SAMPLING AND ANALYSIS PLAN

Section 7.0

Geology

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7.1.1 Regional Geologic Setting

The Roca Honda mine permit area is approximately 17 miles by air north-northeast of Grants in west-central New Mexico. The permit area is in the southeast part of the Ambrosia Lake subdistrict of the Grants uranium district (McLemore and Chenoweth 1989) and is near the boundary between the Chaco slope and the Acoma sag tectonic features. This subdistrict is in the southeastern part of the Colorado Plateau physiographic province and is mostly on the south flank (referred to as the Chaco slope) of the San Juan basin. The regional geology is shown in Figure 7–1. The Roca Honda permit area is also shown relative to the area depicted.

Bounding the San Juan basin to the south-southwest is the Zuni uplift, where rocks as old as Precambrian are exposed 25 to 30 miles southwest of the Roca Honda permit area (Figure 7–1). Less than 5 miles to the east and south of the permit area, Neogene volcanic rocks of the Mount Taylor volcanic field cap Horace Mesa and Mesa Chivato. On the Chaco slope, sedimentary strata mainly of Mesozoic age dip gently northeast into the Central basin part of the San Juan basin. The permit area is structurally complex and is included in the part of the subdistrict that Santos (1970) described as the most folded and faulted part of the Chaco slope. Figure 7–2 identifies the regional structural features in relation to the permit area.

The San Juan basin and bounding structures were largely formed during the Laramide orogeny near the end of the Late Cretaceous through Eocene time (Lorenz and Cooper 2003). This Laramide tectonism produced compression of the San Juan basin between the San Juan and Zuni uplifts, resulting in faults and fold axes oriented north to north-northeast. The more intensively faulted east part of the Chaco slope may be related to the development of the McCartys syncline, which lies just east of the faulted Fernandez monocline (Kirk and Condon 1986).

The San Rafael fault zone cuts the Fernandez monocline and has right-lateral displacement (Figure 7–2) as evidence of shear near the San Juan basin margin. Other faults in or near the permit area are mostly normal with dip-slip displacement and vertical movement less than 40 ft. The large, northeast-striking San Mateo normal fault about 2 miles west of the Roca Honda permit area has vertical displacement of as much as 450 ft (Santos 1970). Strata in the permit area along the Fernandez monocline dip east to southeast at 4 to 8 degrees toward the McCartys syncline, an expression of the Acoma sag (Santos 1966a and 1966b).

Uranium ore deposits in the Grants uranium district are mainly in fluvial sandstones in the Westwater Canyon, Brushy Basin, and Jackpile Sandstone Members of the Upper Jurassic Morrison Formation. Other host rocks for minor uranium deposits are the Upper Jurassic Todilto Member of the Wanakah Formation and the Upper Cretaceous Dakota Sandstone. The Morrison Formation crops out near the south edge of the San Juan basin and dips gently northward into the basin. Formations of Late Cretaceous age that overlie the Morrison Formation, in ascending order, are: Dakota Sandstone, Mancos Shale, Gallup Sandstone, Crevasse Canyon Formation, Point Lookout Sandstone, and Menefee Formation. The Gallup Sandstone, Crevasse Canyon Formation, Point Lookout Sandstone, and Menefee Formation compose the Mesaverde Group.

