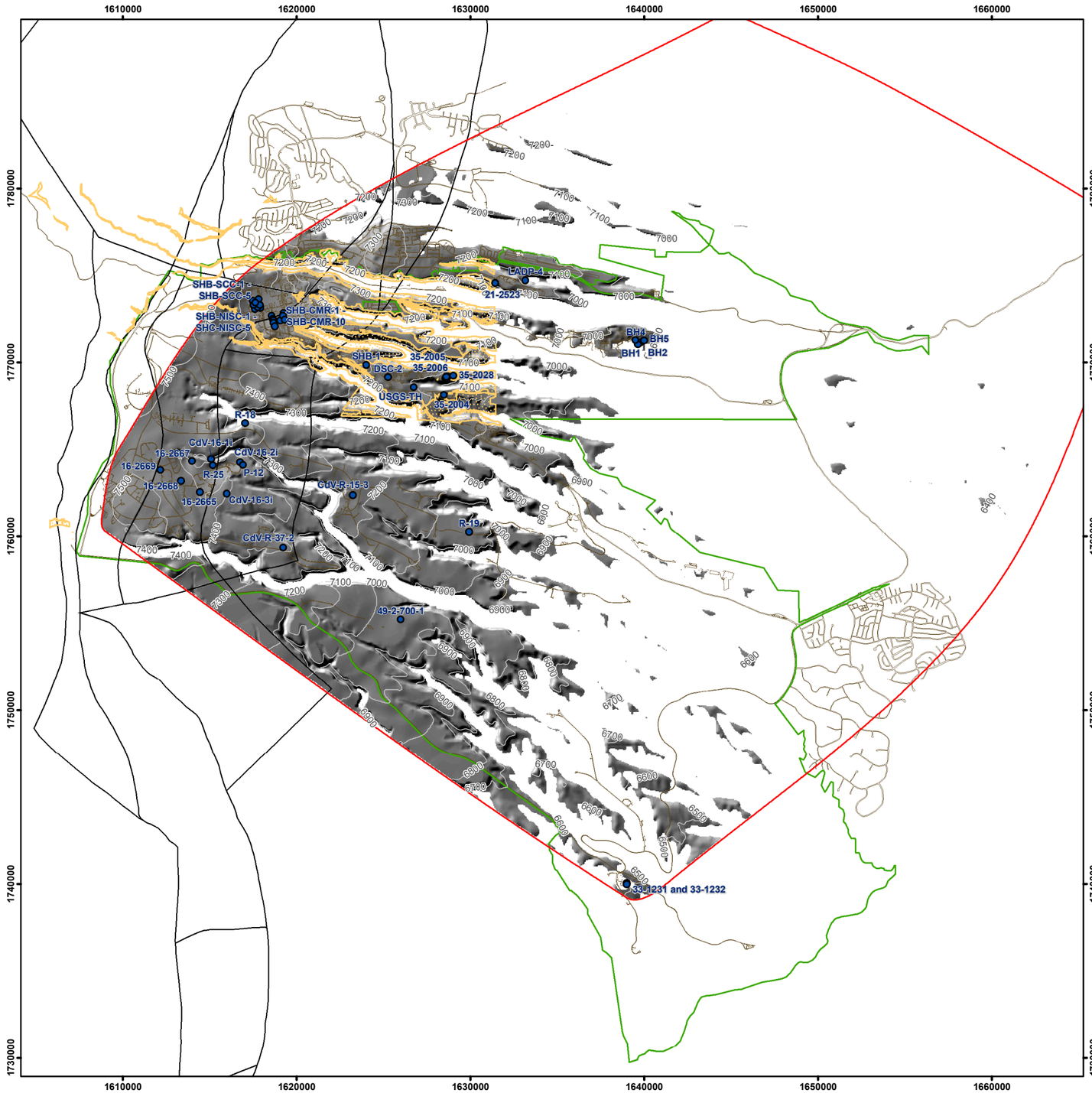
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-50. Thickness of the Tshirege Member, unit 2 (Qbt2)



Elevation of top of Qbt3 in illustrated wells

Well ID	Top Elev.
16-2665	7397.4
16-2667	7407.8
16-2668	7438.0
16-2669	7465.3
21-2523	7157.0
33-1231	6515.8
33-1232	6515.5
35-2004	7125.2
35-2005	7119.7
35-2006	7177.4
35-2007	7115.5
35-2008	7122.0
35-2009	7155.3
35-2011	7112.8
35-2013	7112.1
35-2028	7098.9
49-2-700-1	7060.9
BH1	6914.2
BH2	6914.4
BH4	6925.9
BH5	6910.4
CdV-16-1i	7373.2
CdV-16-2i	7380.1
CdV-16-3i	7398.8
CdV-R-15-3	7224.9
CdV-R-37-2	7305.6
DSC-2	7274.9
LADP-4	7043.7
P-12	7278.6
R-18	7415.0
R-19	7061.3
R-25	7361.1
SHB-1	7314.9
SHB-CMR-1	7344.9
SHB-CMR-10	7348.4
SHB-CMR-2	7349.6
SHB-CMR-3	7353.4
SHB-CMR-4	7354.9
SHB-CMR-5	7358.4
SHB-CMR-6	7342.2
SHB-CMR-7	7342.4
SHB-CMR-8	7347.7
SHB-NISC-1	7362.4
SHB-NISC-2	7353.3
SHB-NISC-3	7353.5
SHB-NISC-4	7364.3
SHB-NISC-5	7357.8
SHB-SCC-1	7360.2
SHB-SCC-2	7350.7
SHB-SCC-3	7352.1
SHB-SCC-4	7361.4
SHB-SCC-5	7358.2
USGS-TH	7147.4

LEGEND

- Wells Intersecting Qbt3
- Elevation of the top of Qbt3 (100' Contours)
- Outcrop of Qbt3
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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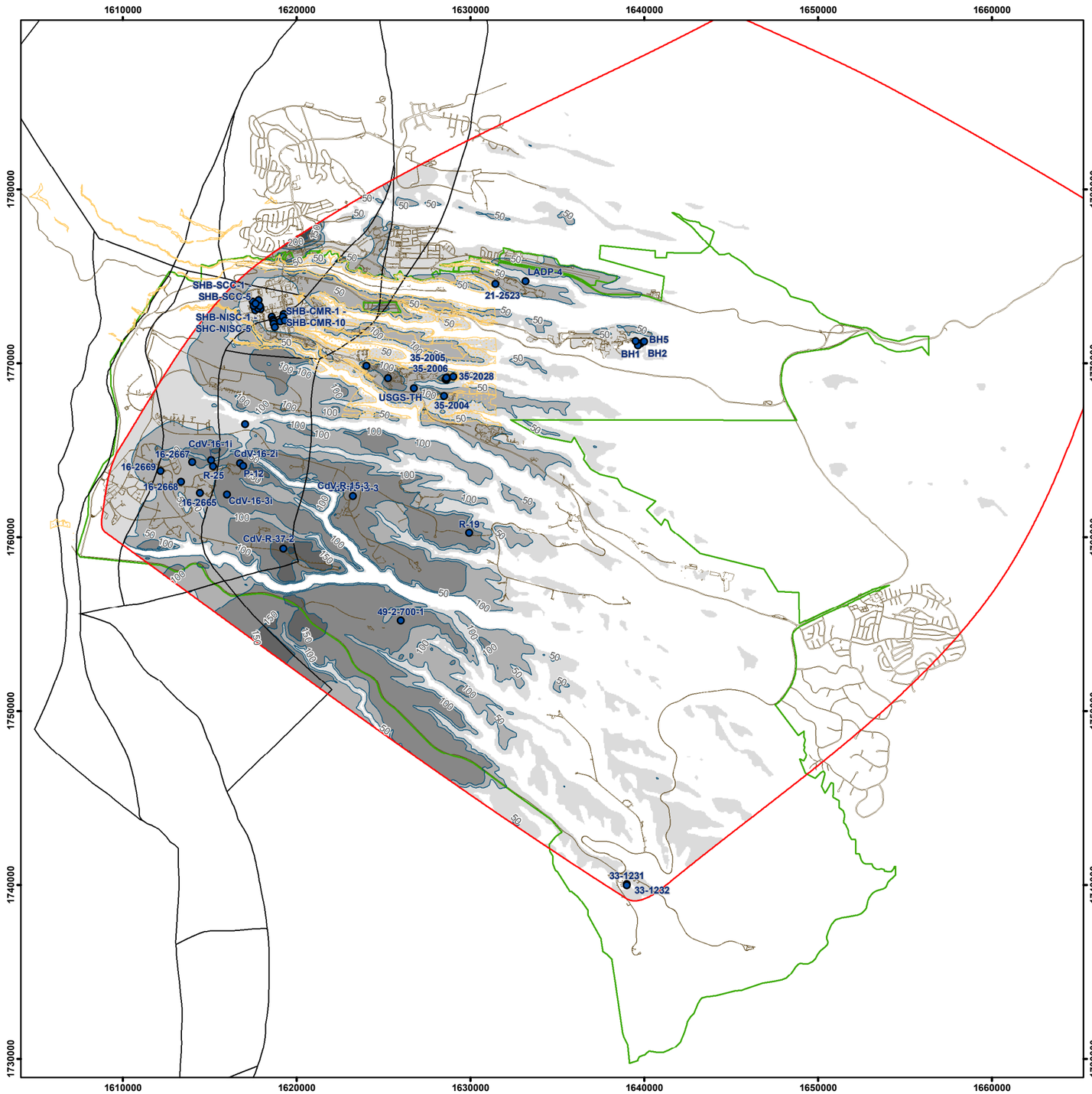
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-51. Structure contours of the top of the Tshirege Member, unit 3 (Qbt3)



Thickness of Qbt3 in illustrated wells

Well ID	Thickness
16-2665	5.0
16-2667	82.8
16-2668	69.5
16-2669	46.0
21-2523	87.0
33-1231	9.8
33-1232	8.5
35-2004	31.0
35-2005	37.0
35-2006	92.5
35-2007	32.0
35-2008	39.5
35-2009	71.0
35-2011	30.5
35-2013	27.0
35-2028	20.5
49-2-700-1	109.0
BH1	6.7
BH2	5.0
BH4	11.4
BH5	6.6
CdV-16-1i	76.0
CdV-16-2i	118.0
CdV-16-3i	119.0
CdV-R-15-3	118.0
CdV-R-37-2	184.0
DSC-2	109.9
LADP-4	8.0
P-12	22.0
R-18	12.0
R-19	112.5
R-25	74.0
SHB-1	119.0
SHB-CMR-1	10.2
SHB-CMR-10	10.0
SHB-CMR-2	12.3
SHB-CMR-3	9.8
SHB-CMR-4	8.9
SHB-CMR-5	13.4
SHB-CMR-6	7.5
SHB-CMR-7	5.0
SHB-CMR-8	7.5
SHB-NISC-1	5.7
SHB-NISC-2	7.6
SHB-NISC-3	0.7
SHB-NISC-4	7.5
SHB-NISC-5	10.3
SHB-SCC-1	17.5
SHB-SCC-2	5.2
SHB-SCC-3	9.0
SHB-SCC-4	9.5
SHB-SCC-5	5.0
USGS-TH	30.0

LEGEND

- Wells Intersecting Qbt3
- Thickness of Qbt3 (50' Contours)
- Outcrop of Qbt3
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 250

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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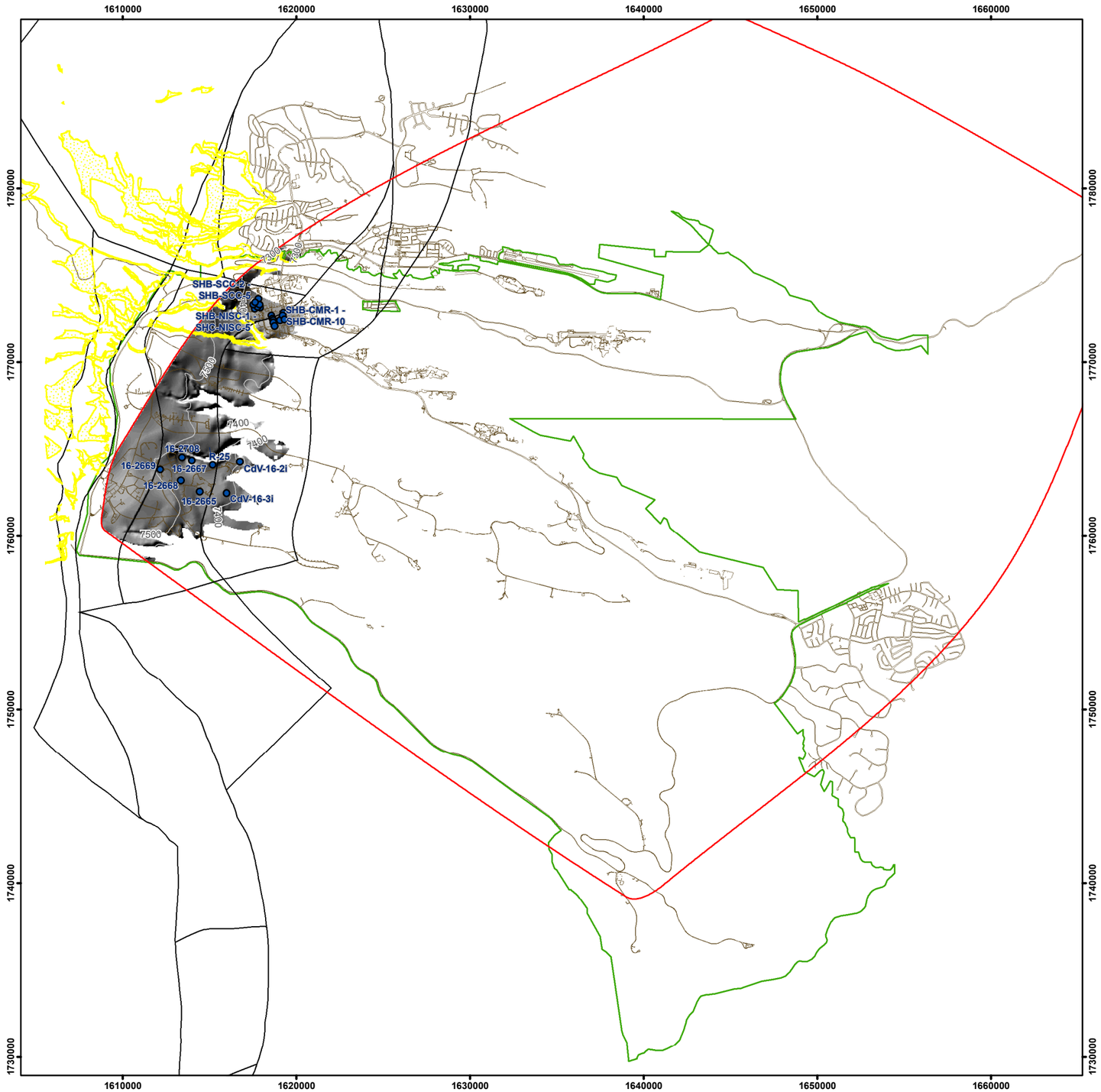
Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-52. Thickness of the Tshirege Member, unit 3 (Qbt3)



Elevation of top of Qbt3t in illustrated wells

Well ID	Top Elev.
16-2665	7416.4
16-2667	7439.5
16-2668	7460.7
16-2669	7489.3
16-2708	7436.0
CdV-16-2i	7401.1
CdV-16-3i	7416.8
R-25	7432.1
SHB-CMR-1	7355.0
SHB-CMR-10	7356.1
SHB-CMR-2	7357.4
SHB-CMR-3	7359.5
SHB-CMR-4	7362.2
SHB-CMR-5	7364.0
SHB-CMR-6	7344.7
SHB-CMR-7	7348.4
SHB-CMR-8	7350.2
SHB-NISC-1	7363.7
SHB-NISC-3	7358.0
SHB-NISC-4	7368.3
SHB-NISC-5	7359.1
SHB-SCC-2	7351.5
SHB-SCC-3	7354.5
SHB-SCC-4	7363.4
SHB-SCC-5	7359.4

LEGEND

- Wells Intersecting Qbt3t
- Elevation of the top of Qbt3t (100' Contours)
- Outcrop of Qbt3t
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

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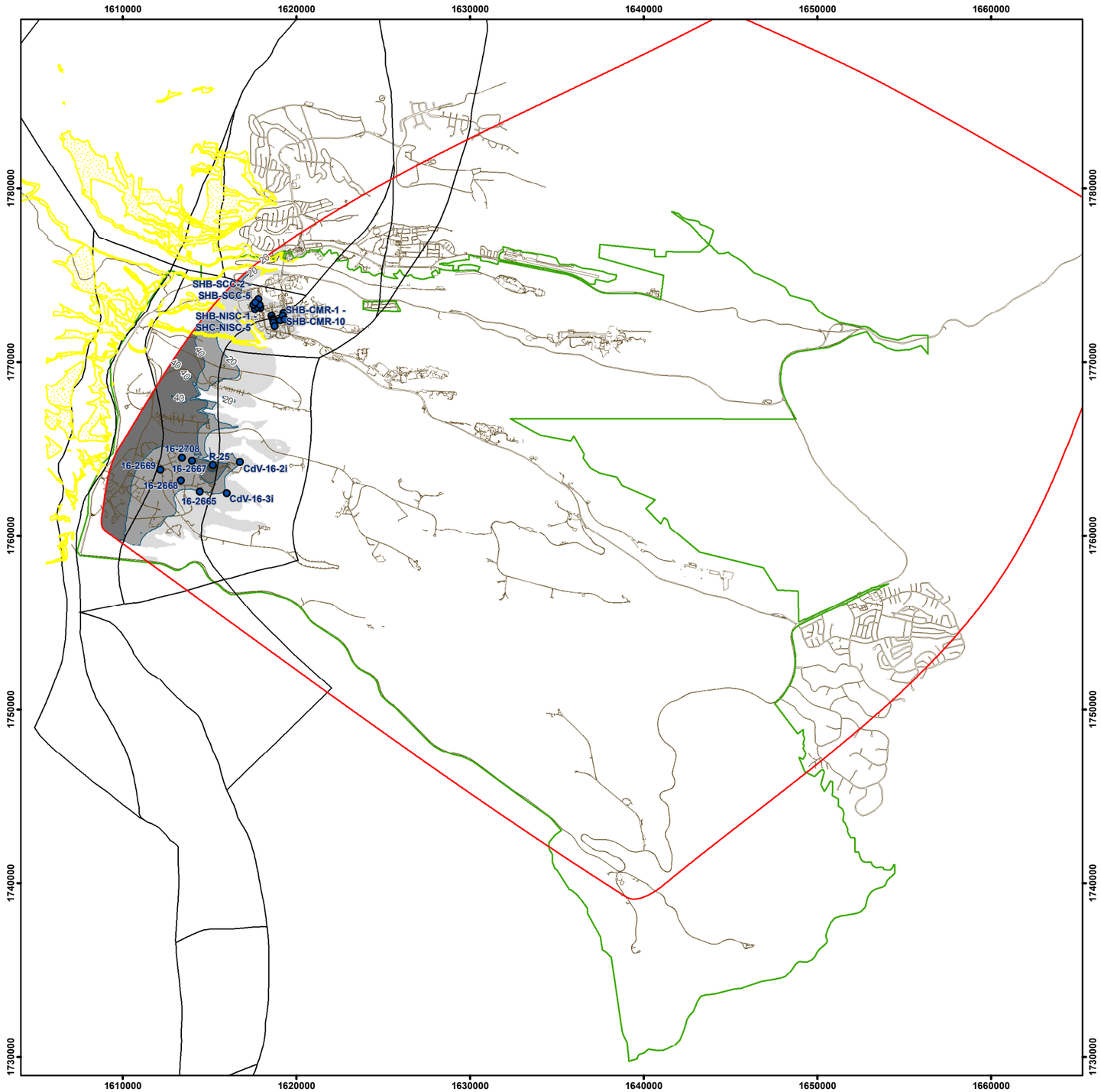
Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-53. Structure contours of the top of the Tshirege Member, unit 3, transition zone (Qbt3t)



Thickness of Qbt3t in illustrated wells

Well ID	Thickness
16-2665	19.0
16-2667	31.7
16-2668	22.7
16-2669	24.0
16-2708	6.5
CdV-16-2i	21.0
CdV-16-3i	18.0
R-25	71.0
SHB-CMR-1	10.1
SHB-CMR-10	7.7
SHB-CMR-2	7.8
SHB-CMR-3	6.1
SHB-CMR-4	7.3
SHB-CMR-5	5.6
SHB-CMR-6	2.5
SHB-CMR-7	6.0
SHB-CMR-8	2.5
SHB-NISC-1	1.3
SHB-NISC-3	4.5
SHB-NISC-4	4.0
SHB-NISC-5	1.3
SHB-SCC-2	0.8
SHB-SCC-3	2.4
SHB-SCC-4	2.0
SHB-SCC-5	1.2

LEGEND

- Wells Intersecting Qbt3t
- Thickness of Qbt3t (50' Contours)
- Outcrop of Qbt3t
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