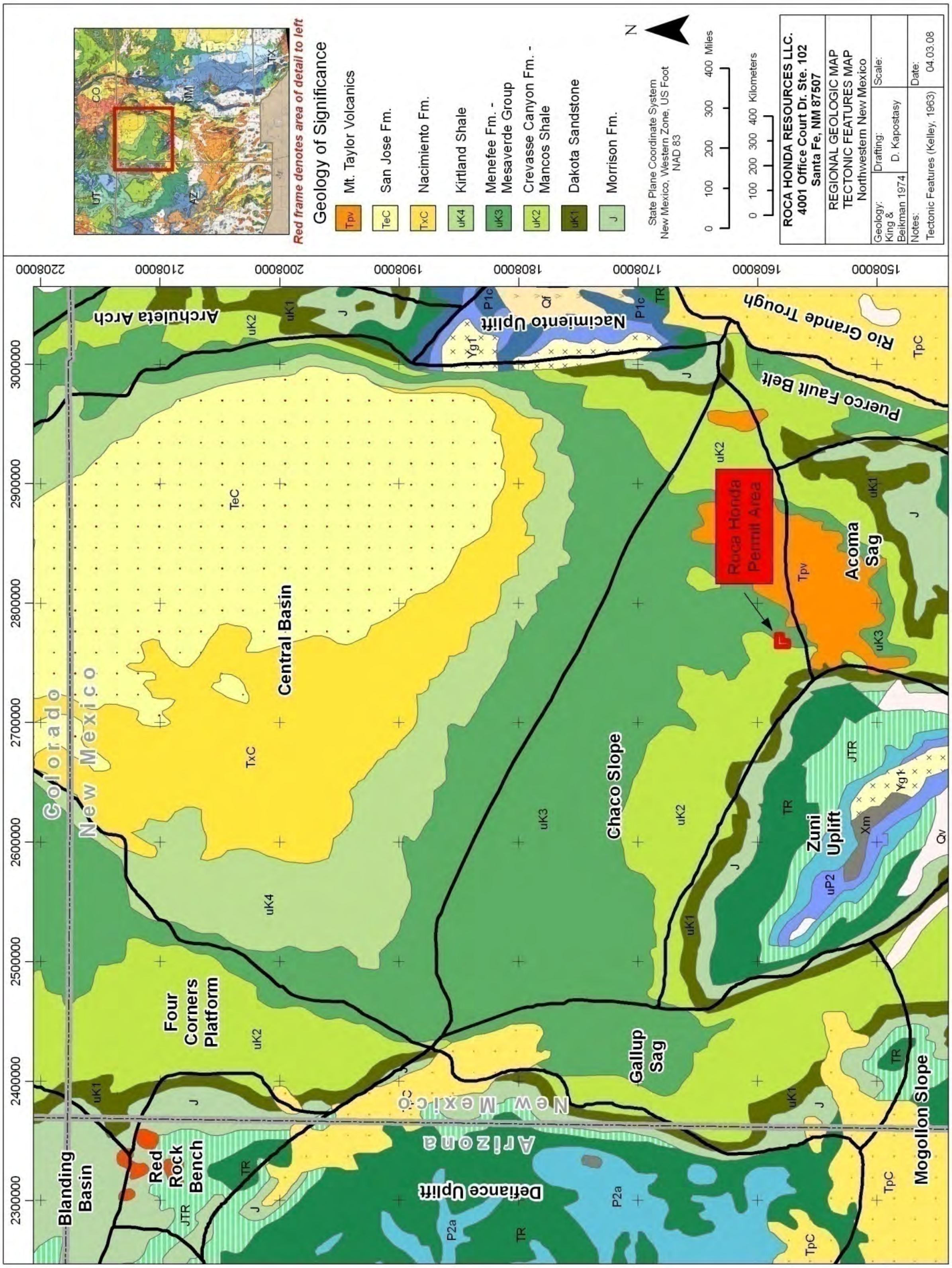

Figure 7-1. Regional Geologic Map of Northwestern New Mexico

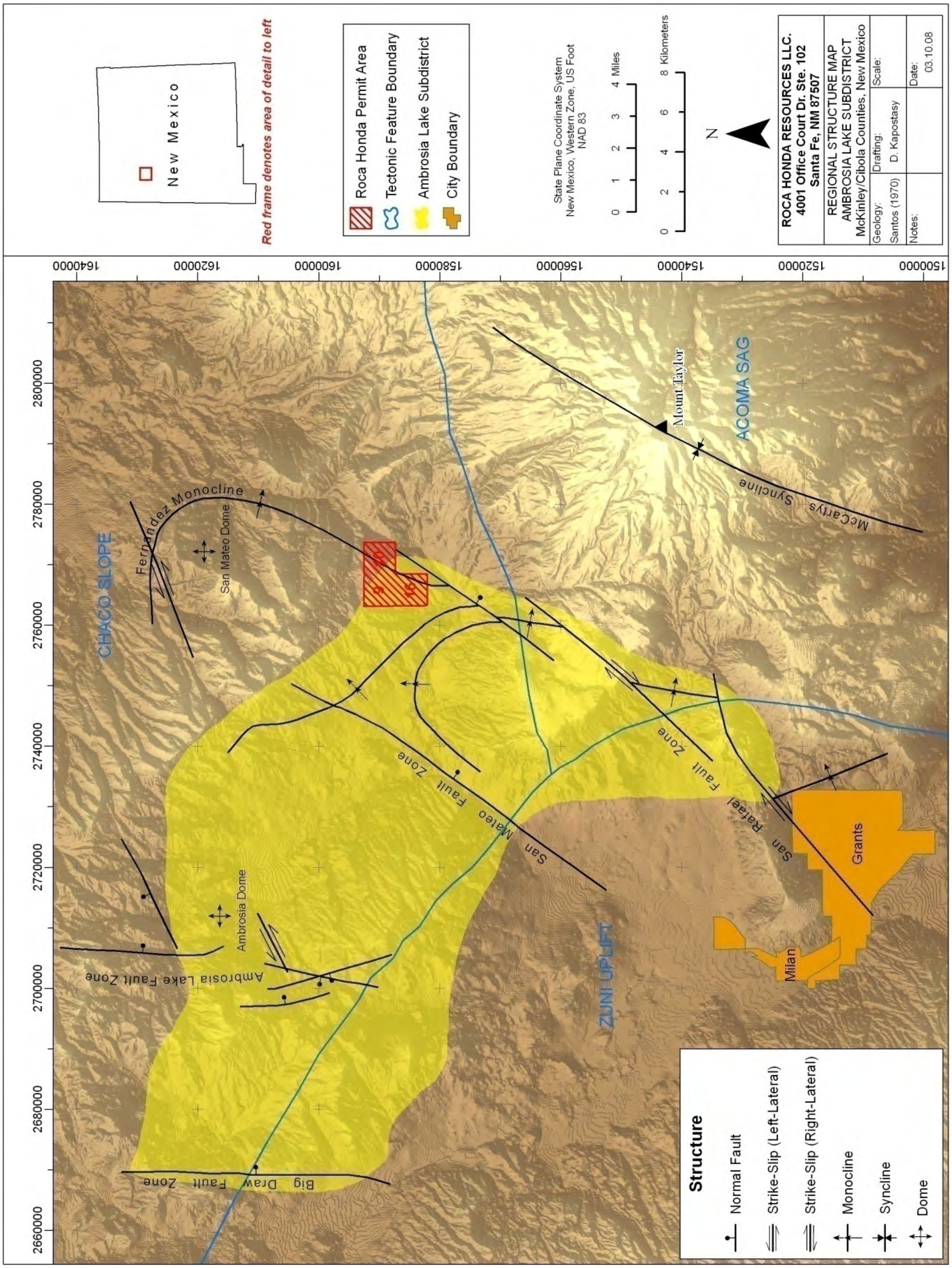

Figure 7-2. Regional Structural Features

The Morrison Formation was deposited in a continental environment, mainly under fluvial conditions. These deposits were derived from an uplifted arc terrane to the west and locally from the Mogollon highlands to the south (Lucas 2004). The Zuni uplift, currently bordering the San Juan basin to the southwest, did not exist in Late Jurassic time and therefore was not a source for Morrison Formation sediments.

Formations of Late Cretaceous age were deposited in or on the margin of the Western Interior Seaway, a shallow continental sea, and the formations represent transgressive or regressive episodes of the Seaway. The Mancos Shale and its several tongues were deposited on the shallow marine sea bottom, and the formations of the Mesaverde Group were deposited along the western shoreline of the Seaway.

7.1.2 Stratigraphy Beneath the Permit Area

Rocks exposed in the Ambrosia Lake subdistrict include marine and nonmarine sediments of Late Cretaceous age, unconformably overlying the uranium-ore-bearing Upper Jurassic Morrison Formation. In this section, geologic units are discussed from youngest to oldest. This is the same order in which the units would be presented in boreholes and matches the convention used in Section 9.0, Ground Water, of this SAP. The uppermost sequence of conformable strata consists of Mesaverde Group, Mancos Shale, and Dakota Sandstone. All rocks that crop out at the Roca Honda permit area are of Late Cretaceous age; these rocks and the Quaternary deposits that cover them in some places are shown in the geologic map in Figure 7–3.

The formations and members and their approximate depth from the surface are shown in the stratigraphic section in Figure 7–4 which is based on historical drilling in the area. The Menefee Formation does not crop out in the Roca Honda permit area (and it is not shown in Figure 7–4), but a partial thickness of it is below Quaternary colluvium as subcrop in the SE¼ Section 10. Because of the intertonguing nature of some of the Cretaceous units in the area, some members or tongues of the Mancos Shale and Dakota Sandstone are included in sequence within the dominant formation in the discussion below.

Formation and member approximate thicknesses are shown in Table 7–1. These thicknesses were determined from geologic mapping by Santos (1966a and 1966b), borehole data from 2007 drilling by RHR in Section 16, and borehole data from historic drilling by Kerr-McGee Corporation and Western Nuclear Corporation.

7.1.2.1 Alluvium

Quaternary alluvial material overlies bedrock throughout the San Mateo Creek valley, and although it probably accepts and transmits ground water from precipitation to underlying bedrock units, it is most likely unsaturated except near San Mateo Creek. San Mateo Creek alluvial materials consist of unconsolidated sands and silts. Well logs indicate this material is from 10 to 80 ft thick although it may be significantly thicker in some areas (OSE 2008).

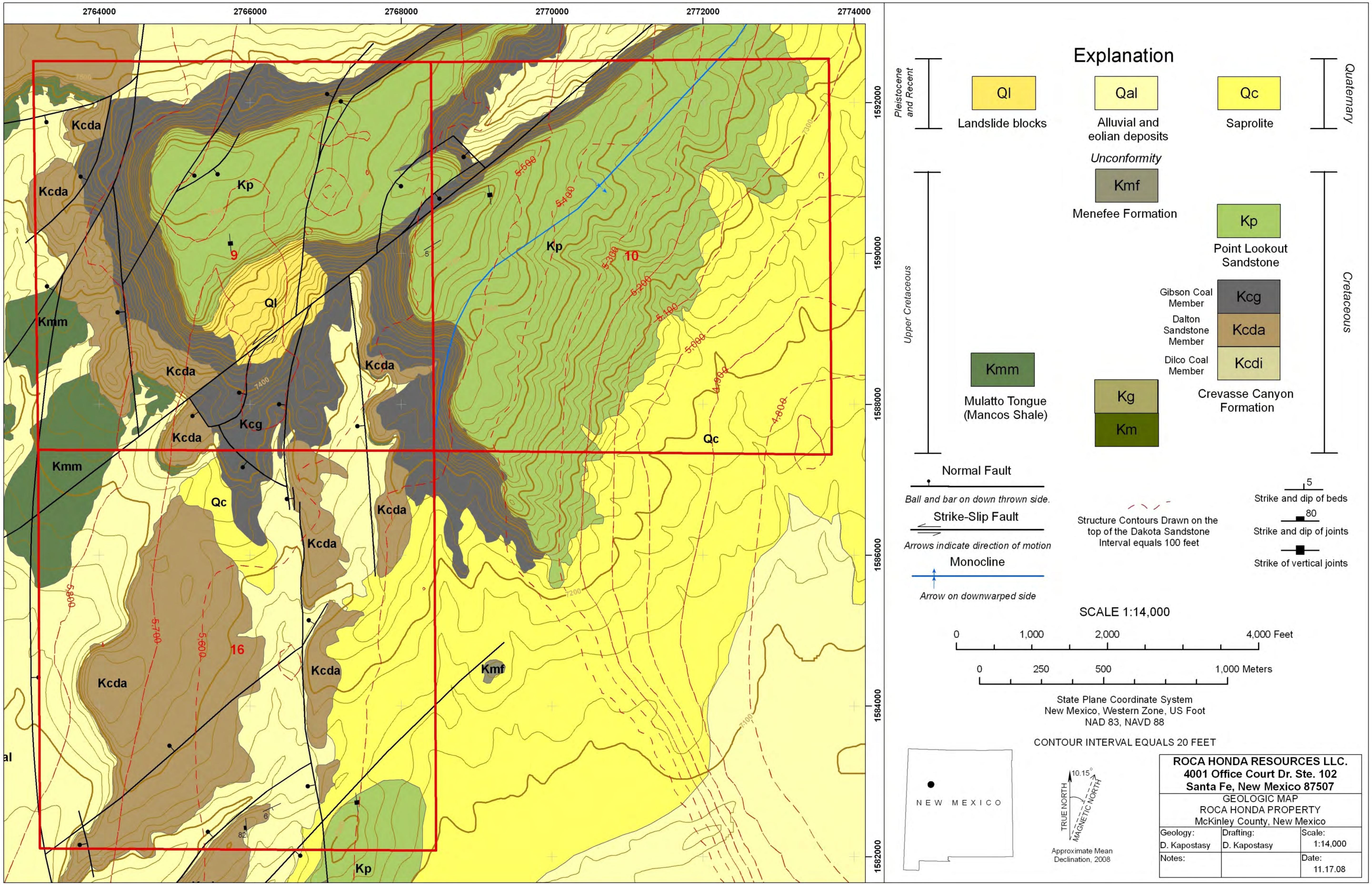