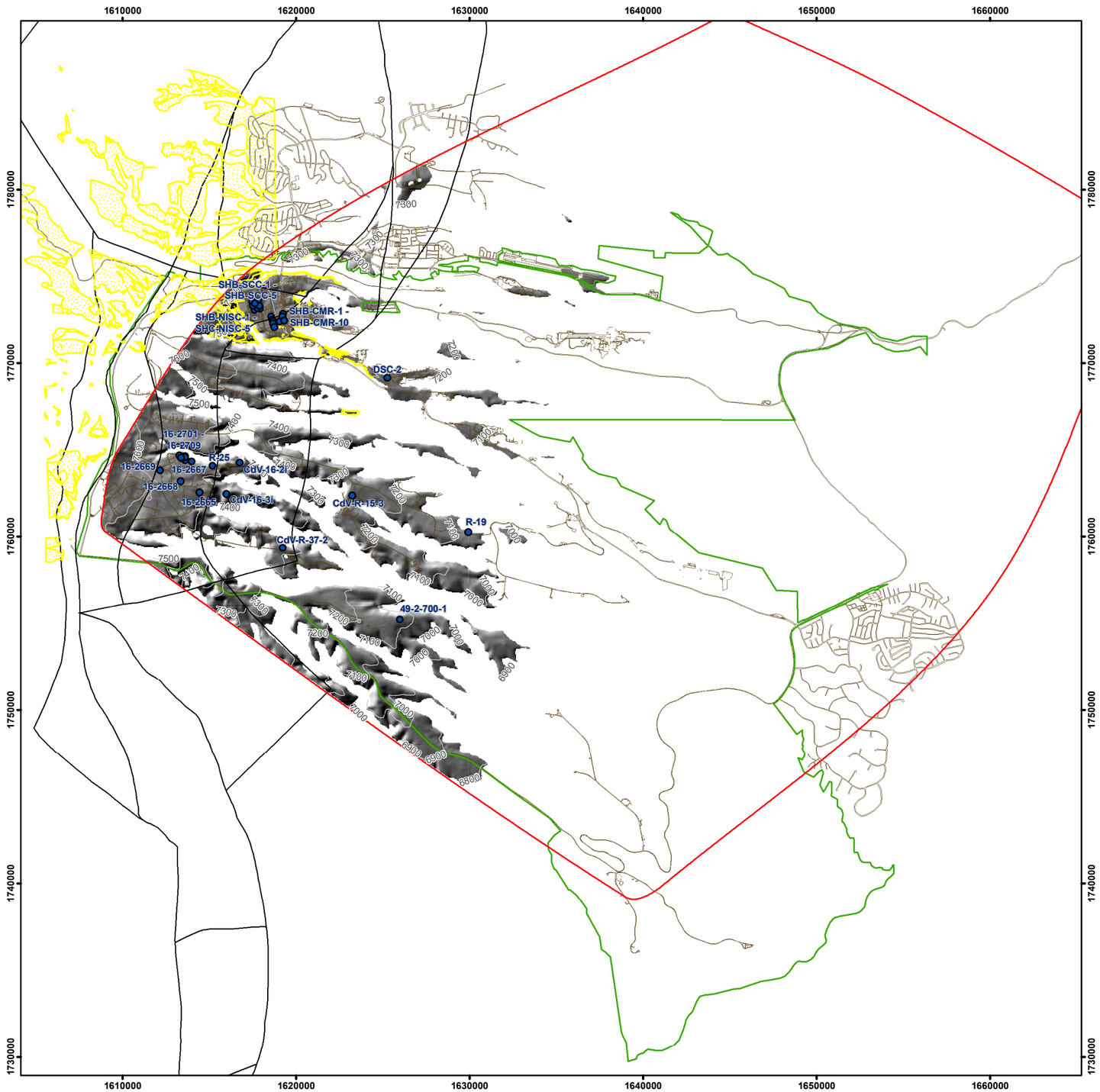
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-54. Thickness of the Tshirege Member, unit 3, transition zone (Qbt3t)



Elevation of top of Qbt4 in illustrated wells

Well ID	Top Elev.
16-2665	7515.9
16-2667	7530.0
16-2668	7551.7
16-2669	7577.3
16-2701	7541.5
16-2702	7526.0
16-2703	7547.6
16-2704	7538.9
16-2706	7528.0
16-2708	7534.0
16-2709	7518.8
16-2711	7521.0
16-2712	7519.0
16-2735	7533.0
49-2-700-1	7125.9
CdV-16-2i	7457.1
CdV-16-3i	7486.8
CdV-R-15-3	7253.9
CdV-R-37-2	7330.6
DSC-2	7285.0
R-19	7063.6
R-25	7516.1
SHB-CMR-1	7401.5
SHB-CMR-10	7378.4
SHB-CMR-2	7398.4
SHB-CMR-3	7398.6
SHB-CMR-4	7397.0
SHB-CMR-5	7397.5
SHB-CMR-6	7390.0
SHB-CMR-7	7394.1
SHB-CMR-8	7391.3
SHB-NISC-1	7433.2
SHB-NISC-2	7420.1
SHB-NISC-3	7421.8
SHB-NISC-4	7431.3
SHB-NISC-5	7426.5
SHB-SCC-1	7433.2
SHB-SCC-2	7422.5
SHB-SCC-3	7420.1
SHB-SCC-4	7433.9
SHB-SCC-5	7427.7

LEGEND

- Wells Intersecting Qbt4
- Elevation of the top of Qbt4 (100' Contours)
- Outcrop of Qbt4
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

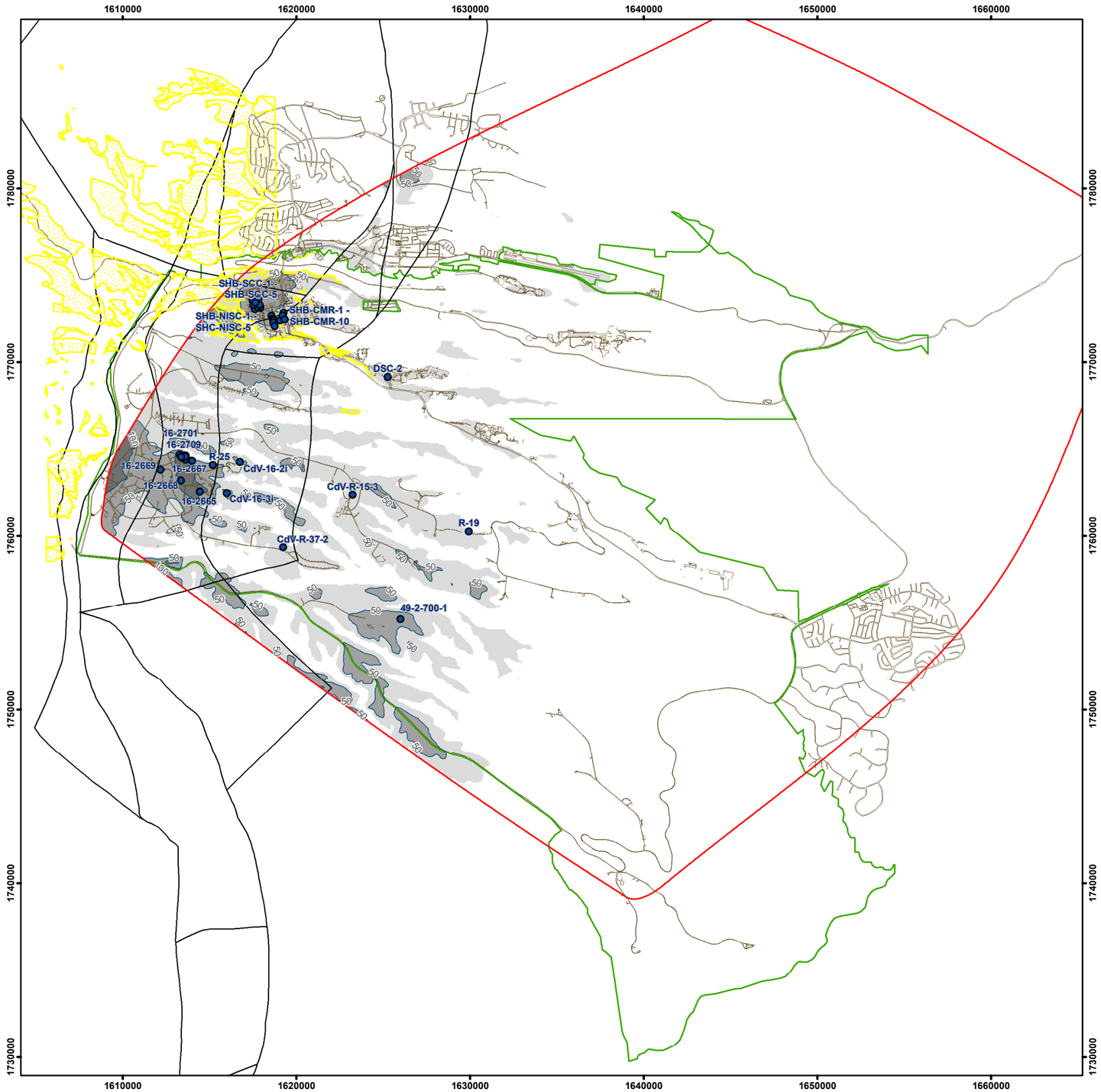
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-55. Structure contours of the top of the Tshirege Member, unit 4 (Qbt4)



Thickness of Qbt4 in illustrated wells

Well ID	Thickness
16-2665	99.5
16-2667	90.5
16-2668	91.0
16-2669	88.0
16-2701	79.5
16-2702	60.0
16-2703	67.6
16-2704	69.9
16-2706	88.0
16-2708	98.0
16-2709	32.8
16-2711	68.0
16-2712	97.0
16-2735	87.0
49-2-700-1	65.0
CdV-16-2i	56.0
CdV-16-3i	70.0
CdV-R-15-3	29.0
CdV-R-37-2	25.0
DSC-2	10.1
R-19	2.3
R-25	84.0
SHB-CMR-1	46.5
SHB-CMR-10	22.3
SHB-CMR-2	41.0
SHB-CMR-3	39.1
SHB-CMR-4	34.8
SHB-CMR-5	33.5
SHB-CMR-6	45.3
SHB-CMR-7	45.7
SHB-CMR-8	41.1
SHB-NISC-1	69.5
SHB-NISC-2	66.9
SHB-NISC-3	63.8
SHB-NISC-4	63.0
SHB-NISC-5	67.4
SHB-SCC-1	73.0
SHB-SCC-2	71.0
SHB-SCC-3	65.6
SHB-SCC-4	70.5
SHB-SCC-5	68.3

LEGEND

- Wells Intersecting Qbt4
- Thickness of Qbt4 (50' Contours)
- Outcrop of Qbt4
- Structural Blocks
- Los Alamos National Laboratory
- Roads
- Area of Qbt Subunit Definition

Thickness (feet)

- 0 - 50
- 51 - 100
- 101 - 150
- 151 - 200

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

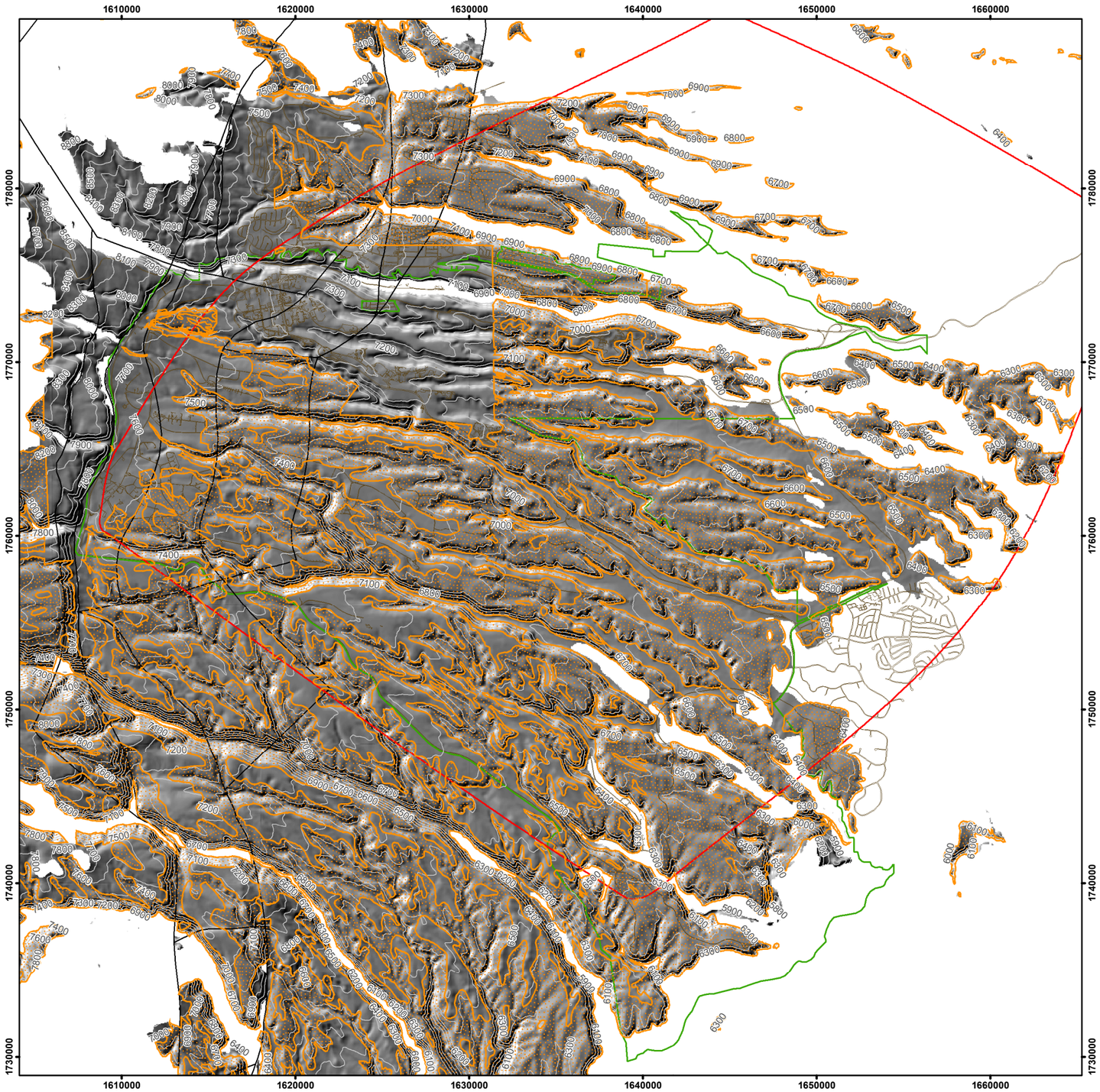
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-56. Thickness of the Tshirege Member, unit 4 (Qbt4)



LEGEND

- Elevation of the top of Qbt (100' Contours)
- Outcrop of Qbt
- Area of Qbt Subunit Definition
- Structural Blocks
- Los Alamos National Laboratory
- Roads

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

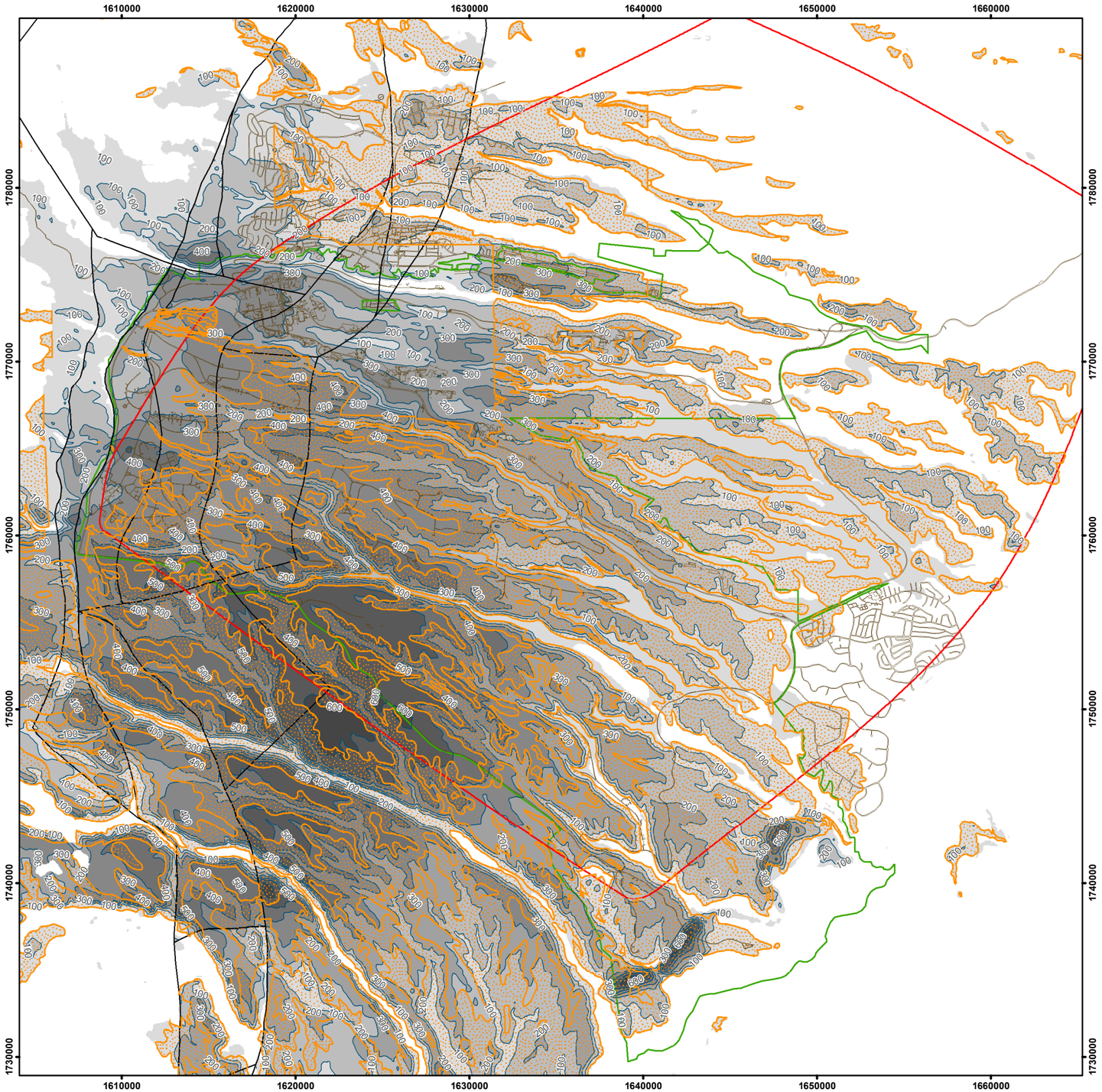
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-57. Structure contours of the top of the Tshirege Member of the Bandelier Tuff (Qbt)



LEGEND

- Thickness of Qbt (100' Contours)
- Outcrop of Qbt
- Area of Qbt Subunit Definition
- Structural Blocks
- Los Alamos National Laboratory
- Roads

Thickness (feet)

- 0 - 100
- 101 - 200
- 201 - 300
- 301 - 400
- 401 - 500
- 501 - 600
- 601 - 700

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

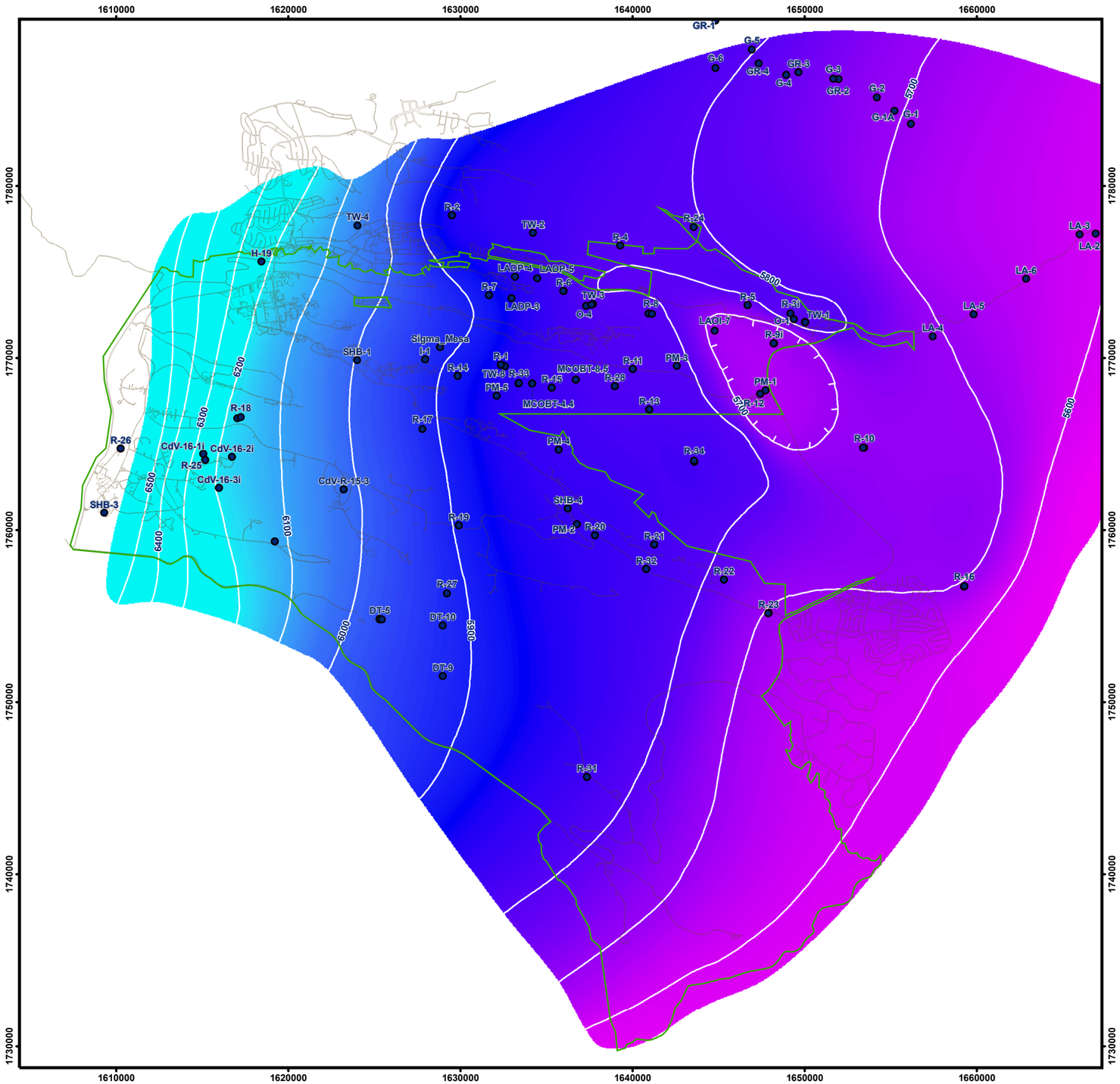
®

Constructed from the 2005 LANL Sitewide Geologic Model (Cole et al., 2006)

Outcrops are derived from the surface geologic map (Plate 2-1)

Date: April, 2006

Plate 4-58. Thickness of the Tshirege Member of the Bandelier Tuff (Qbt)



LEGEND

- Wells
- Los Alamos National Laboratory
- Roads
- Elevation of water table (100' Contours)

SCALE 1:80,000

0 0.5 1 2 3 4 Miles

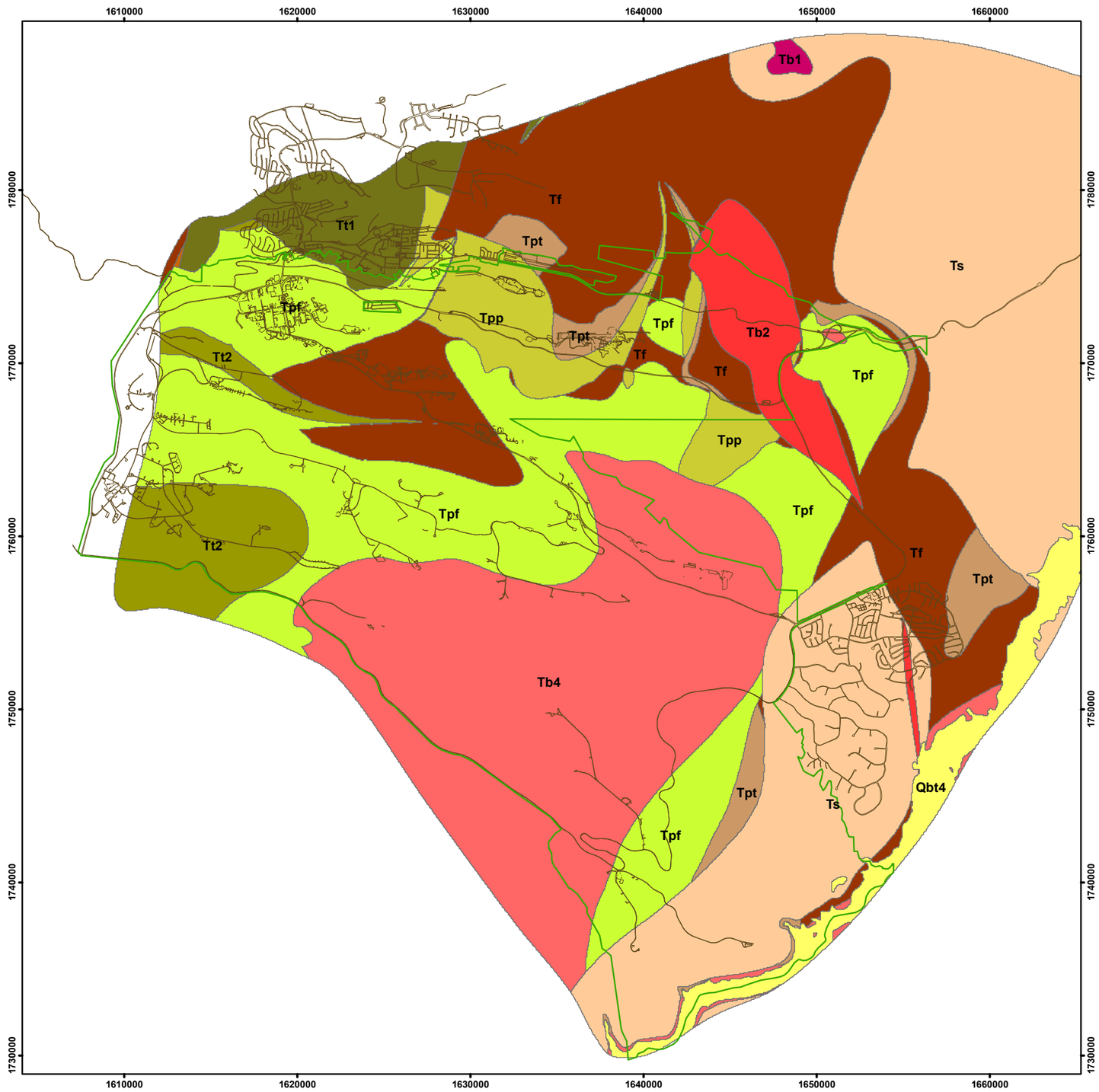
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

®

Constructed using the 2006 version of the regional water table developed by E. Keating and LANL's GIS Lab (LANL 2006).

Date: April, 2006

Plate 5-1. Regional water table elevation



LEGEND

GEOLOGY

- Qbt4
- Qct
- Tpf
- Tb4
- Tt2
- Tpp
- Tpt
- Tt1
- Tf
- Tb2
- Tk
- Ts
- Tb1
- LANL
- Roads

SCALE 1:80,000

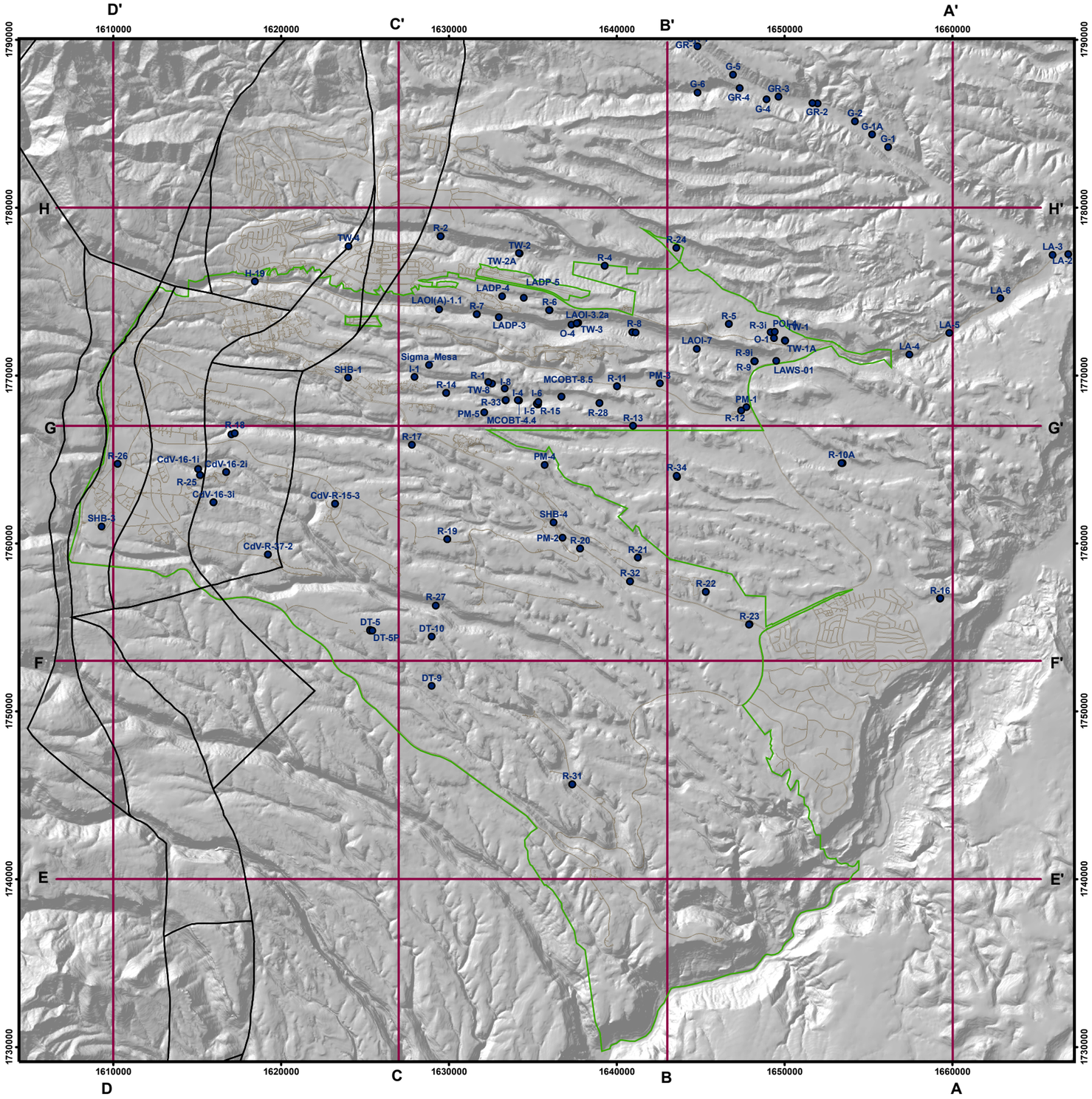
0 0.5 1 2 3 4 Miles

State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

Constructed using the 2005 LANL Sitewide Geologic Model (Cole et al., 2006) and the 2006 water table contours shown in Plate 5-1 (LANL 2006)

Date: April, 2006

Plate 6-1. Modeled geology at the regional water table



LEGEND

- Cross Section Lines
- Structural Blocks
- Wells
- Los Alamos National Laboratory
- Roads

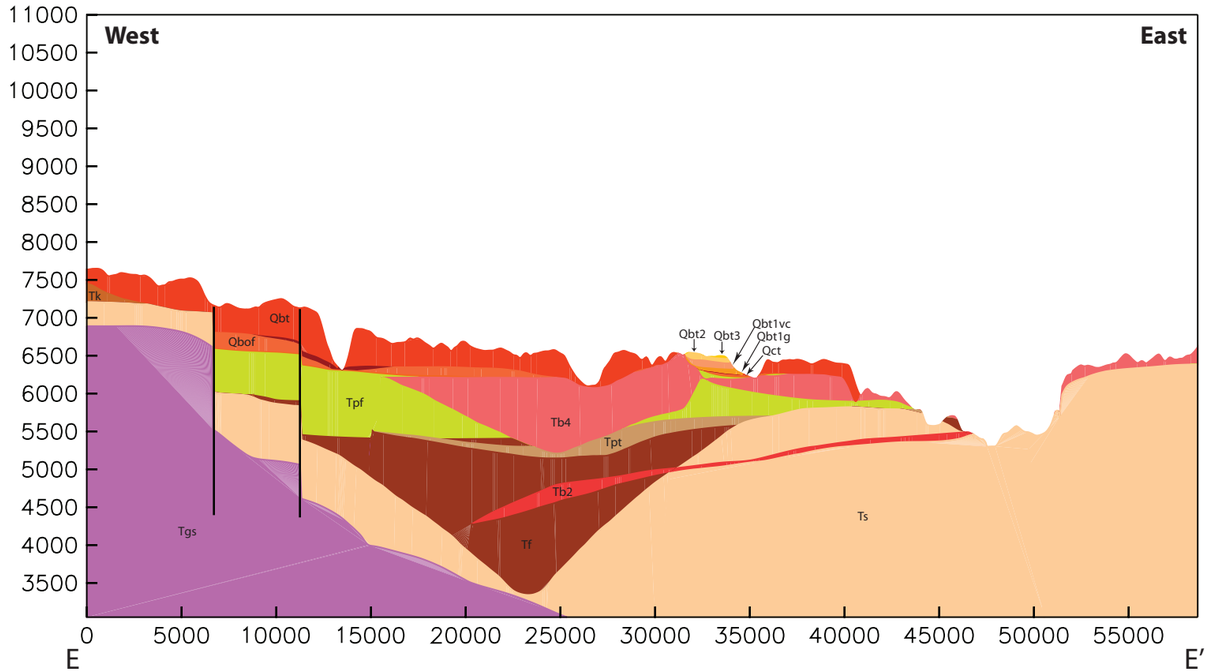
SCALE 1:80,000

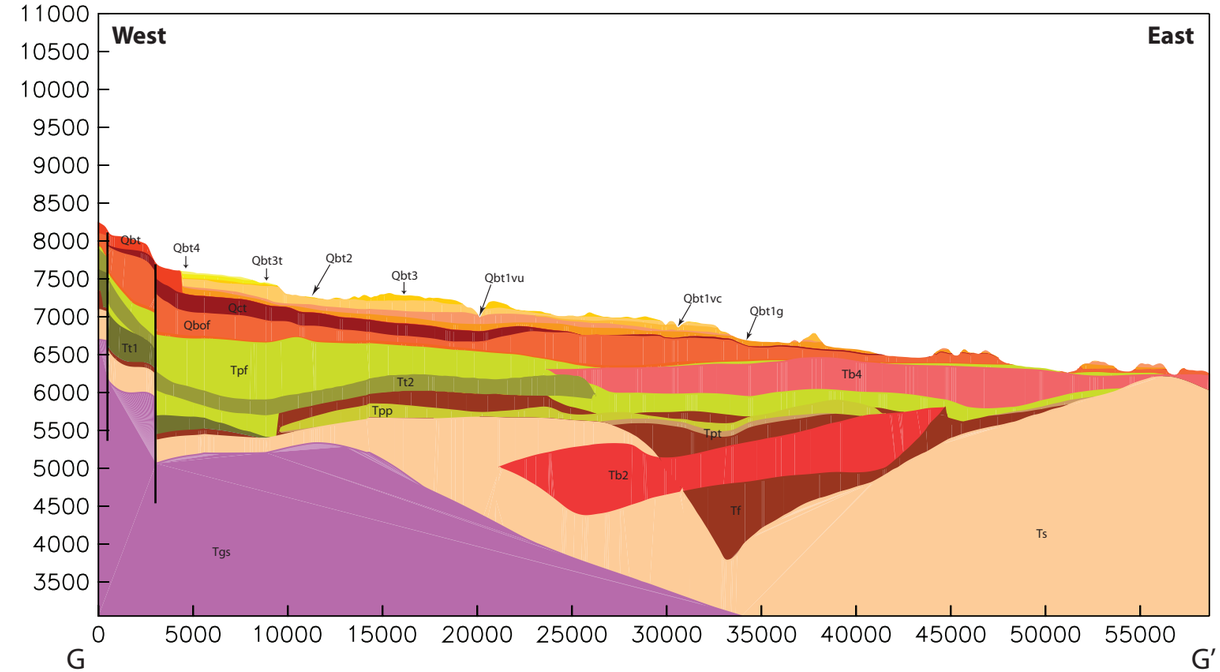
0 0.5 1 2 3 4 Miles

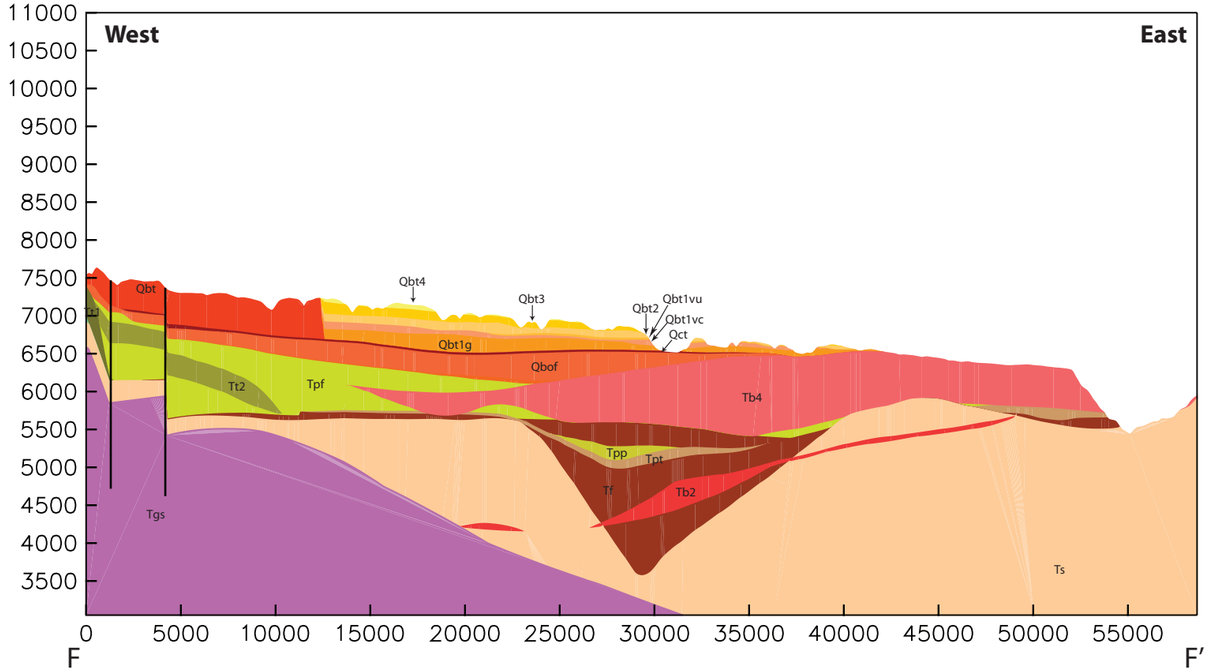
State Plane Coordinate System, New Mexico Central Zone
1983 North American Datum

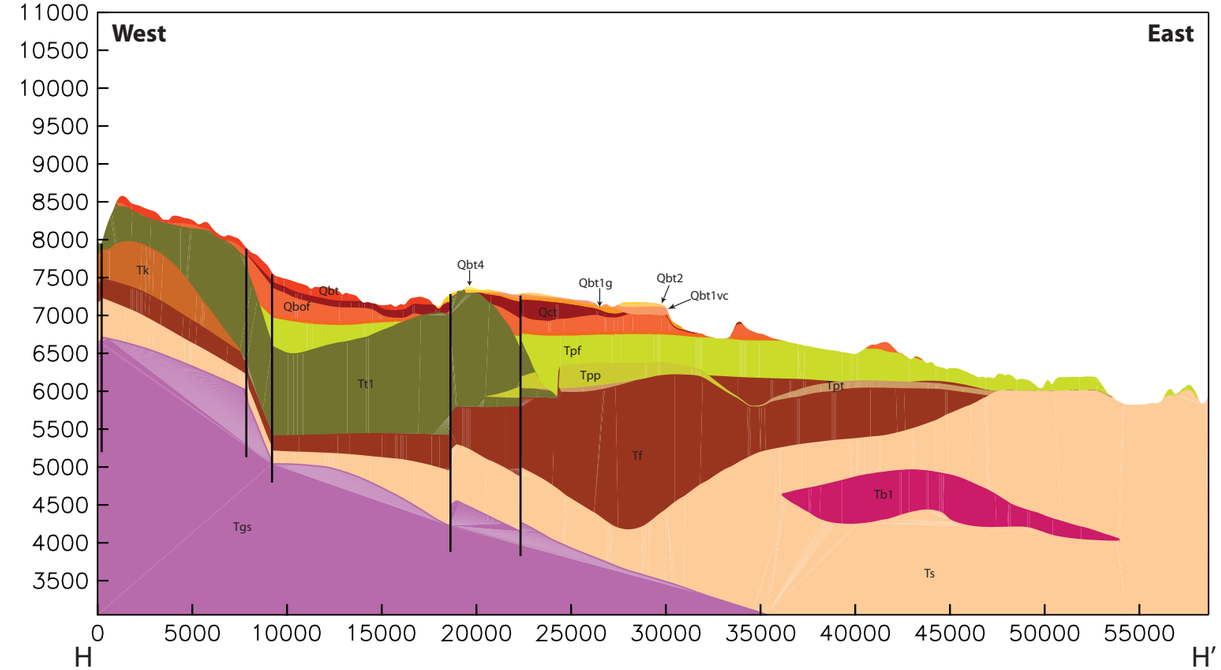
®

Plate 7-1. Locations of cross sections shown in Plates 7-2 and 7-3







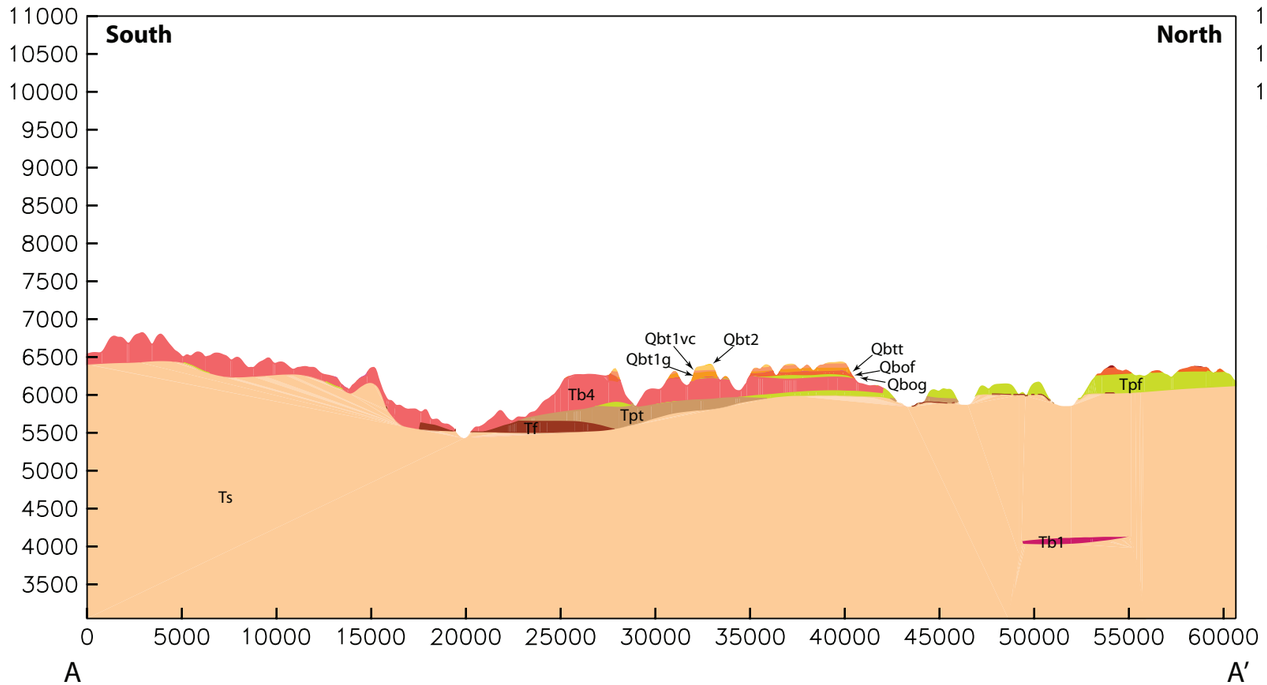


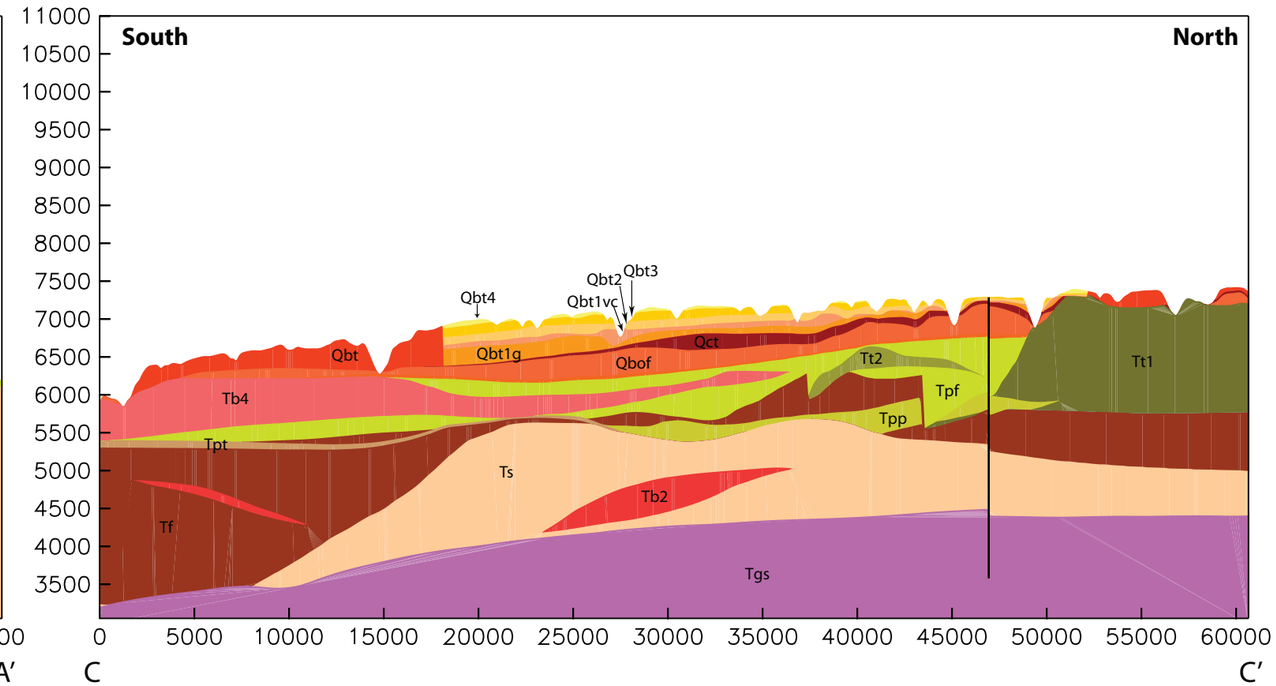
* Subunits of Qbt are only defined where well control exists.