Figure 7-3. Geologic Map of the Roca Honda Permit Area

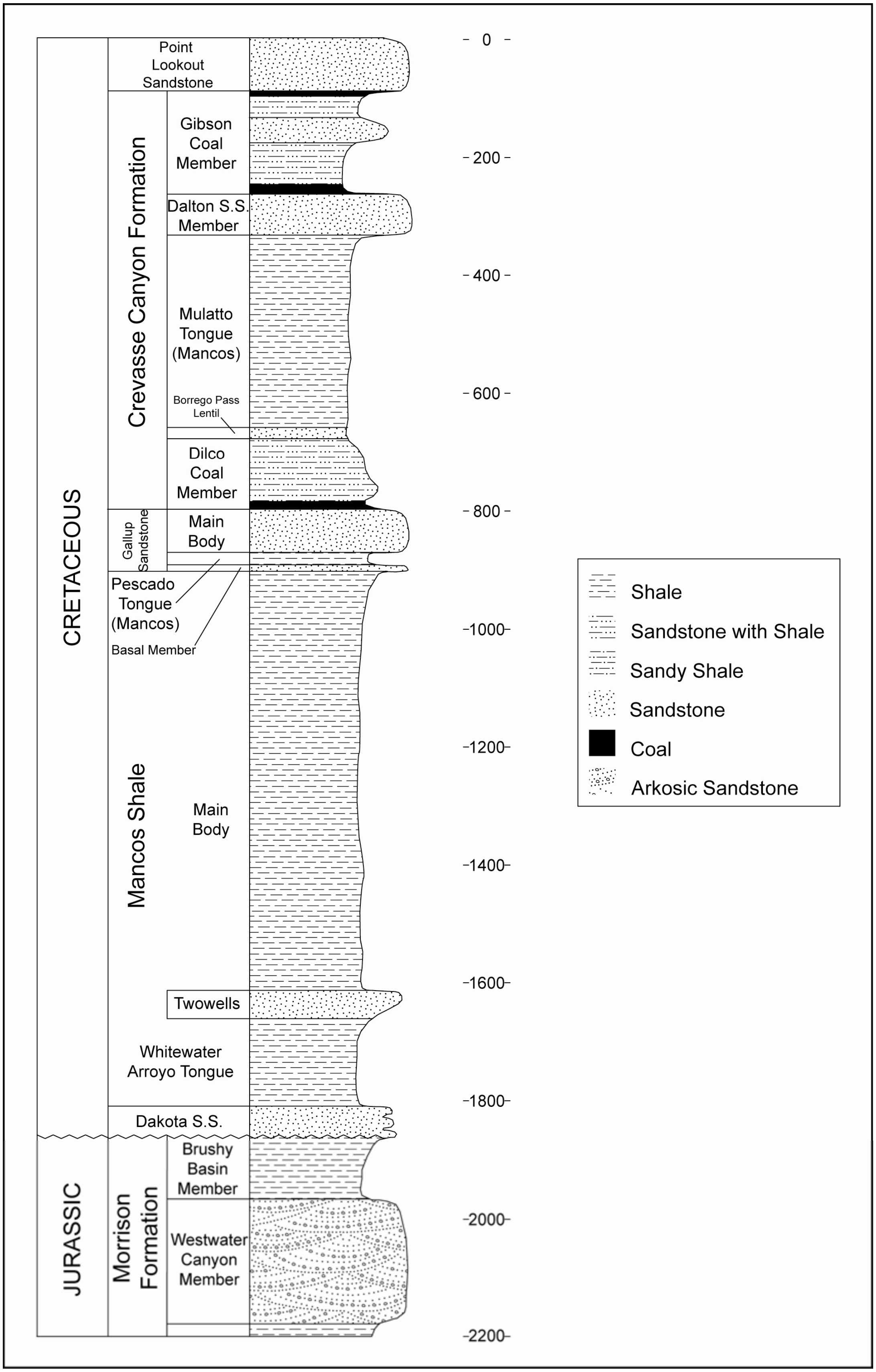

Figure 7-4. Typical Stratigraphic Section of the Roca Honda Permit Area

Table 7-1. Typical Stratigraphic Thickness Data for the Permit Area

Unit	Unit Name	Average Thickness (ft)	Maximum Thickness (ft)	Minimum Thickness (ft)	Data Source
Qal	Alluvium	-	-	-	-
Kmf	Menefee Formation	-	-	-	-
Kp	Point Lookout Sandstone	-	120	-	Geologic Maps (Santos 1966a and 1966b)
Kcg	Gibson Coal Member (Crevasse Canyon Formation)	-	240	-	Geologic Maps (Santos 1966a and 1966b)
Kcda	Dalton Sandstone Member (Crevasse Canyon Formation)	-	100	-	Geologic Maps (Santos 1966a and 1966b)
Kmm	Mulatto Tongue (Mancos Shale)	305	318	292	2007 Section 16 Drilling
Kcbp	Borrego Pass Lentil (Crevasse Canyon Formation)	40	-	-	2007 Section 16 Drilling, Brod and Stone (1981)
Kcdi	Dilco Coal Member (Crevasse Canyon Formation)	120	128	108	2007 Section 16 Drilling
Kg	Gallup Sandstone	73	76	68	2007 Section 16 Drilling
Kmp	Pescado Tongue (Mancos Shale)	21	22	20	2007 Section 16 Drilling
Kgb	Gallup Sandstone (basal)	11	16	8	2007 Section 16 Drilling
Km	Mancos Shale	710	720	702	2007 Section 16 Drilling
Kdt	Twowells Sandstone Tongue (Dakota Sandstone)	49	52	46	2007 Section 16 Drilling
Kmw	Whitewater Arroyo Shale Tongue (Mancos Shale)	148	150	146	2007 Section 16 Drilling
Kd	Dakota Sandstone	52	68	19	Historic Data
Jmb	Brushy Basin Member (Morrison Formation)	105	269	22	Historic Data