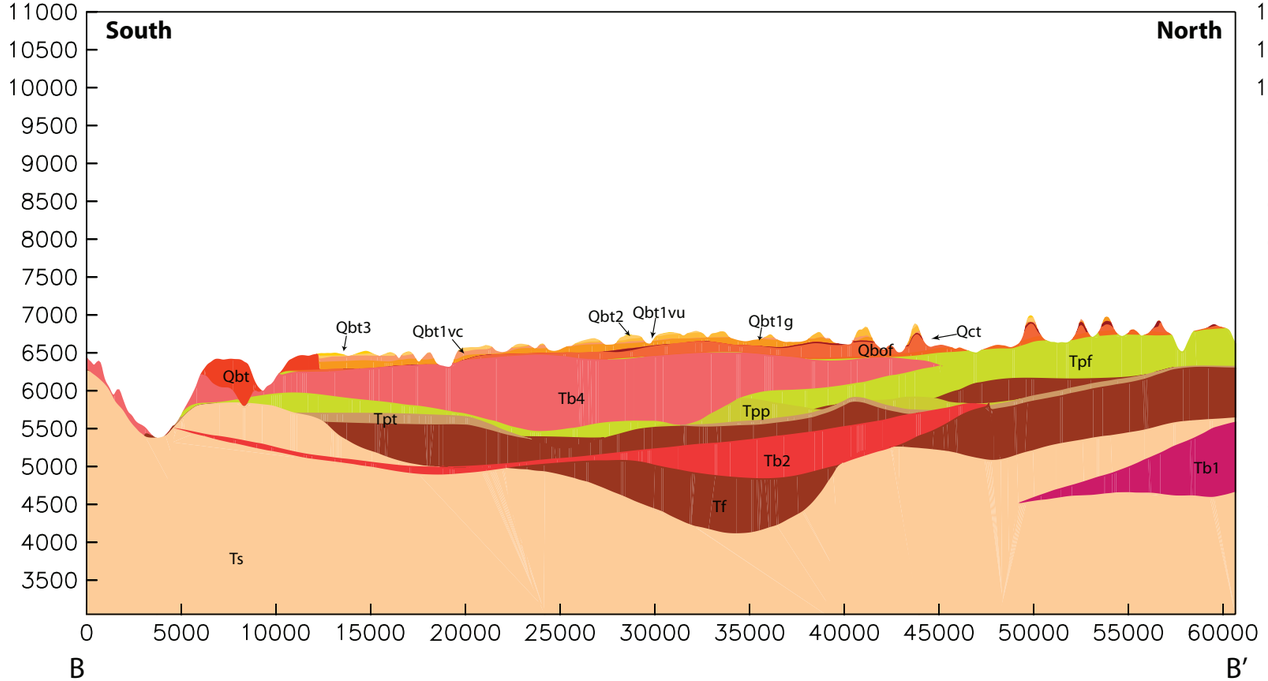
* Abrupt steps in units where faults are not present are an artifact of the modeling process which will be addressed in the future.

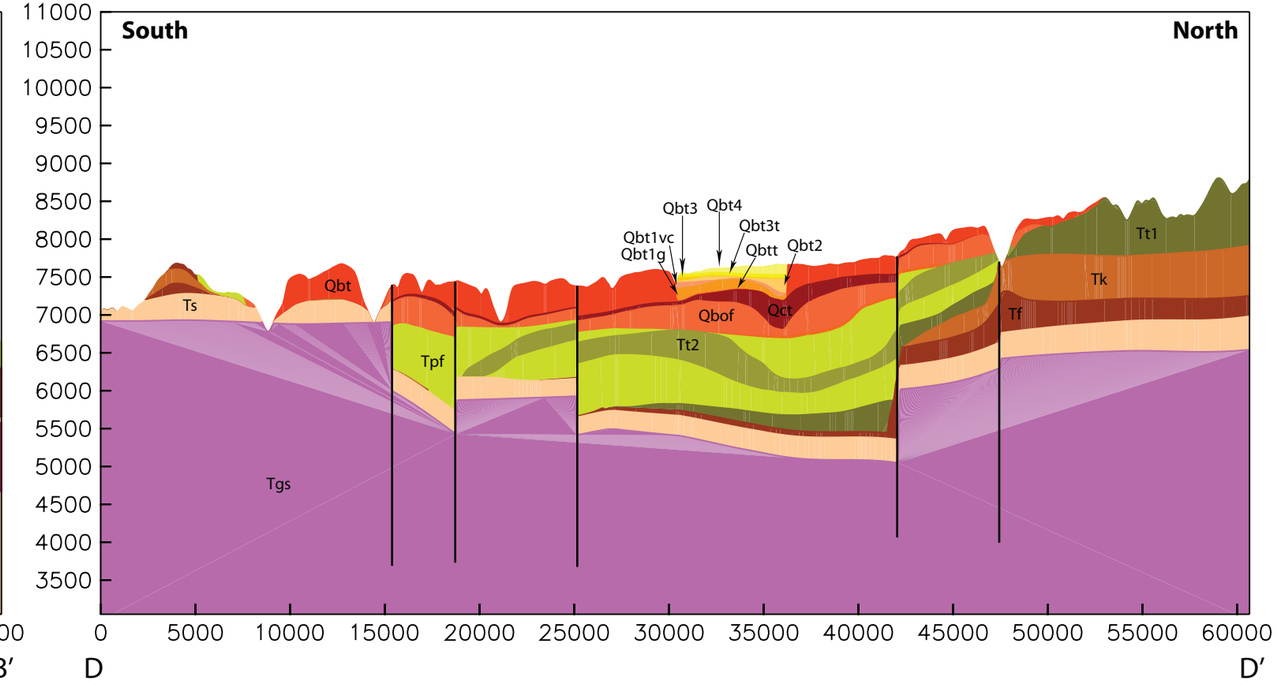
Horizontal scale: 1:120,000 Vertical scale: 1:48,000 2.5x vertical exaggeration

Plate 7-2. East-west cross sections. Locations of cross sections are shown on Plate 7-1.









* Subunits of Qbt are only defined where well control exists.

* Abrupt steps in units where faults are not present are an artifact of the modeling process which will be addressed in the future.

Horizontal scale: 1:120,000 Vertical scale: 1:48,000 2.5x vertical exaggeration

Plate 7-3. North-south cross sections. Locations of cross sections are shown on Plate 7-1.

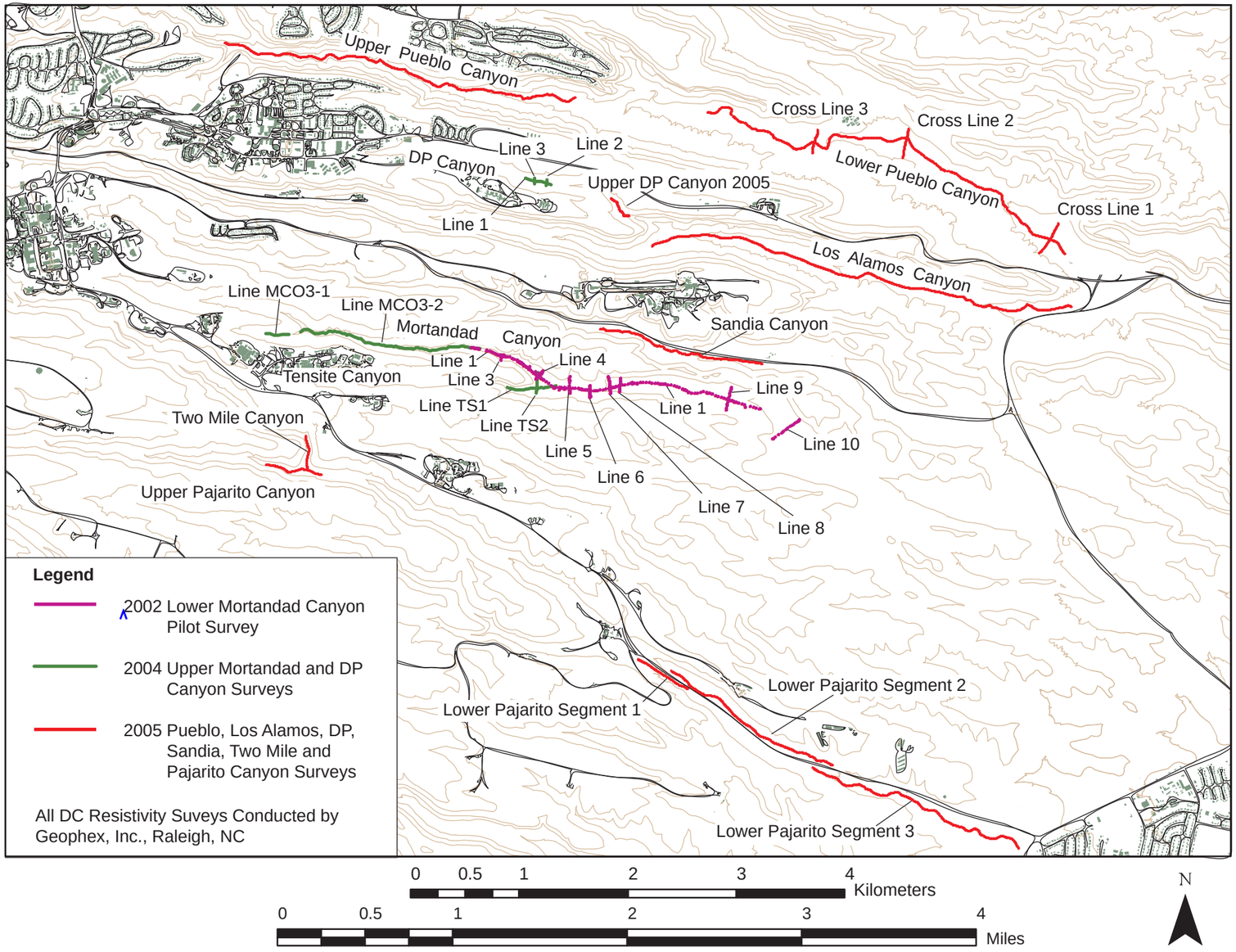


Plate 8-1. All DC resisitivity surveys conducted by Geophex, Inc.

PUEBLO CANYON

Includes the 2005 Pueblo Canyon Survey (Red)

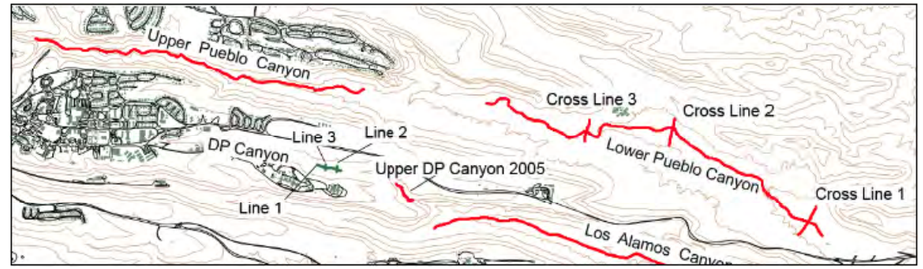
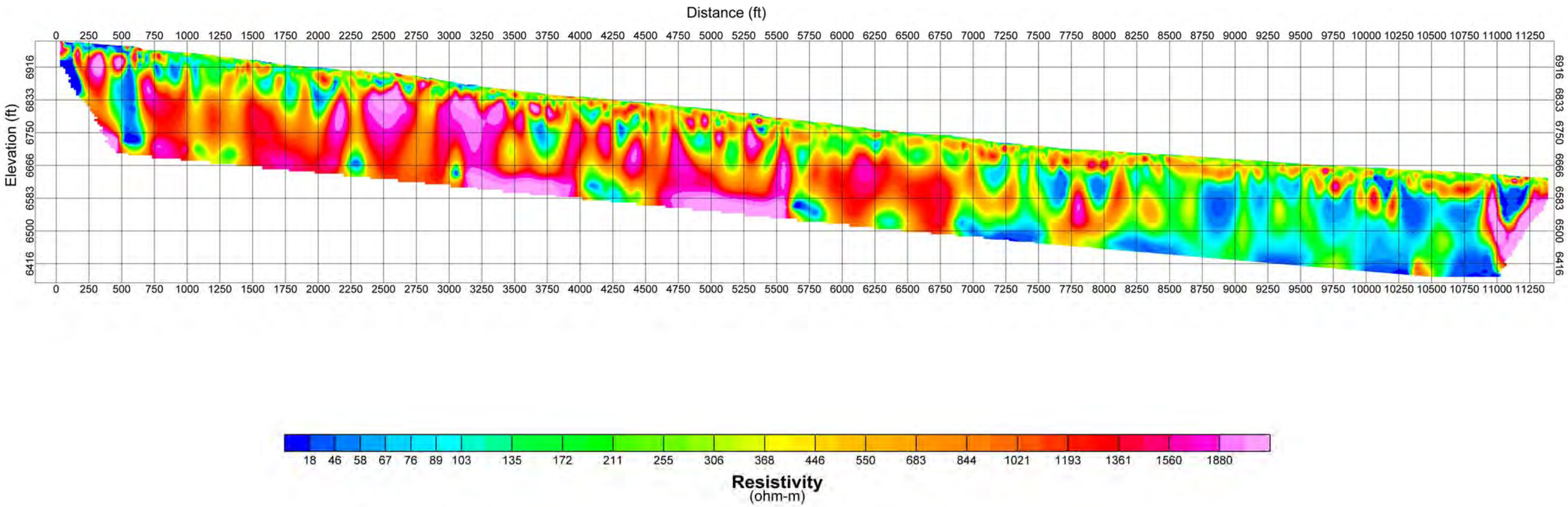


Plate 8-2. Pueblo Canyon surveys



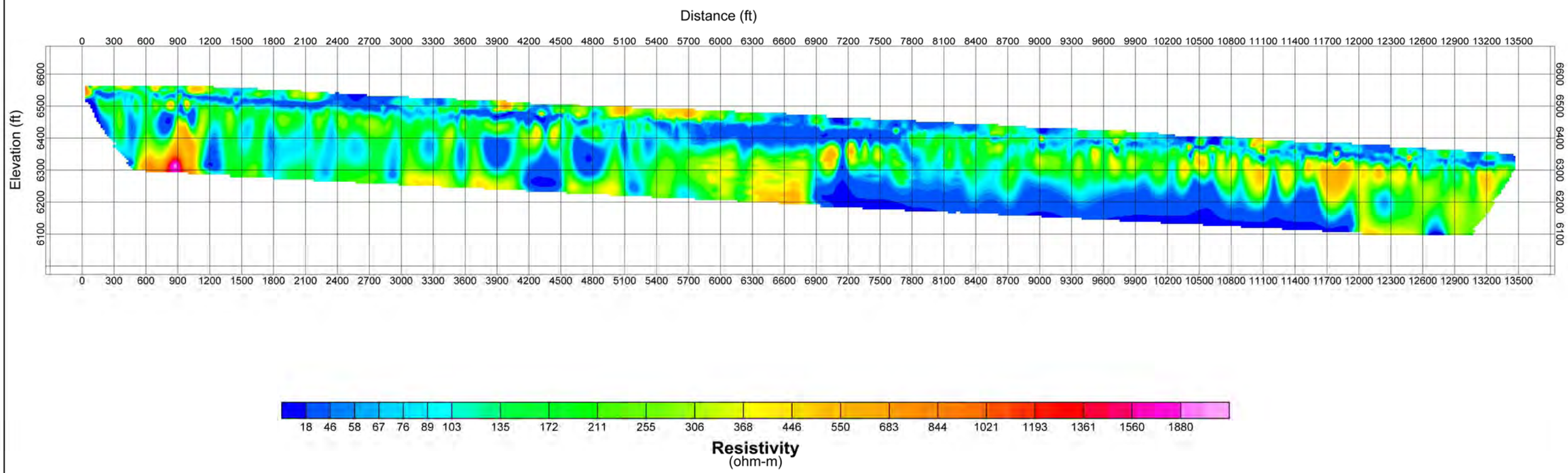
Preliminary Resistivity Data Profile from Upper Pueblo Canyon -- Nov. 2005
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 19.6 ft electrode spacing

500 0 500 1000
feet

First electrode is located at 0.0ft (N-1778982.5ft, E-1624255.6ft)
Last electrode is located at 11,414ft (N-1777332.6ft, E-1634844.1ft)
2-D Least-Squares Inversion--RMS error = 12.1
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)
Vertical Exaggeration 3:1

Geophex
-terrum et mare exploramus-

Plate 8-3. Upper Pueblo Canyon resistivity data profile



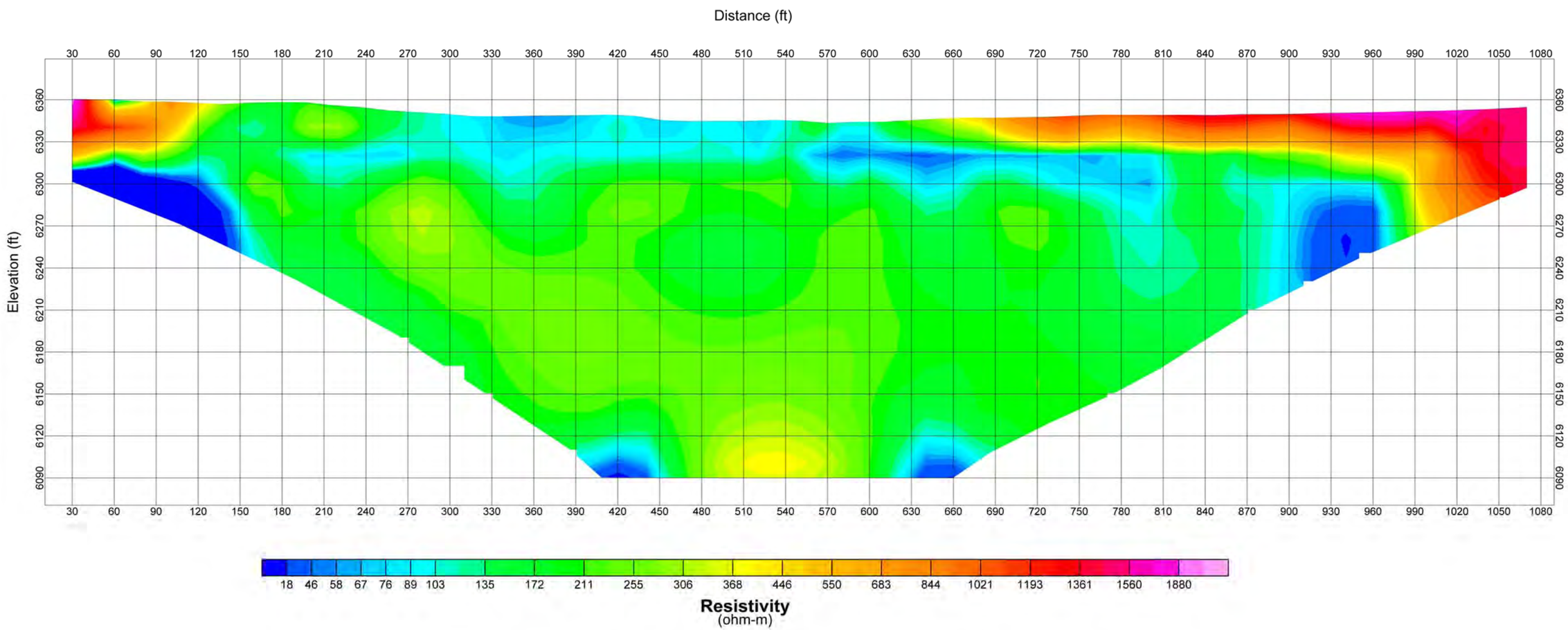
Preliminary Resistivity Data Profile from Lower Pueblo Canyon -- Dec. 2005
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 19.6 ft electrode spacing

500 0 500 1000
feet

First electrode is located at 0.0ft (N-1776875.7ft, E-1638847.0ft)
Last electrode is located at 13,480.8ft (N-1772590.1ft, E-1649666.1ft)
2-D Least-Squares Inversion--RMS error = 7.9
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)
Vertical Exaggeration 3:1

Geophex
-terrum et mare exploramus-

Plate 8-4. Lower Pueblo Canyon resistivity data profile



Preliminary Resistivity Data Profile from Lower Pueblo Canyon Cross Line 1 (APCO Area) -- Dec. 2005