Jmw	Westwater Canyon Member (Morrison Formation)				
JmwA	Westwater A Sandstone	34	59	0	Historic Data
JmwA-B1	A-B1 Shale	16	100	0	Historic Data
JmwB1	Westwater B1 Sandstone	33	56	0	Historic Data
JmwB1-B2	B1-B2 Shale	10	37	0	Historic Data
JmwB2	Westwater B2 Sandstone	27	56	6	Historic Data
JmwB2-C	B2-C Shale	13	39	0	Historic Data
JmwC	Westwater C Sandstone	48	90	5	Historic Data
JmwC-D	C-D Shale	15	39	0	Historic Data
JmwD	Westwater D Sandstone	17	45	2	Historic Data

Drill hole data and lack of outcrop at the permit area do not allow for an estimate to be made on the thickness of the Menefee Formation and alluvium.

7.1.2.2 Menefee Formation

The Menefee Formation, an upper unit of the Upper Cretaceous Mesaverde Group, consists of two members—the Allison Member underlain by the Cleary Coal Member. The formation consists of thin to thick sandstone beds interbedded with shale and coal seams. Geophysical logs from the San Juan basin indicate that the formation typically consists of approximately 30 percent sandstone, 65 percent shale, and less than 5 percent coal (Brod and Stone 1981). Beds of the Allison Member do not crop out in the permit area, but are farther to the north, in the central San Juan basin. Beds of the Cleary Coal Member outcrop just east and south of the permit area on the east flank of the Fernandez monocline. This member is in the permit area as subcrop beneath Quaternary colluvium only in the SE¼ Section 10.

7.1.2.3 Point Lookout Sandstone

The Point Lookout Sandstone is a regressive marine beach sandstone in the middle of the Mesaverde Group. The Point Lookout Sandstone generally consists of light gray, thick bedded, very fine- to medium-grained, locally crossbedded sandstone. This unit is as much as 120 ft thick in the permit area. A resistant cap of Point Lookout Sandstone forms the top of Jesus Mesa in the permit area and also represents the dip slope. Just east of Jesus Mesa, the steeper slope that dips to the southeast in Section 10 represents the dip slope of the Point Lookout Sandstone along the Fernandez monocline (Figure 7–3).

7.1.2.4 Crevasse Canyon Formation

The Crevasse Canyon Formation is a lower unit of the Mesaverde Group that crops out through much of the west part of the Roca Honda permit area. The unit consists of the following members from youngest to oldest: Gibson Coal Member, Dalton Sandstone Member, Borrego Pass Lentil, and Dilco Coal Member (Figure 7–4). The Mulatto Tongue of the Mancos Shale is below the Dalton Sandstone Member and above the Borrego Pass Lentil (Figure 7–4). The Mulatto Tongue is approximately 300 ft thick in the permit area and is a marine deposit representing a transgression of the Western Interior Seaway.

The Gibson Coal Member is as much as 240 ft thick in the area of interest and crops out mainly in the steep slopes on the sides of Jesus Mesa (Figure 7–3). The Dalton Sandstone Member, a regressive marine beach sandstone, is as much as 100 ft thick.

Shale and silty sandstone of the Mulatto Tongue of the Mancos Shale crop out on gentle slopes and are covered in places by Quaternary alluvium and colluvium in the southwest part of the Roca Honda permit area. Below the Mulatto Tongue is the Borrego Pass Lentil, a transgressive marine sandstone that was previously referred to as the Stray sandstone of local usage (Santos 1966a). Boreholes drilled in 2007 in the permit area indicate that the Borrego Pass Lentil is about 40 ft thick. The entire thickness of the Mulatto Tongue is not exposed in the west part of the permit area because several normal faults disrupt the sequence. Therefore, whether the Borrego Pass Lentil, which lies just below the Mulatto Tongue, crops out in that area is not known.

The Dilco Coal Member has an average thickness of about 120 ft and crops out just west of the permit area in Section 17. The member contains thin sandstone, shale, and discontinuous coal beds representative of a back-shore swamp environment associated with a regression of the Western Interior Seaway (Fassett 1989).

7.1.2.5 Gallup Sandstone

The lowest formation of the Mesaverde Group is the Gallup Sandstone, which is solely in the subsurface in the Roca Honda permit area and is separated into two units by the thin Pescado Tongue of the Mancos Shale. The upper unit (or main body) of the Gallup Sandstone is a regressive marine beach sandstone that is fine- to medium-grained and is about 75 ft thick. The approximately 20-ft-thick Pescado Tongue consists of thin alternating and interfingering beds of sandstone, siltstone, and shale. A thin, fine- to coarse-grained sandstone (average thickness of about 10 ft) forms the basal bed of the Gallup Sandstone and marks a brief regression of the Western Interior Seaway.

7.1.2.6 Mancos Shale

The main body of Mancos Shale represents the full transgression of the Western Interior Seaway and in the Roca Honda permit mine area, its subsurface thickness averages about 710 ft. The marine deposits of this formation consist mainly of dark gray to black silty shale with minor interbedded sandstone. In the southern San Juan basin, the lower part of the Mancos Shale is intertongued with the underlying upper part of the Dakota Sandstone. The intertongued units generally represent a transgressive rock sequence (Landis et al. 1973).