Los Alamos National Laboratory

Los Alamos County, New Mexico

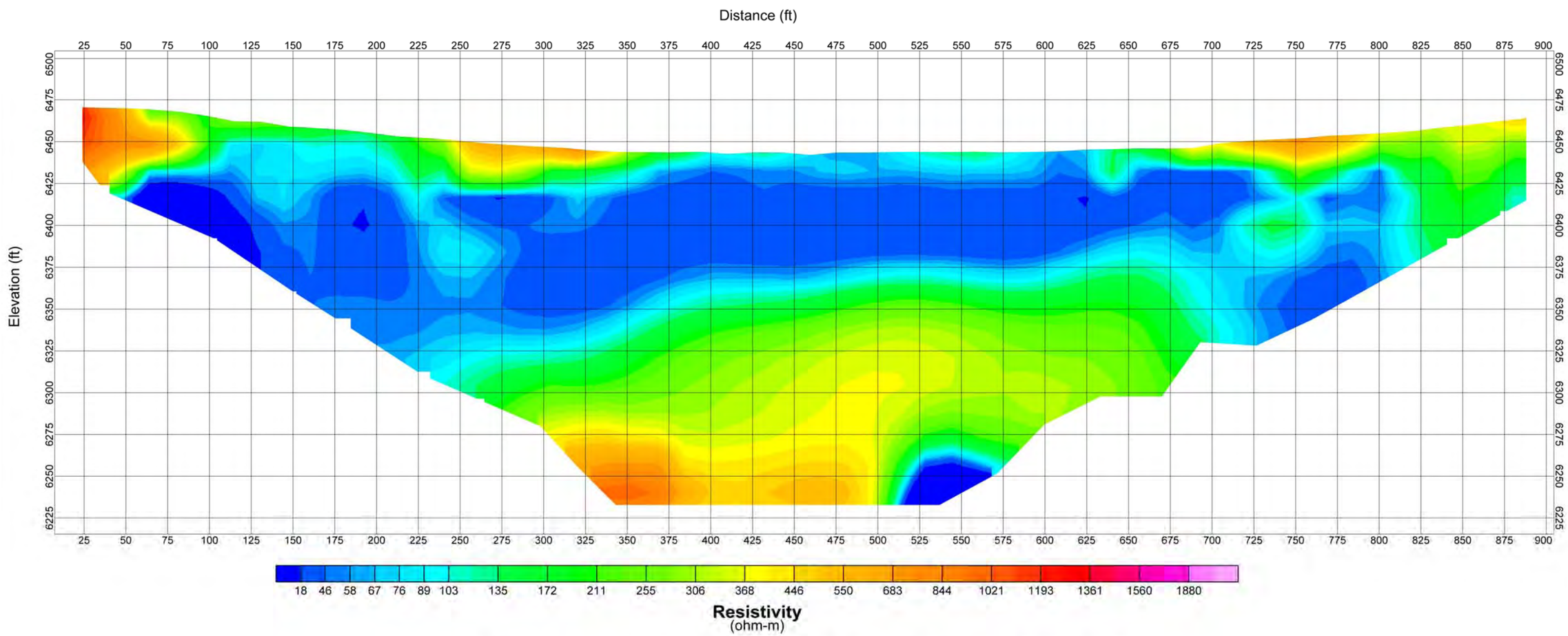
19.6 ft electrode spacing

50 0 50
feet

First electrode is located at 0.0ft (N-1772625.2ft, E-1648876.8ft)
Last electrode is located at 1082.4ft (N-1773515.9ft, E-1649465.0ft)
2-D Least-Squares Inversion--RMS error = 6.3
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terram et mare explorantus-

Plate 8-5. Lower Pueblo Canyon cross line 1



Preliminary Resistivity Data Profile from Lower Pueblo Canyon Cross Line 2 -- Dec. 2005

Los Alamos National Laboratory

Los Alamos County, New Mexico

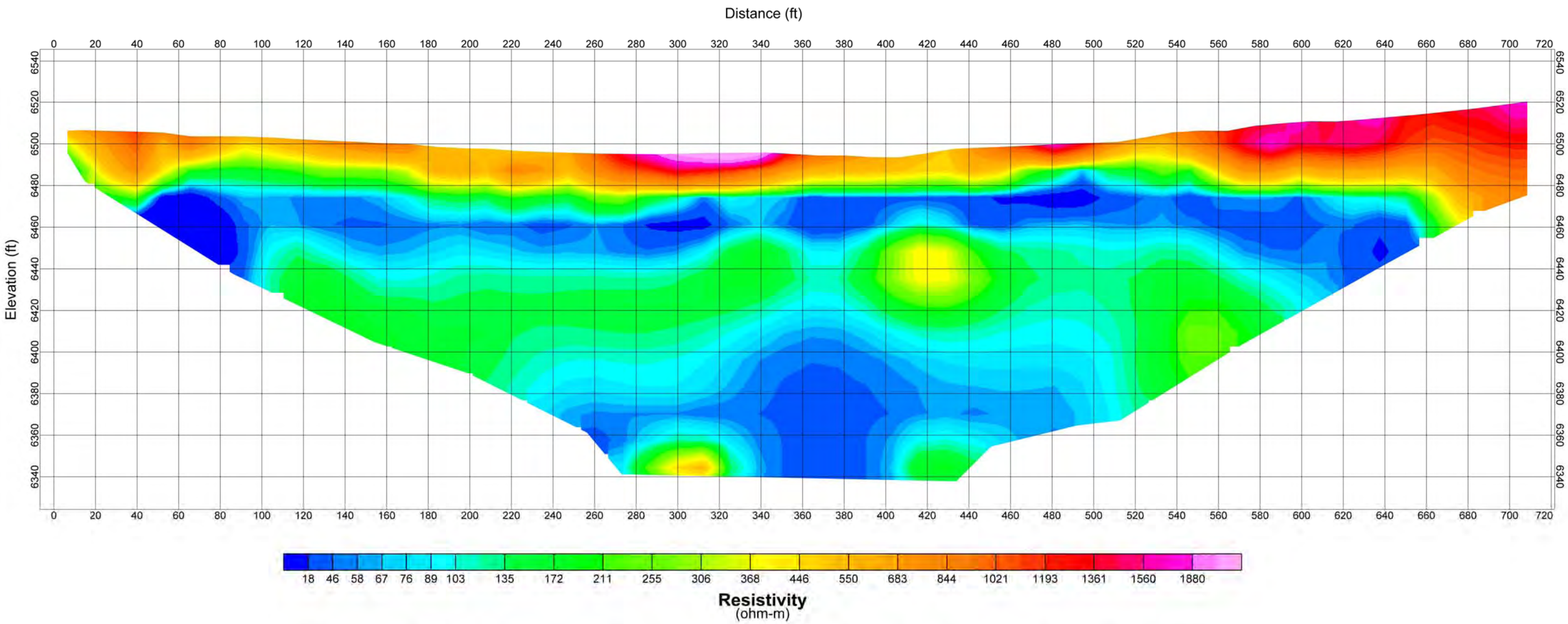
16.4 ft electrode spacing

25 0 25 50 75
feet

First electrode is located at 0.0ft (N-1775501.9ft, E-1644756.0ft)
Last electrode is located at 902.0ft (N-1776384.2ft, E-1644923.2ft)
2-D Least-Squares Inversion--RMS error = 6.8
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terrum et mare exploramus-

Plate 8-6. Lower Pueblo Canyon cross line 2



Preliminary Resistivity Data Profile from Lower Pueblo Canyon Cross Line 3 (Hamilton Bend)-- Dec. 2005

Los Alamos National Laboratory

Los Alamos County, New Mexico

13.1 ft electrode spacing

25 0 25 50
feet

First electrode is located at 0.0ft (N-1775644.9ft, E-1642020.1ft)
Last electrode is located at 721.6ft (N-1776342.1ft, E-1642183.9ft)
2-D Least-Squares Inversion--RMS error = 5.6
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terrum et mare exploramus-

Plate 8-7. Lower Pueblo Canyon cross line 3

LOS ALAMOS AND DP CANYONS

Includes the 2004 DP Canyon Survey (Green) and the 2005 Los Alamos and DP Canyons Survey (Red)

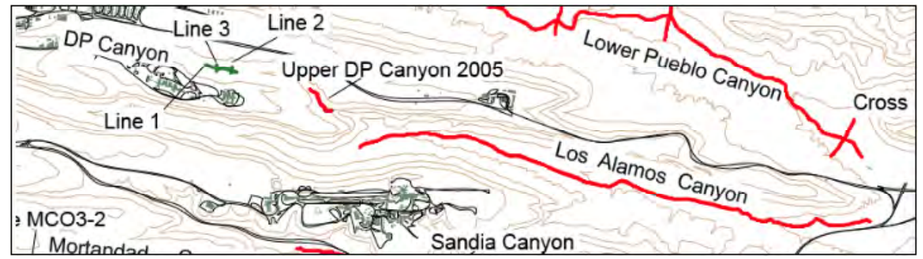
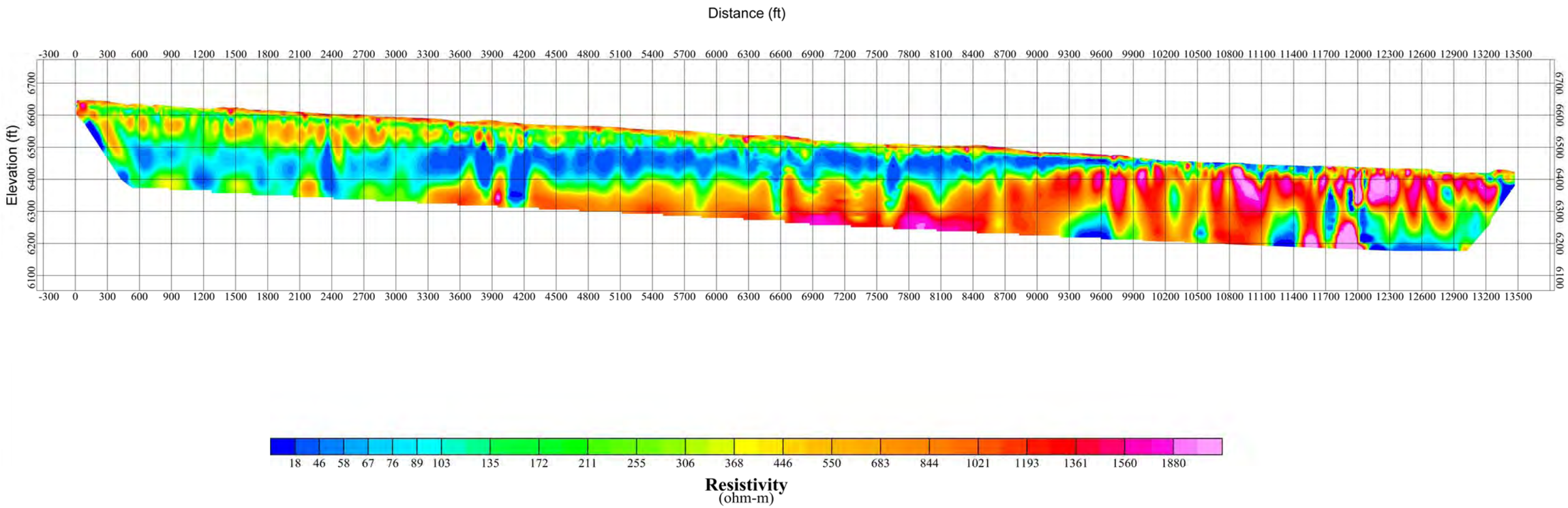


Plate 8-8. Los Alamos Canyon and DP Canyon resistivity surveys



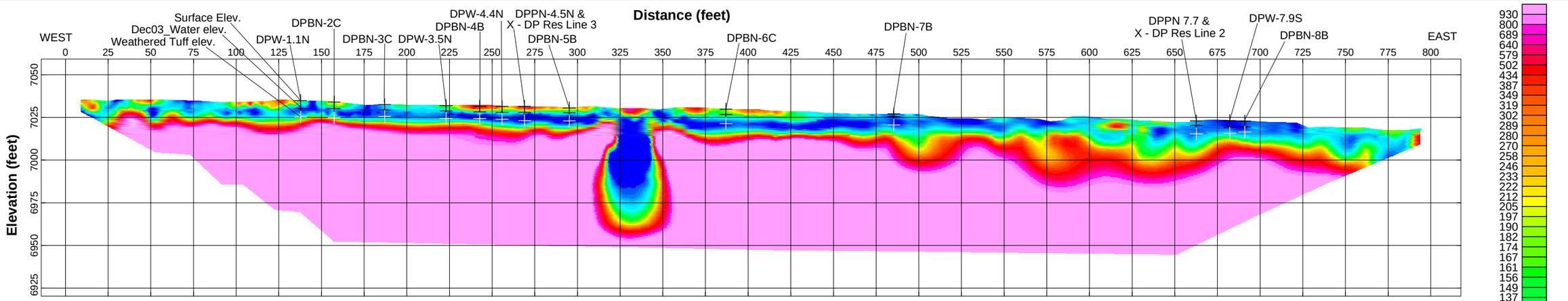
Preliminary Resistivity Data Profile from Los Alamos Canyon-- Dec. 2005
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 19.6 ft electrode spacing

500 0 500 1000
feet

First electrode is located at 0.0ft (N-1772839.1ft, E-1637166.2ft)
Last electrode is located at 13480.8ft (N-1770995.4ft, E-1649854.5ft)
2-D Least-Squares Inversion--RMS error = 8.5
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)
Vertical Exaggeration 3:1

Geophex
-terram et mare exploramus-

Plate 8-9. Los Alamos Canyon resistivity data profile



Resistivity Data from DP Canyon -- Dec. 2003
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 6.6 ft electrode spacing

25 0 25 50 75
feet

Geophex, Ltd

First electrode is located at 0.0ft (N-1774870.0ft, E-1633335.2ft)
Last electrode is located at 806.9ft (N-1774689.1ft, E-1634108.8ft)
2-D Least-Squares Inversion--RMS error = 11.1
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)
Vertical Exaggeration 1:1

Plate 8-10. Resistivity data from DP Canyon

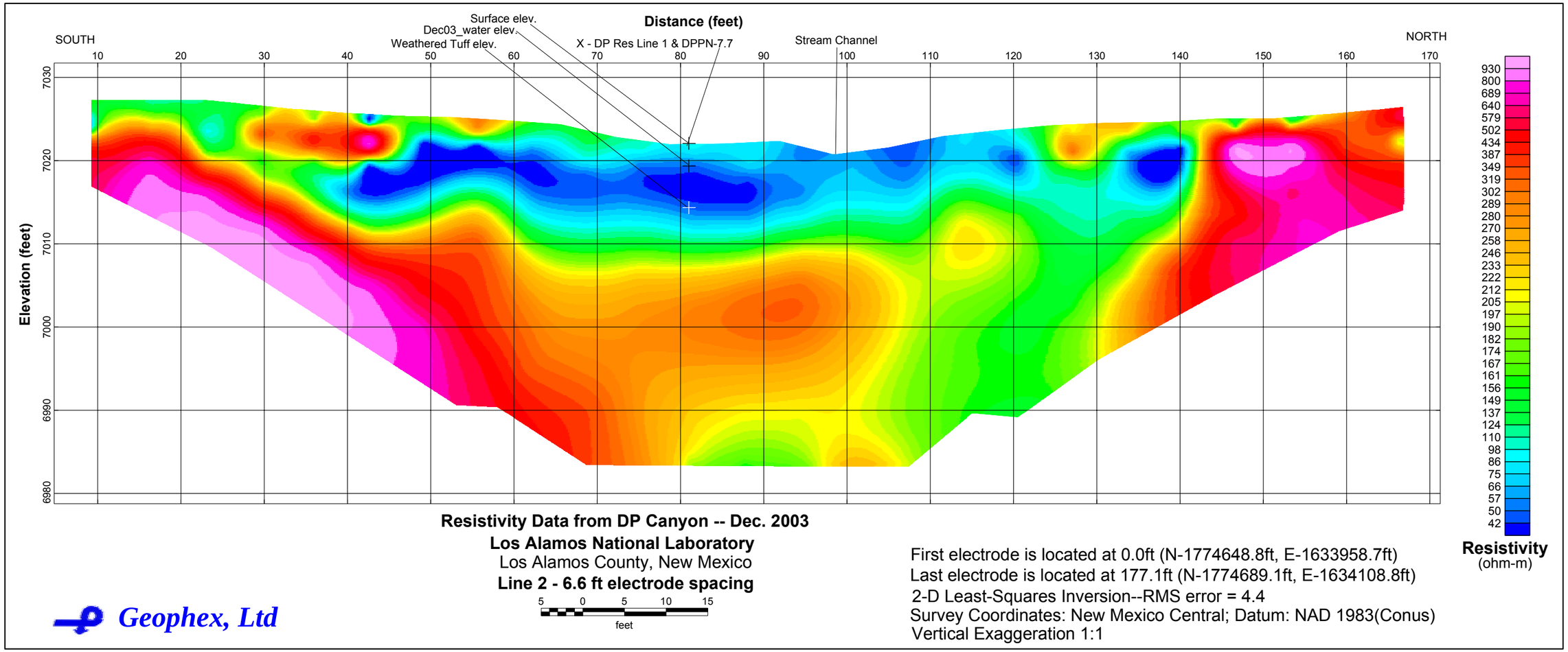


Plate 8-11. Resistivity data from DP Canyon

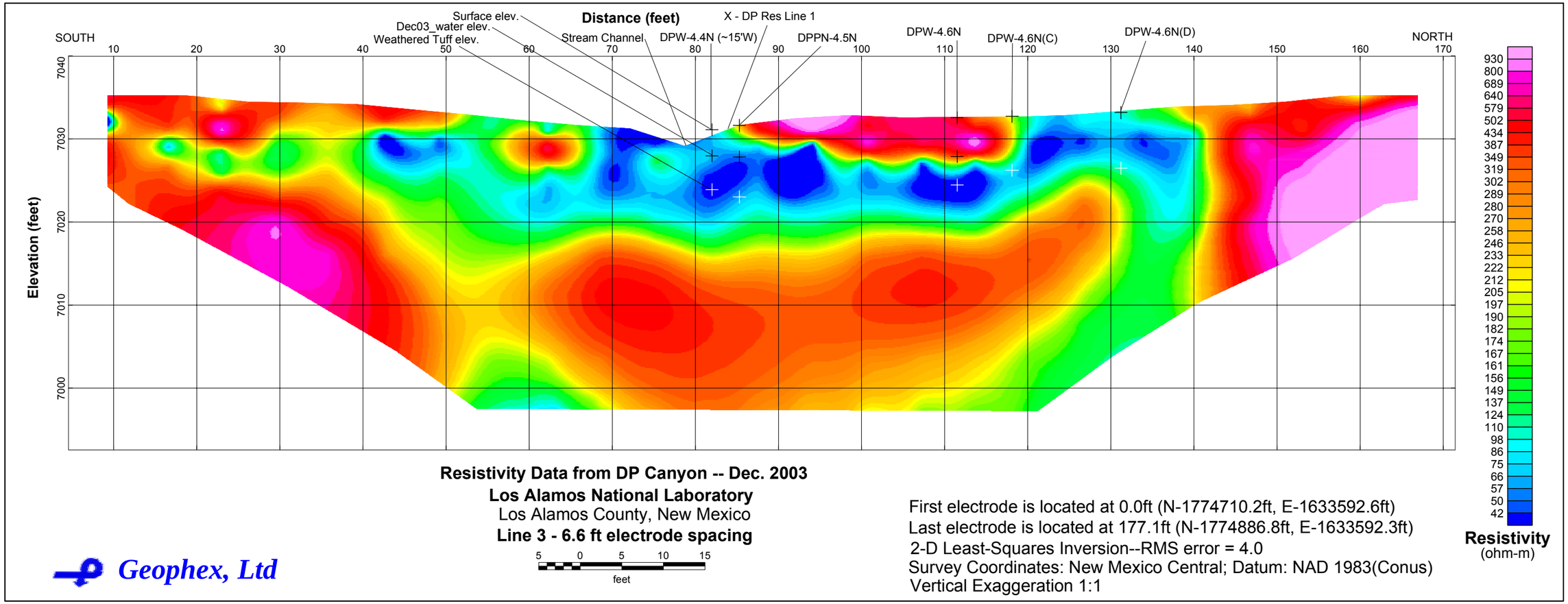
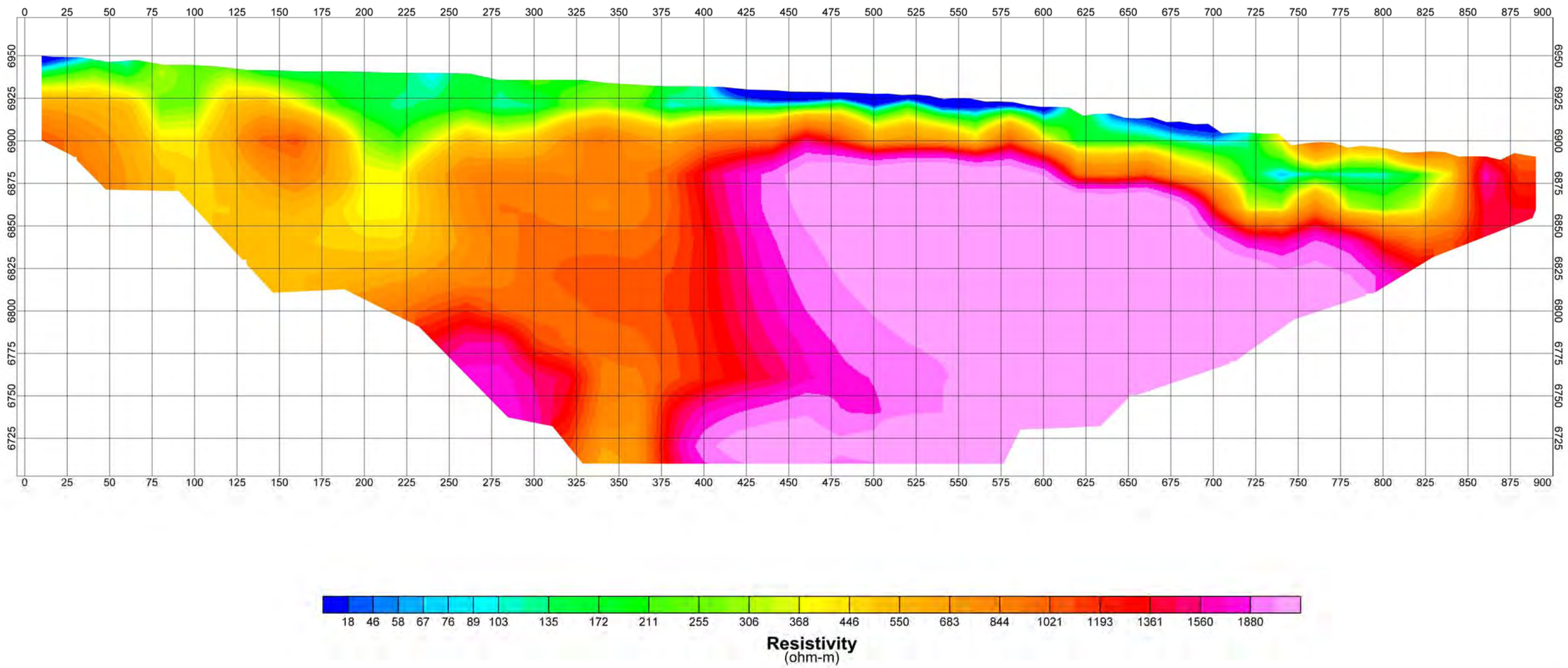


Plate 8-12. Resistivity data from DP Canyon



Preliminary Resistivity Data Profile from Upper DP Canyon -- Nov. 2005
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 16.4 ft electrode spacing

25 0 25 50 75
feet

First electrode is located at 0.0ft (N-ft, E-ft)
Last electrode is located at ft (N-ft, E-ft)
2-D Least-Squares Inversion--RMS error =
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)
Vertical Exaggeration 1:1

Geophex
-terram et mare exploramus-

Plate 8-13. Upper DP Canyon resistivity data profile

SANDIA CANYON

Includes the 2005 Sandia Canyon Survey (Red)

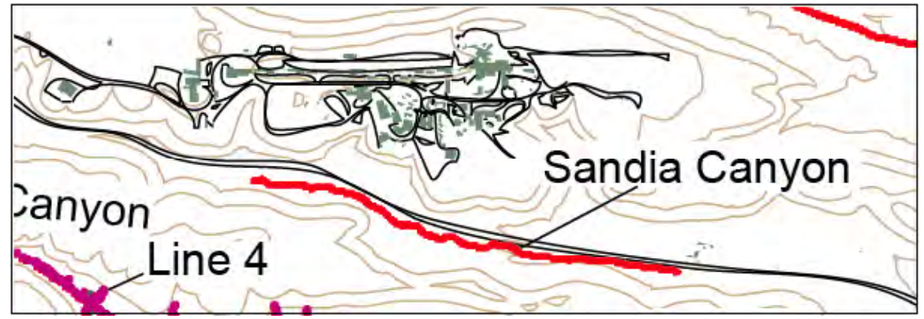
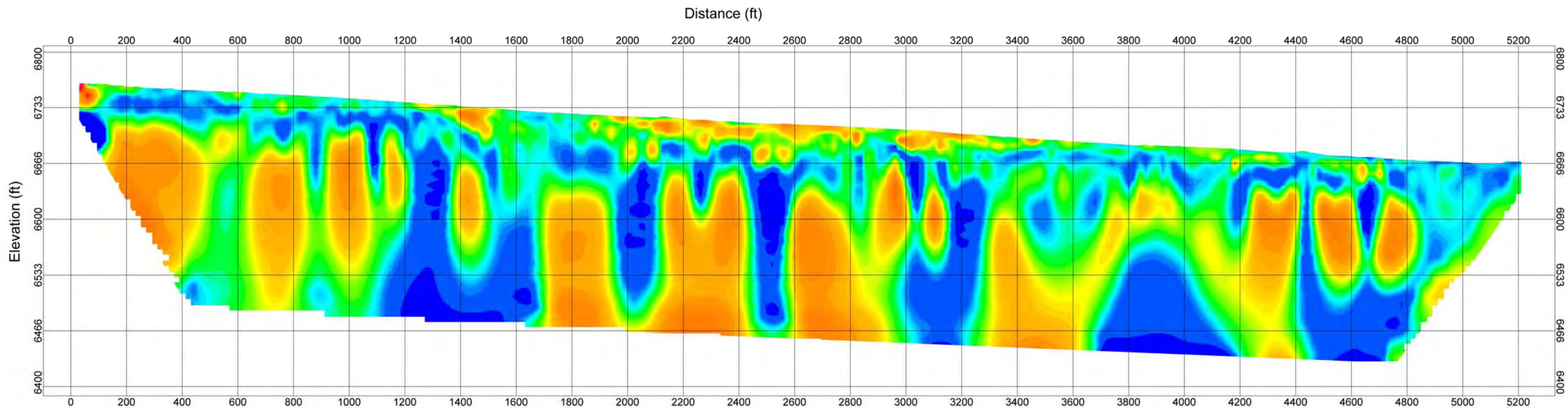
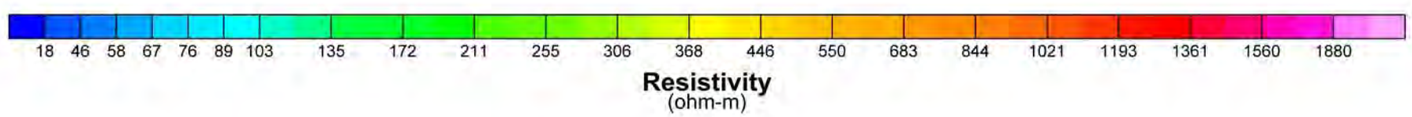


Plate 8-14. Sandia Canyon surveys





Preliminary Resistivity Data Profile from Sandia Canyon -- Nov. 2005
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 19.6 ft electrode spacing

250 0 250
feet

First electrode is located at 0.0ft (N-1770328.7ft, E-1635601.1ft)
Last electrode is located at 5215.2ft (N-1769277.2ft, E-1640505.4ft)
2-D Least-Squares Inversion--RMS error = 11.8
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)
Vertical Exaggeration 3:1

Geophex
-terrum et mare exploramus-

Plate 8-15. Sandia Canyon resistivity data profile

MORTANDAD CANYON

Includes the 2002 Lower Mortandad Canyon Pilot Survey (Purple) and the 2004 Upper Mortandad Canyon and Ten Site Canyon Survey (Green)

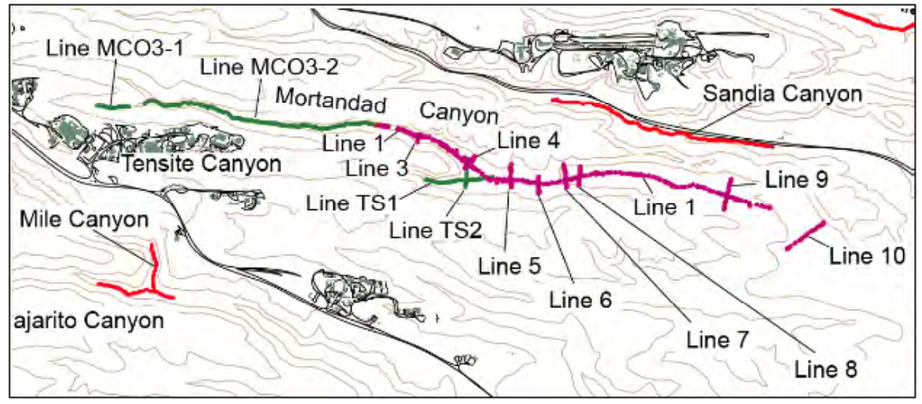


Plate 8-16. Mortandad Canyon surveys

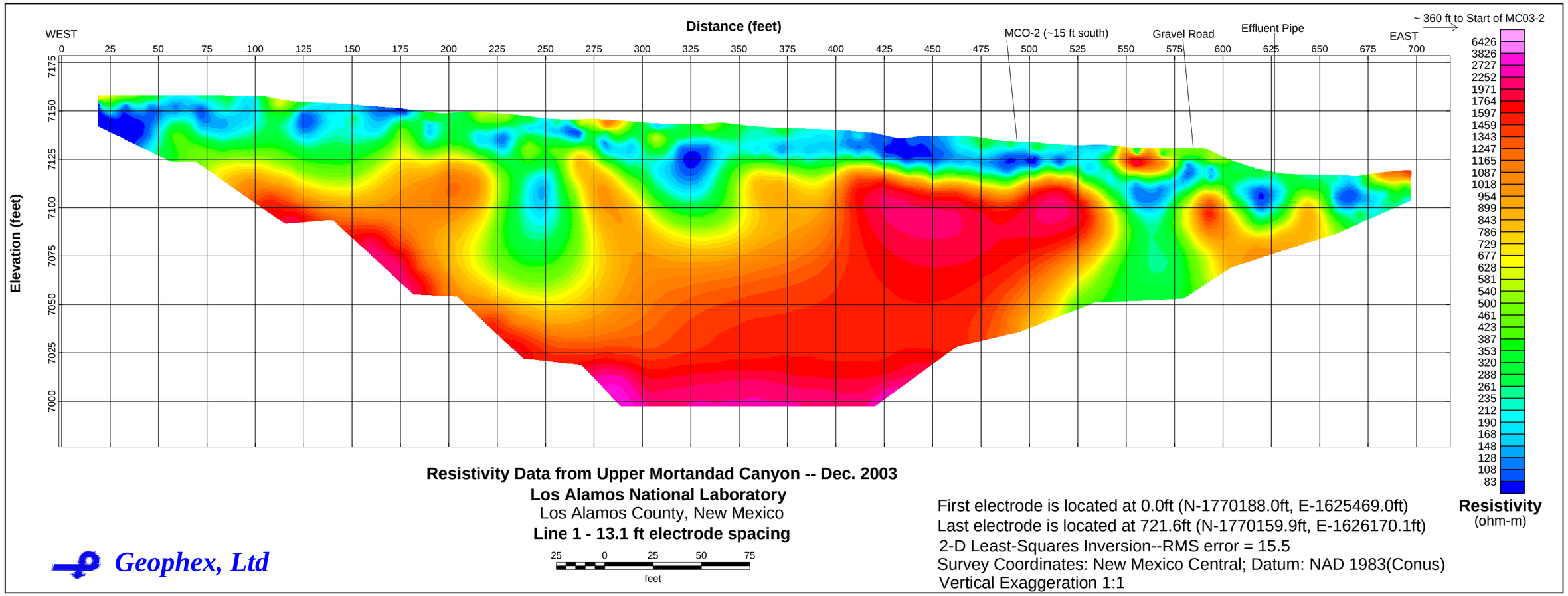
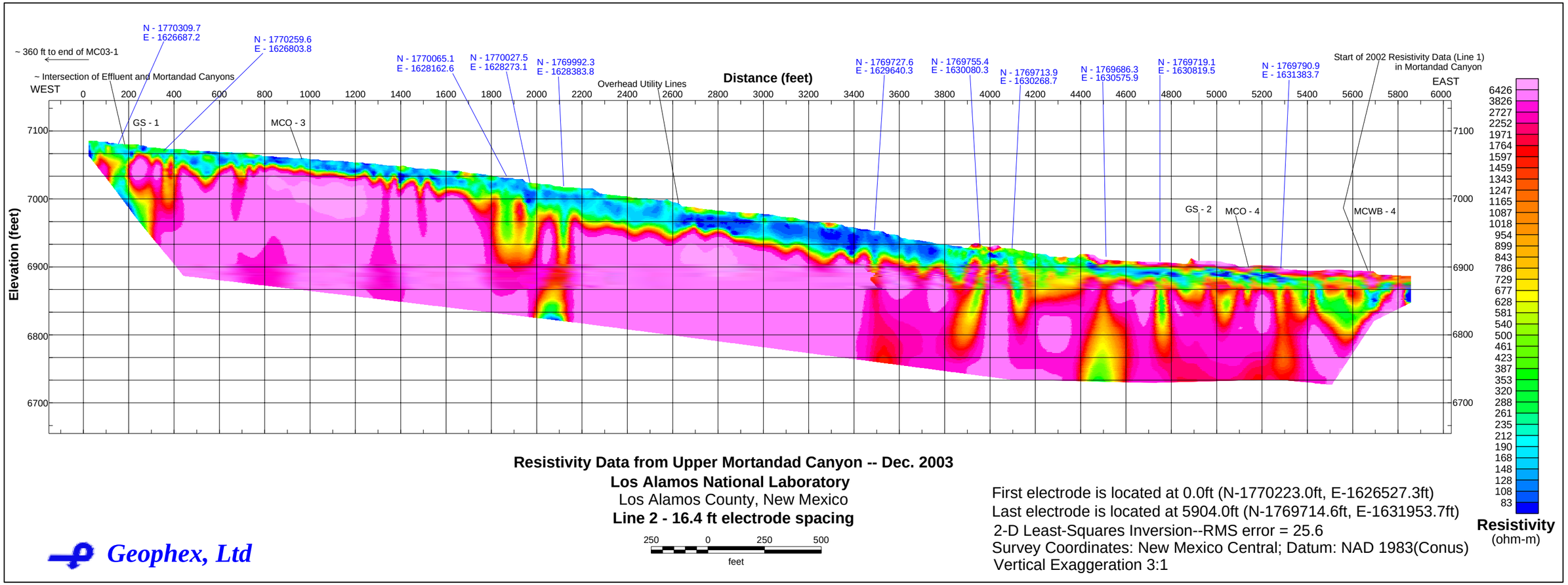


Plate 8-17. Resistivity data from upper Mortandad Canyon



Resistivity Data from Upper Mortandad Canyon -- Dec. 2003
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 2 - 16.4 ft electrode spacing

First electrode is located at 0.0ft (N-1770223.0ft, E-1626527.3ft)
Last electrode is located at 5904.0ft (N-1769714.6ft, E-1631953.7ft)
2-D Least-Squares Inversion--RMS error = 25.6
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)
Vertical Exaggeration 3:1

Geophex, Ltd

Plate 8-18 Resistivity Data from upper Mortandad Canyon

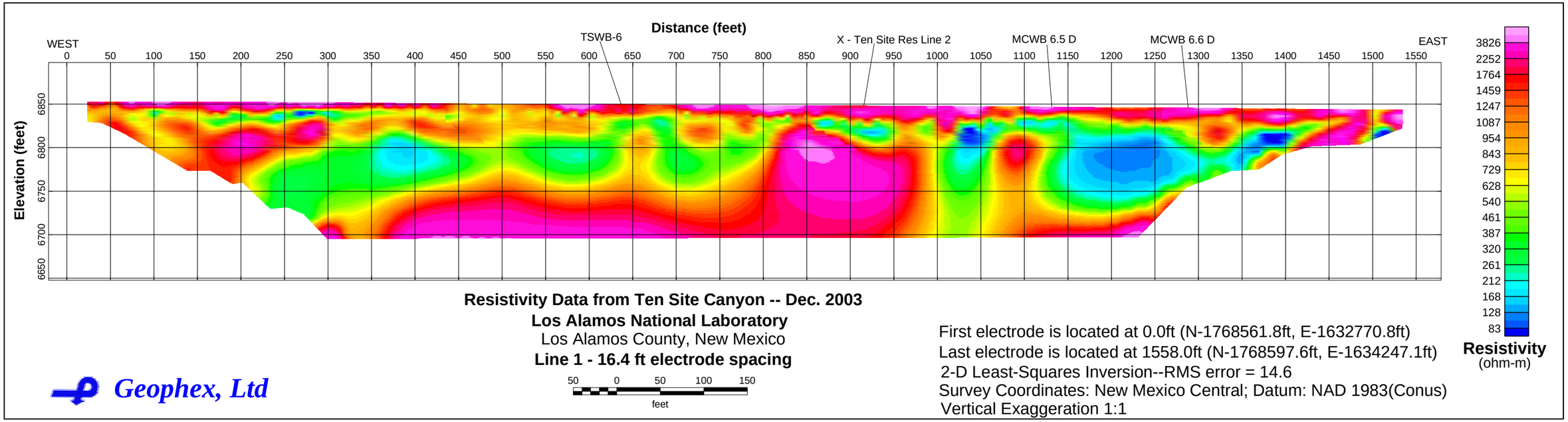


Plate 8-19. Resistivity data from Ten Site Canyon

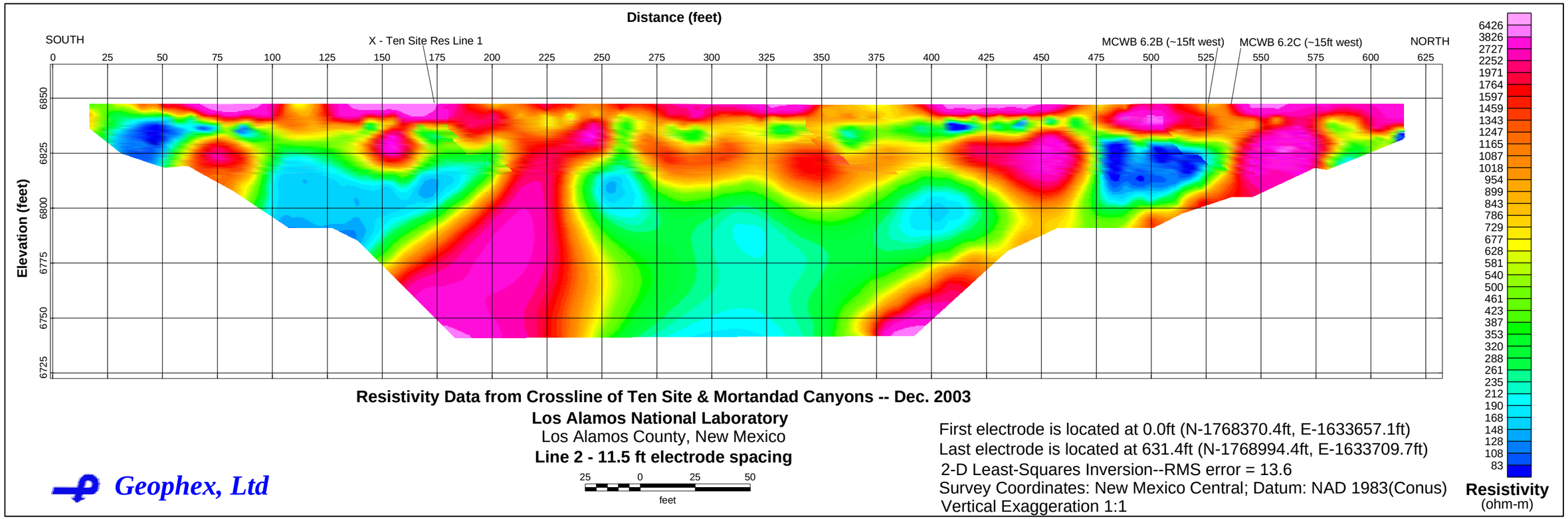


Plate 8-20. Resistivity data from cross line of Ten Site and Mortandad Canyons

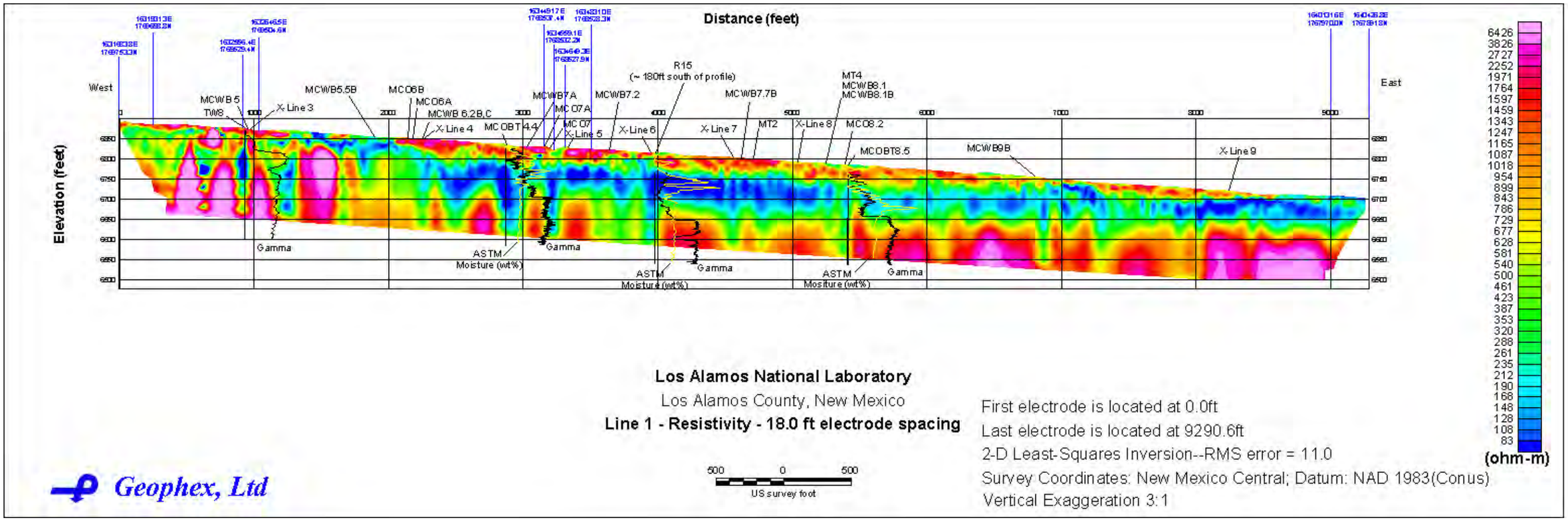


Plate 8-21. Mortandad Canyon Canyon line 1

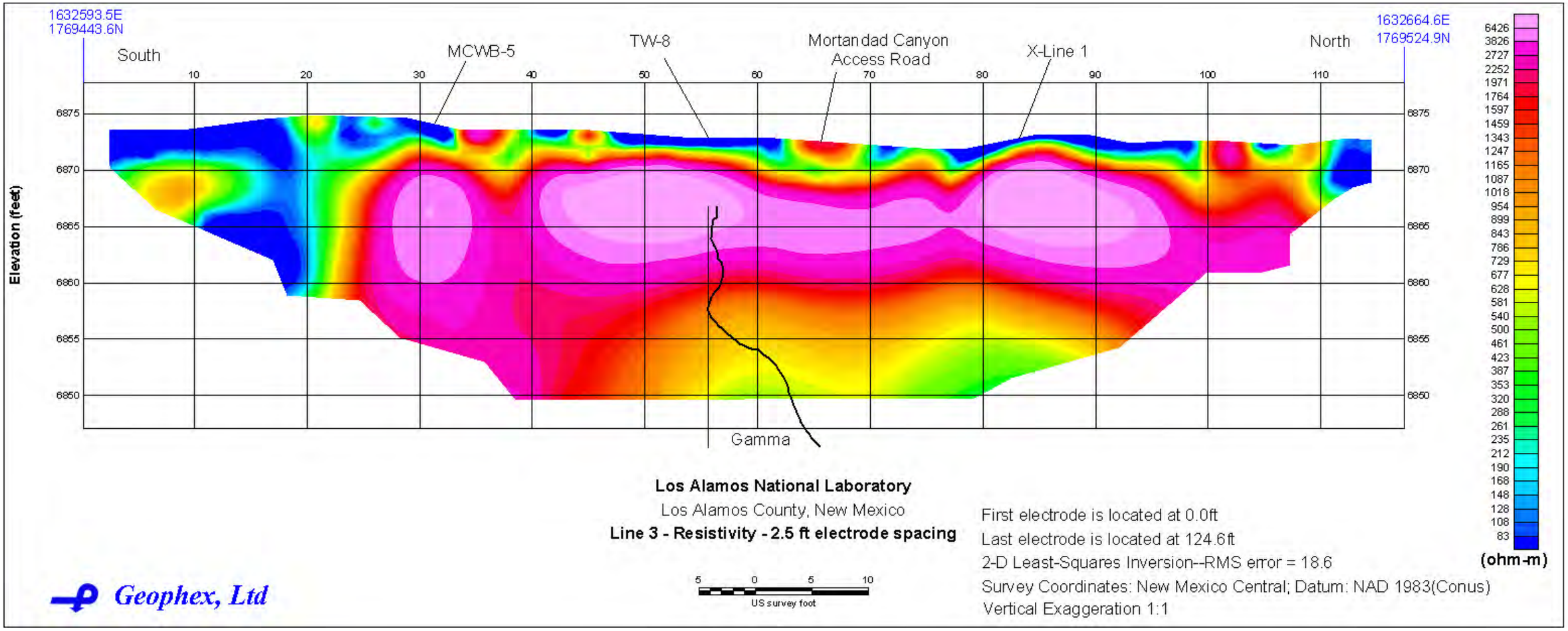


Plate 8-22. Mortandad Canyon line 3

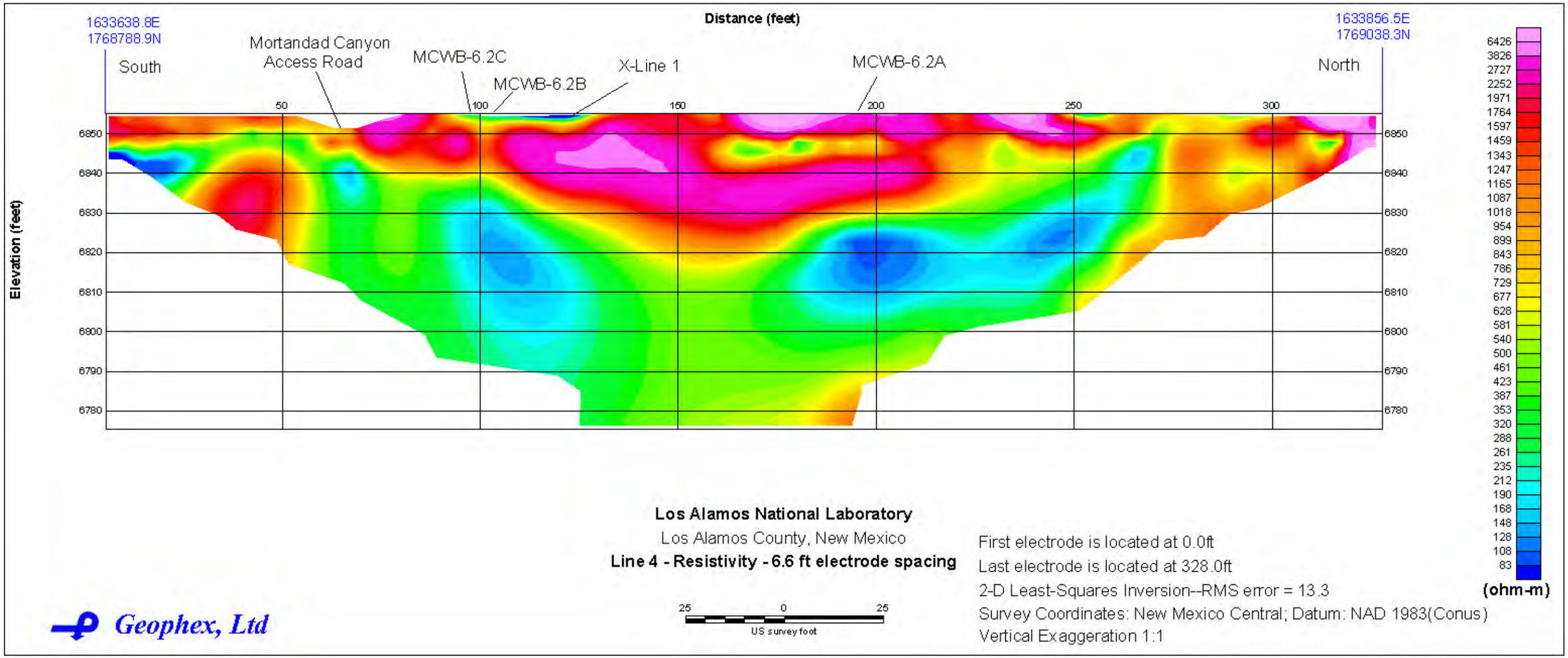


Plate 8-23. Mortandad Canyon line 4

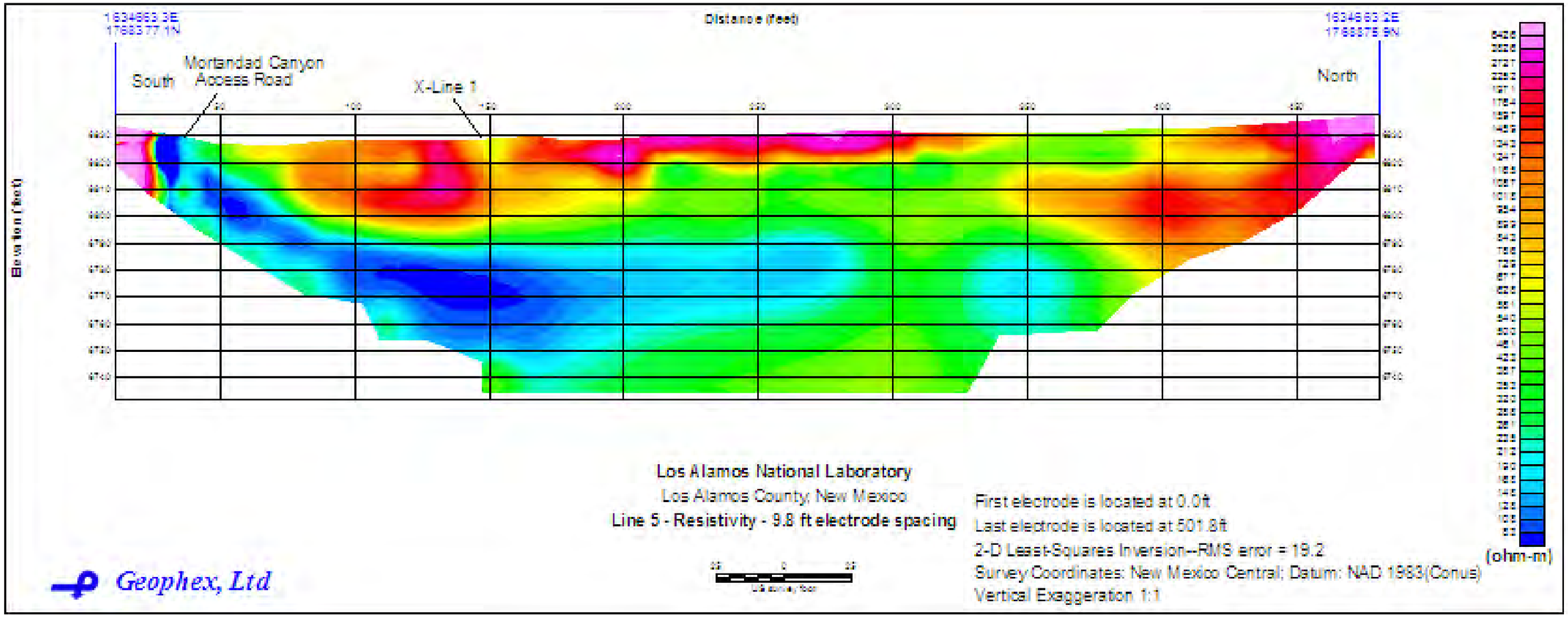


Plate 8-24. Mortandad Canyon line 5

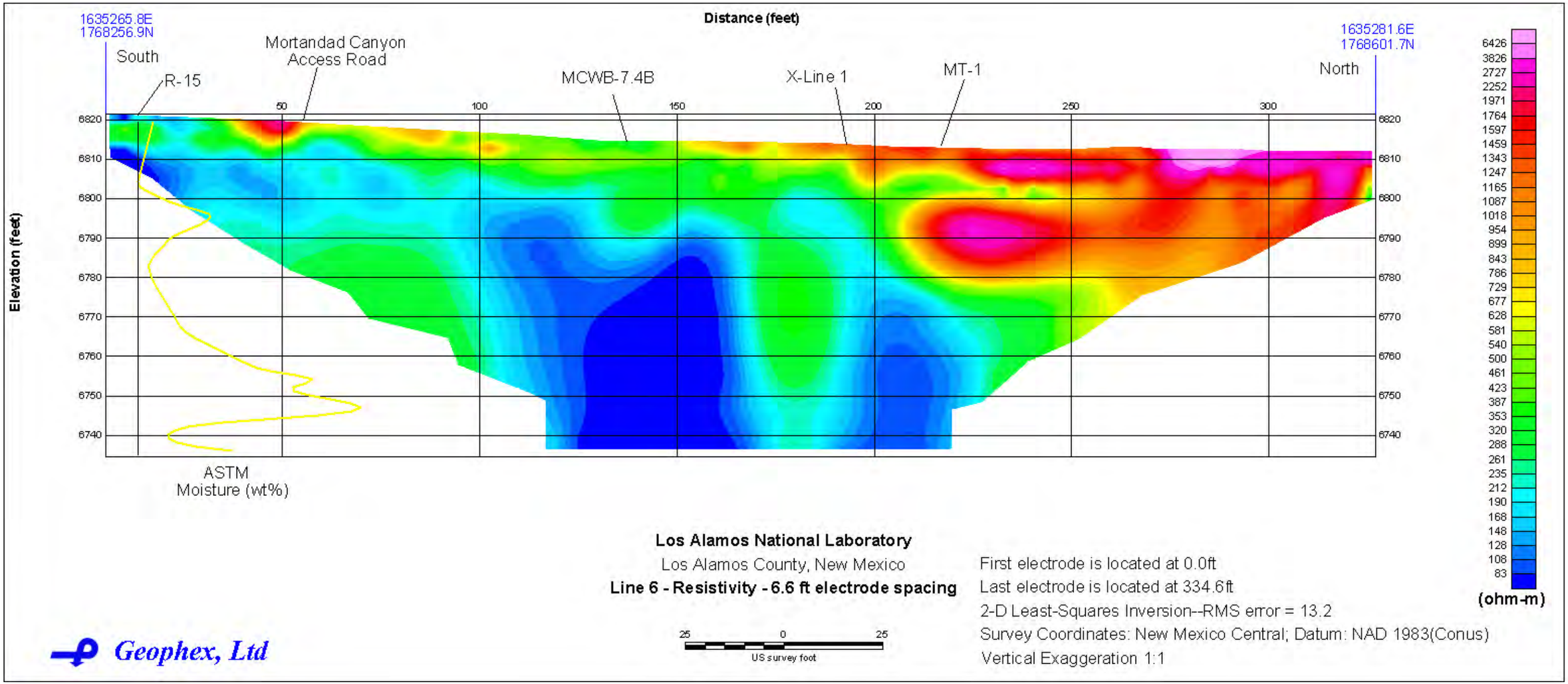


Plate 8-25. Mortandad Canyon line 6

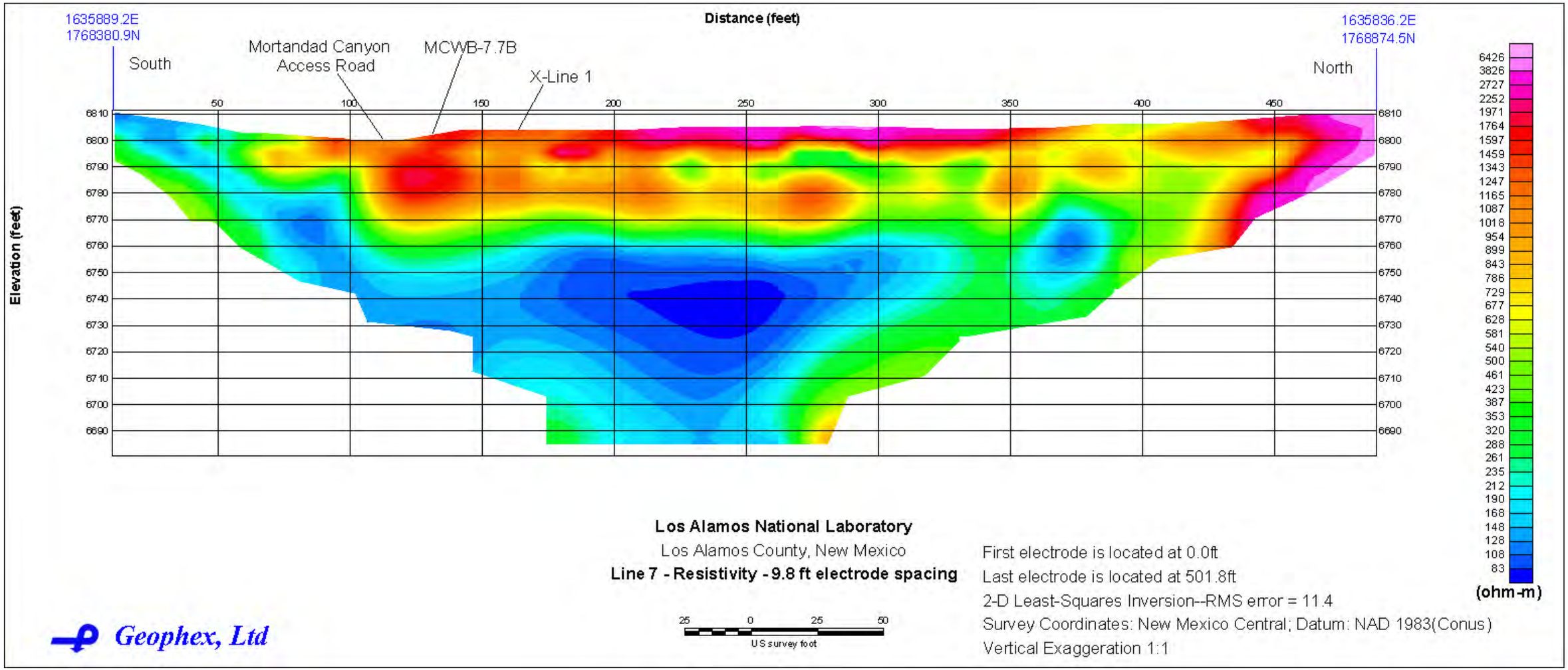


Plate 8-26. Mortandad Canyon line 7

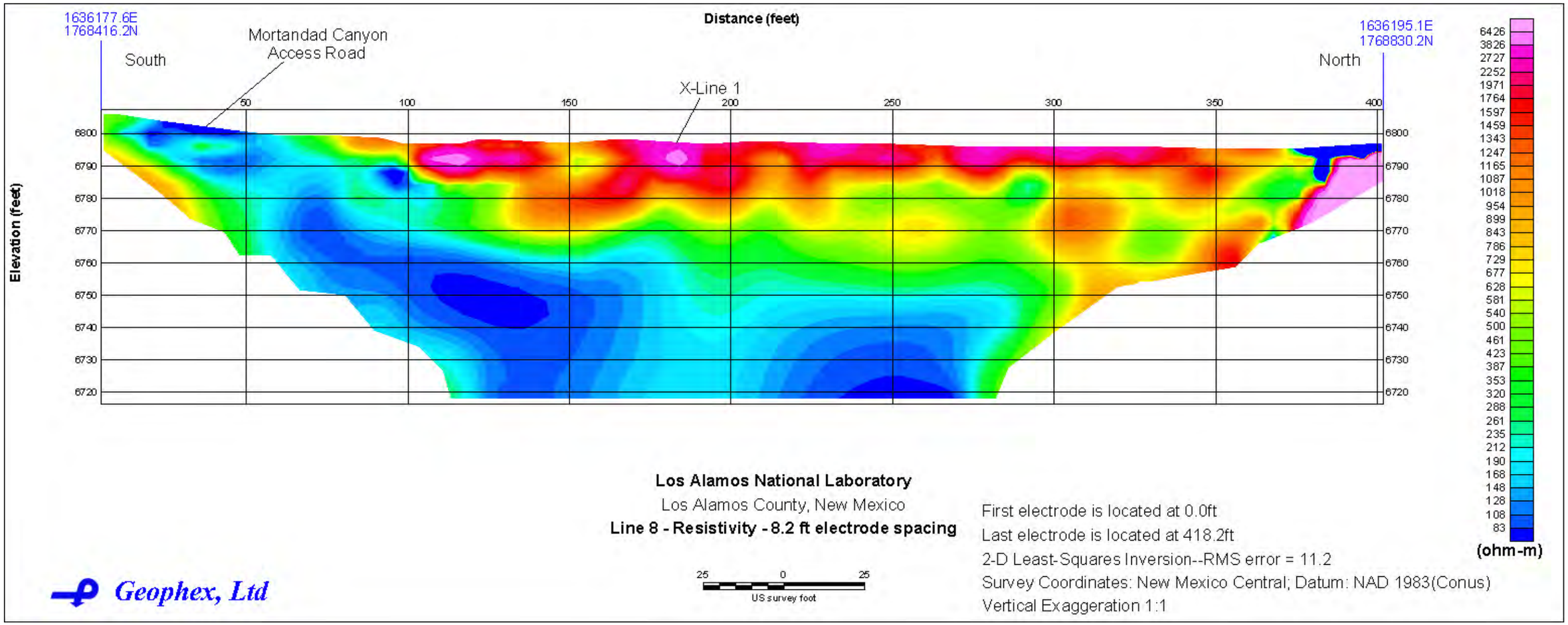


Plate 8-27. Mortandad Canyon line 8

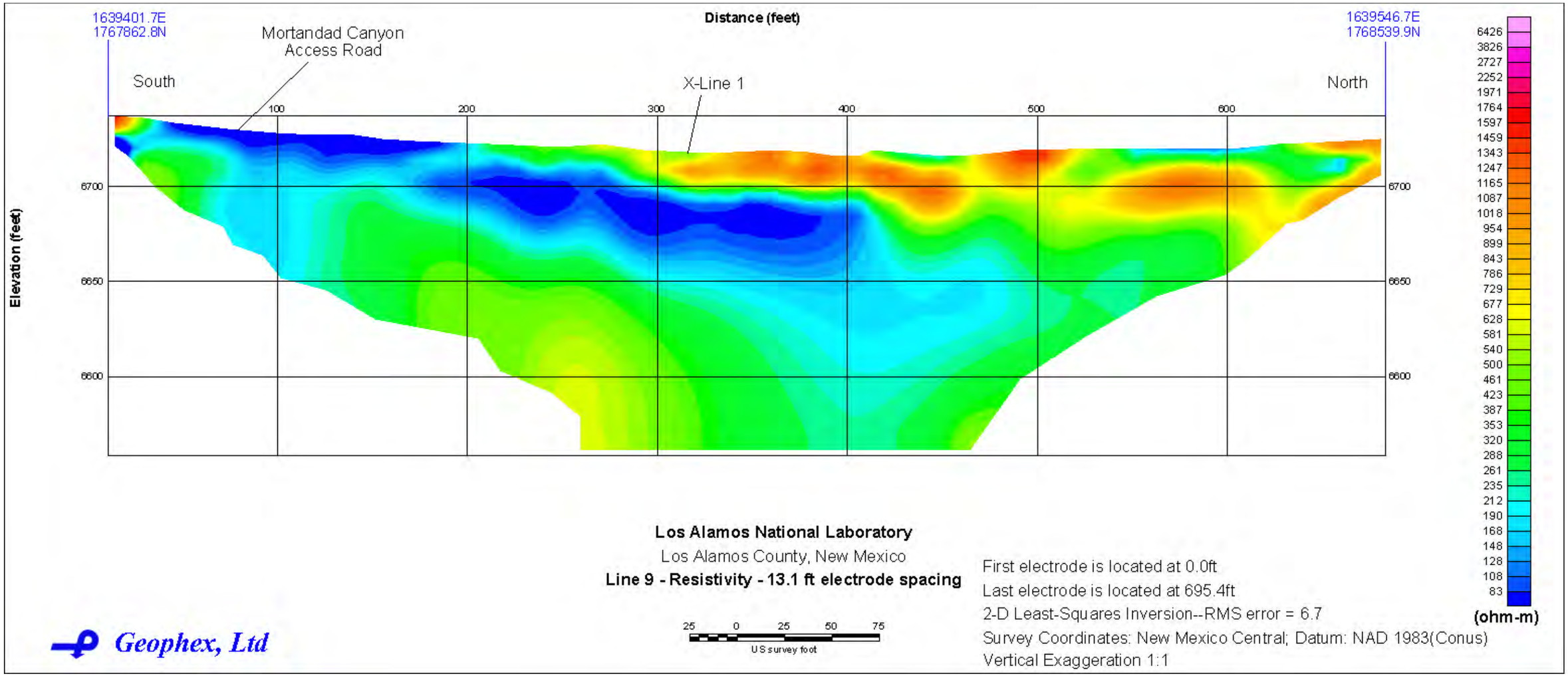


Plate 8-28. Mortandad Canyon line 9

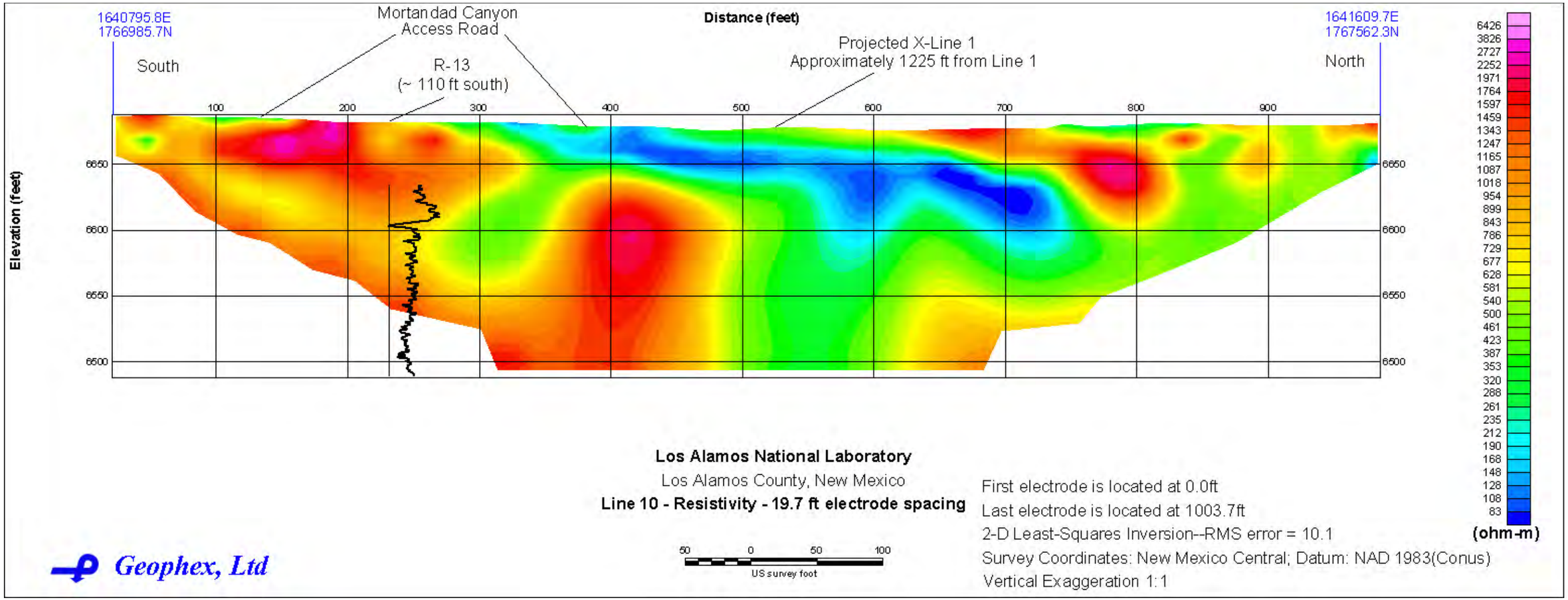


Plate 8-29. Mortandad Canyon line 10

PAJARITO CANYON

Includes the 2005 Pajarito Canyon Survey (Red)

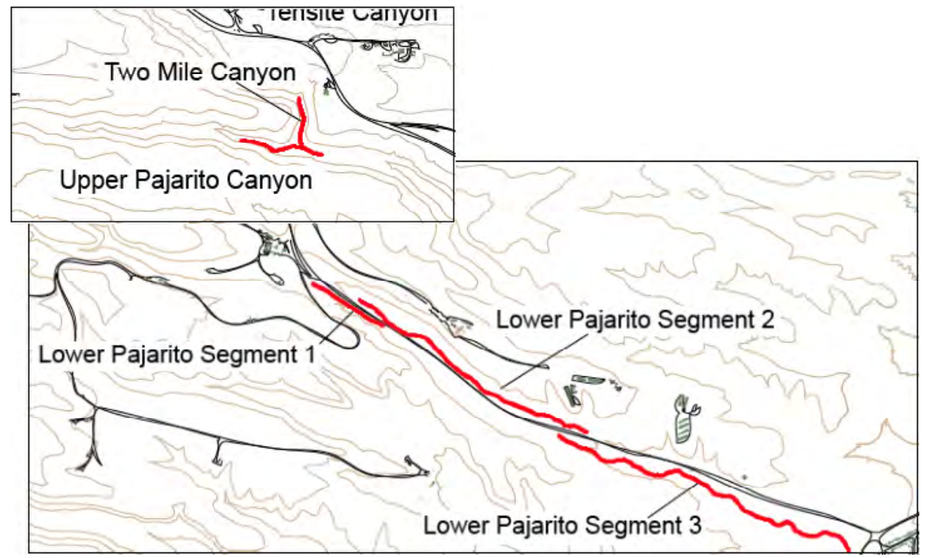
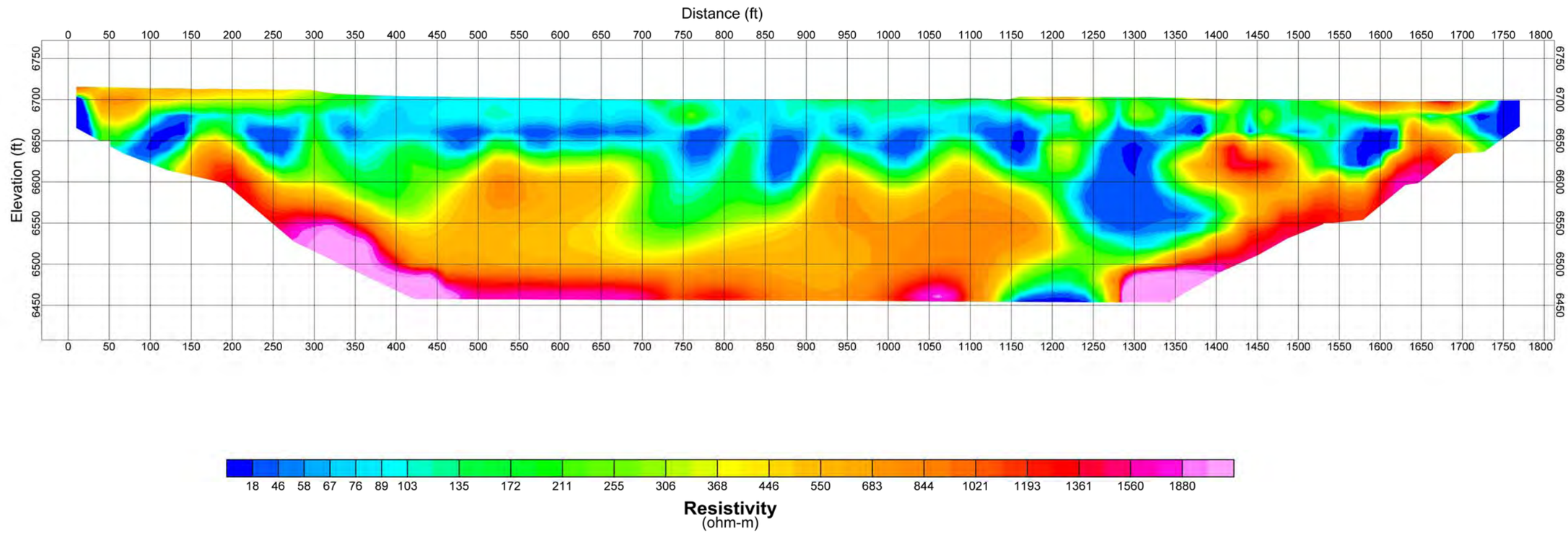


Plate 8-30. Pajarito Canyon surveys



Preliminary Resistivity Data Profile from Lower Pajarito Canyon-Segment #1-- Dec. 2005

Los Alamos National Laboratory

Los Alamos County, New Mexico

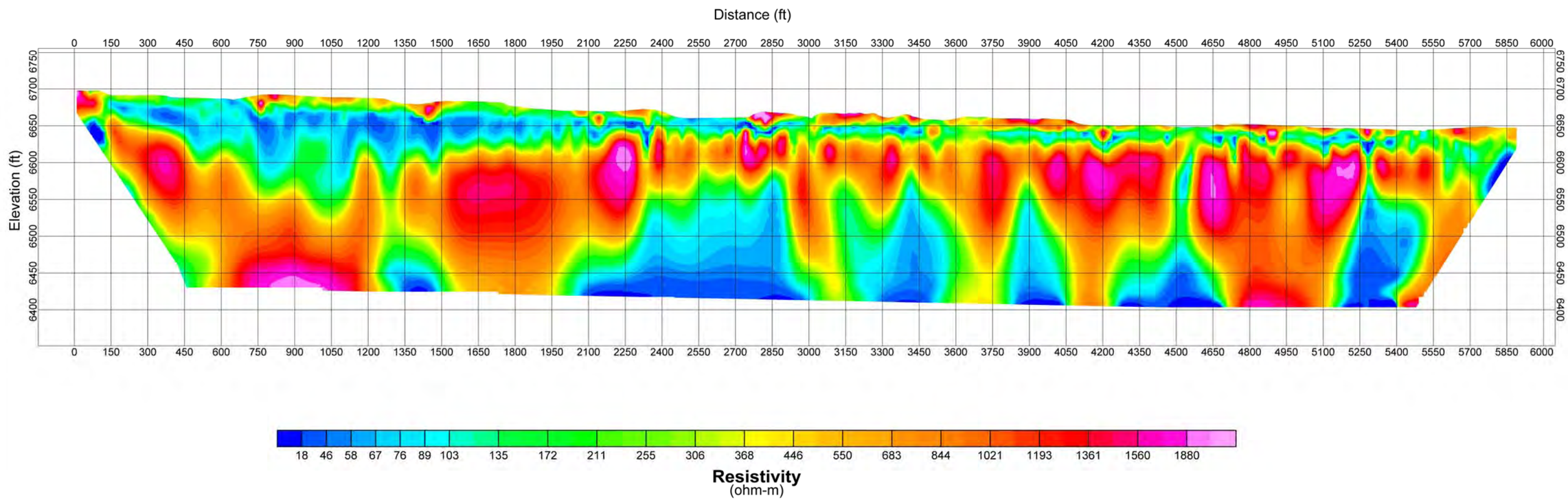
Line 1 - 19.6 ft electrode spacing

100 0 100
feet

First electrode is located at 0.0ft (N-1760342.3ft, E-1636741.5ft)
Last electrode is located at 1771.2ft (N-1759448.9ft, E-1638252.1ft)
2-D Least-Squares Inversion--RMS error = 15.7
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terrum et mare exploramus-

Plate 8-31. Resistivity data profile from Lower Pajarito Canyon - Segment #1



Preliminary Resistivity Data Profile from Lower Pajarito Canyon-Segment #2-- Dec. 2005

Los Alamos National Laboratory

Los Alamos County, New Mexico

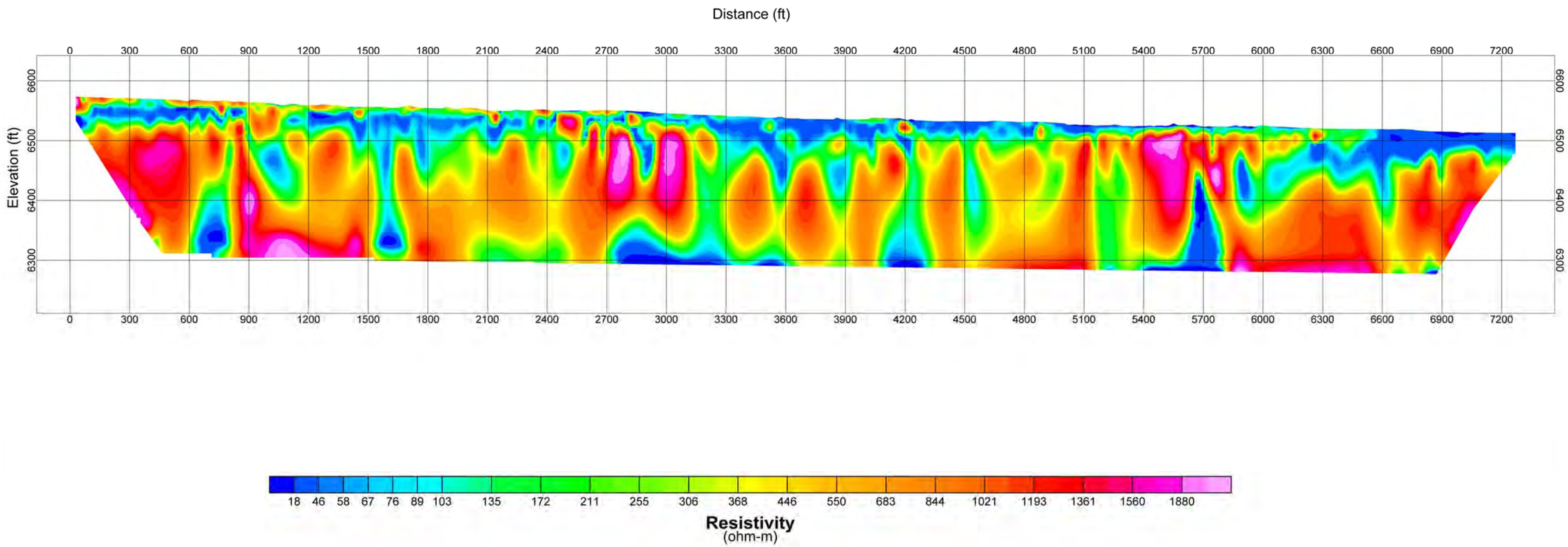
Line 2 - 19.6 ft electrode spacing

250 0 250 500
feet

First electrode is located at 0.0ft (N-1759988.0ft, E-1637754.0ft)
Last electrode is located at 5904.0ft (N-1757138.9ft, E-1642640.4ft)
2-D Least-Squares Inversion--RMS error = 10.5
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terram et mare explorantus-

Plate 8-32. Resistivity data profile from Lower Pajarito Canyon - Segment #2



Preliminary Resistivity Data Profile from Lower Pajarito Canyon-Segment #3-- Dec. 2005

Los Alamos National Laboratory

Los Alamos County, New Mexico

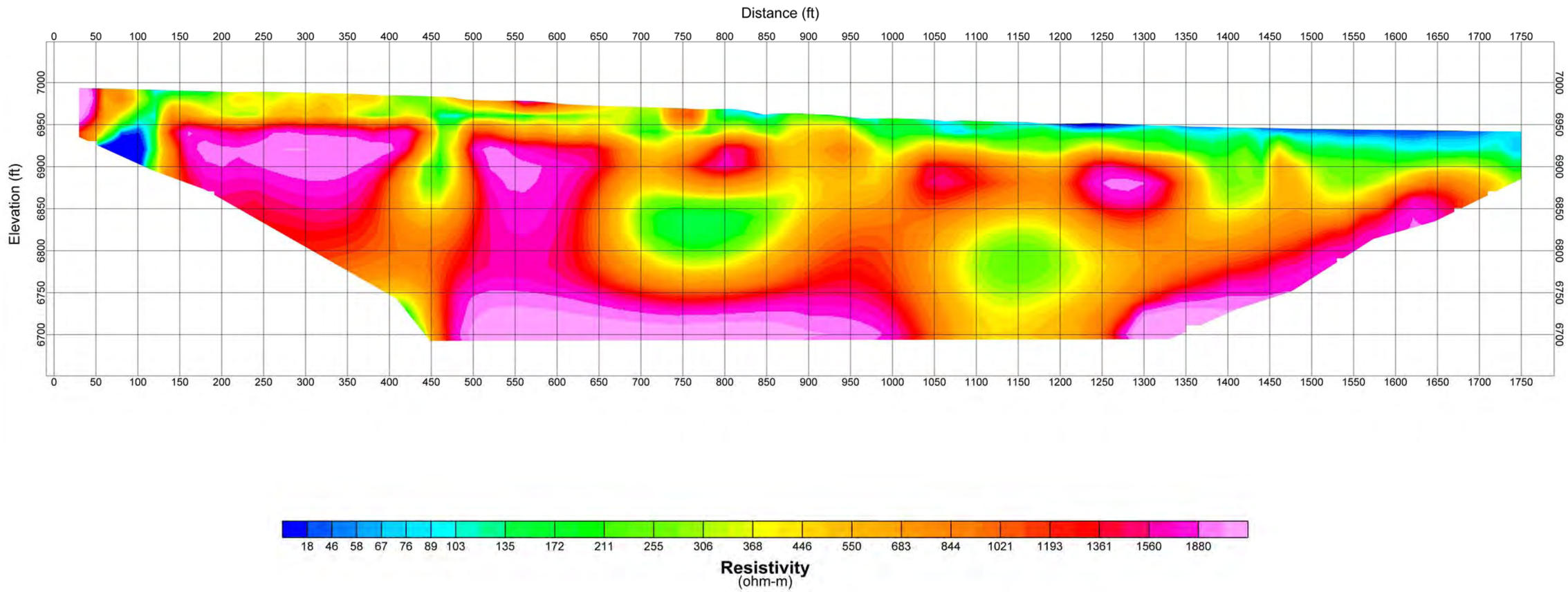
Line 3 - 19.6 ft electrode spacing

250 0 250 500 750
feet

First electrode is located at 0.0ft (N-1757064.5ft, E-1642035.3ft)
Last electrode is located at 7281.6ft (N-1754629.8ft, E-1648255.1ft)
2-D Least-Squares Inversion--RMS error = 10.8
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terrum et mare exploramus-

Plate 8-33. Resistivity data profile from Lower Pajarito Canyon - Segment #3



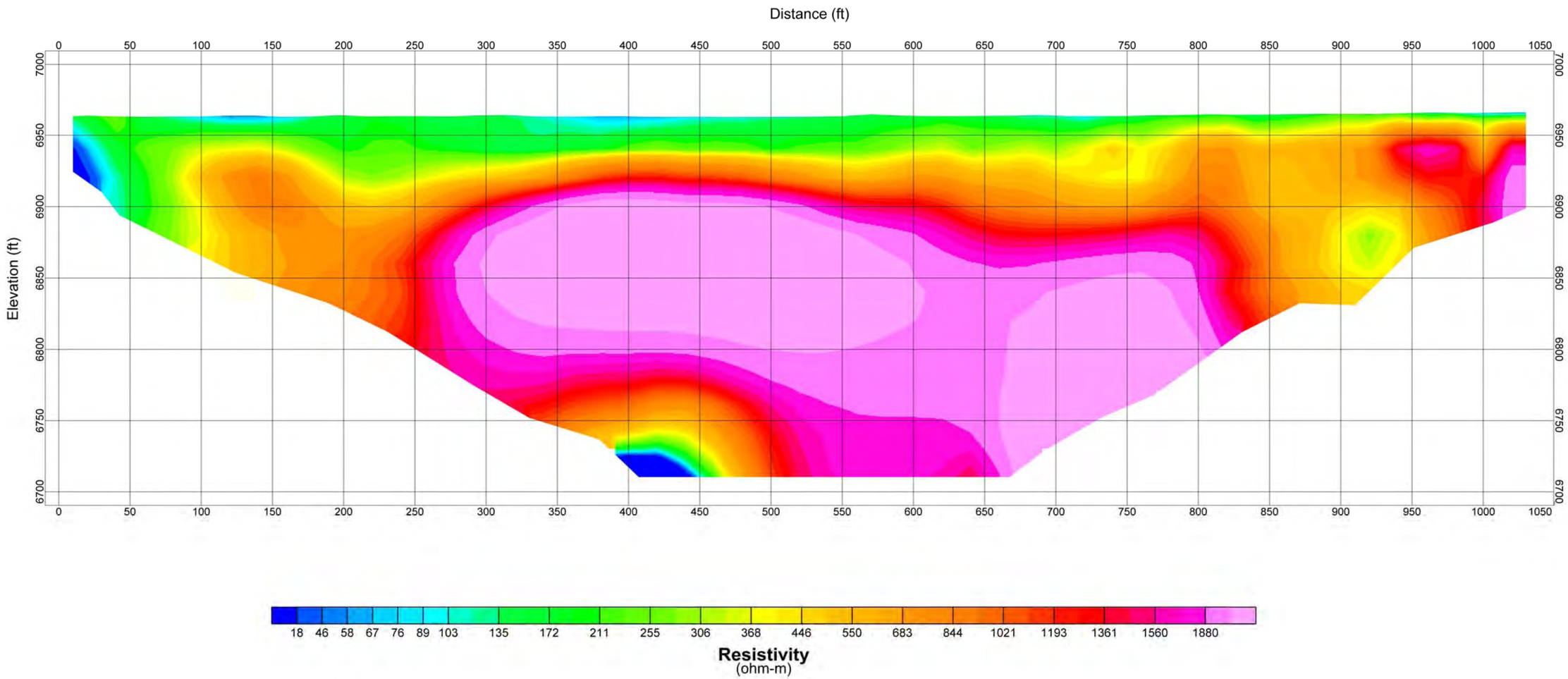
Preliminary Resistivity Data Profile from Upper Pajarito Canyon -- Dec. 2005
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 19.6 ft electrode spacing

50 0 50 100 150
feet

First electrode is located at 0.0ft (N-1766225.1ft, E-1625503.7ft)
Last electrode is located at 1771.2ft (N-1765918.7ft, E-1627178.3ft)
2-D Least-Squares Inversion--RMS error = 7.3
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terrum et mare exploramus-

Plate 8-34. Resistivity data profile from Upper Pajarito Canyon



Preliminary Resistivity Data Profile from Two Mile Canyon -- Dec. 2005
Los Alamos National Laboratory
Los Alamos County, New Mexico
Line 1 - 19.6 ft electrode spacing

50 0 50
feet

First electrode is located at 0.0ft (N-1766046.7ft, E-1626779.9ft)
Last electrode is located at 1082.4ft (N-1767105.2ft, E-1626693.2ft)
2-D Least-Squares Inversion--RMS error = 6.6
Survey Coordinates: New Mexico Central; Datum: NAD 1983(Conus)

Geophex
-terram et mare explorantus-

Plate 8-35. Resistivity data profile from Two Mile Canyon

R-18
R-17
PM-4
R-34
R-26
CdV-16-1i
CdV-16-2i
R-25
CdV-16-3i
CdV-R-15-3
SHB-3
R-19
CdV-R-37-2
R-21
R-22
R-27
DT-5
DT-10
DT-9
Bandelier Natl. Mon.
R-31