In the subsurface of the permit area, the main body of Mancos Shale is underlain by the Twowells Sandstone Tongue of the Dakota Sandstone (Pike 1947), which is about 50 ft thick. Underlying the Twowells Sandstone Tongue is the Whitewater Arroyo Shale Tongue of the Mancos Shale (Owen 1966), which is about 150 ft thick. In the permit area, the base of the Mancos Shale is considered to be the base of the Whitewater Arroyo Shale Tongue (Figure 7–4).

7.1.2.7 Dakota Sandstone

Marine shoreface deposits of Dakota Sandstone are composed mainly of fine-grained gray sandstone. In the subsurface in the permit area, the Dakota Sandstone is approximately 50 ft thick. In the main Ambrosia Lake subdistrict about 5 miles northwest of the permit area, the Dakota Sandstone is composed of four members (Landis et al. 1973). For ease of presentation, the four members are not shown in Figure 7–4. The four members are in descending stratigraphic order: Paguate Sandstone Tongue of the Dakota Sandstone, Clay Mesa Shale Tongue of the Mancos Shale, Cubero Sandstone Tongue of the Dakota Sandstone, and Oak Canyon Member of the Dakota Sandstone. The Dakota Sandstone is the lowermost Upper Cretaceous formation, and unconformably overlies the Upper Jurassic Morrison Formation.

7.1.2.8 Morrison Formation

The uppermost member of the Morrison Formation in the Roca Honda permit area is the Brushy Basin Member. The Brushy Basin Member is variable in thickness (22 to 269 ft), but the average thickness is approximately 105 ft (Table 7–1), based on historical drilling in the area. Figure 7-5 is a typical strtigraphic depiction of the Dakota Sandstone and Morrison Formation in the permit area. The fluvial/lacustrine deposits of the Brushy Basin Member are underlain by the Westwater Canyon Member, which hosts the uranium deposits in the permit area. The fluvial, sandstone-dominated Westwater Canyon Member is approximately 100 to 250 ft thick under the permit area. The Westwater Canyon Member is informally subdivided into sandstone and shale units (Table 7–1 and Figure 7–5). The sandstone units, which contain the uranium mineralization, have grains composed of quartz (~61 percent), feldspar (~35 percent), chert (~3 percent), and heavy minerals (<1 percent).

Four members of the Morrison Formation are recognized by the USGS in the Grants uranium district. These members are, in descending order: Jackpile Sandstone Member, Brushy Basin Member, Westwater Canyon Member, and Recapture Member. The Jackpile Sandstone Member, the uppermost fluvial sandstone in the formation, was not deposited in the Ambrosia Lake subdistrict, but was deposited east of Mount Taylor where it hosts uranium mineralization in the Laguna subdistrict. The mostly greenish-gray, mudstone-dominated Brushy Basin Member is as much as 269 ft thick in the permit area. The Westwater Canyon Member consists of gray, light yellow-brown, and reddish-gray claystone (Fitch 2006) and is as much as 250 ft thick in the permit area. Grayish-red siltstone and claystone compose the Recapture Member.

The classic members of the Morrison Formation defined in the 1950s and 1960s described above will be the nomenclature retained for the Roca Honda mine permit area although a more simplified division of the Morrison Formation based on sequence stratigraphy was developed in the 1990s by the New Mexico Bureau of Geology and Mineral Resources (Lucas and Anderson 1998, Lucas and Heckert 2003). This division, not yet formally accepted by the USGS, preserves the Brushy Basin Member, places the Recapture Member in a lower formation (the Bluff Sandstone), and replaces the Westwater Canyon Member with the Salt Wash Member, which was found to extend from Colorado and Utah southward through the San Juan basin. Using this division, the Morrison Formation in the Ambrosia Lake subdistrict would contain only two members—the Salt Wash Member and the Brushy Basin Member.

7.1.3 Description of the Ore Body

Uranium ore bodies occur in two distinct forms in the Ambrosia Lake subdistrict, primary ore and redistributed ore. Primary ore is found in the form of uranium-rich humic material that coats sand grains (Fitch 2006). It is commonly referred to as black ore because of the color it gives to the sandstone it impregnates (Fitch 1980). Primary ore bodies are irregularly shaped and tend to be roughly tabular and elongated. They range from a few square feet in area to much larger bodies, which can produce up to several million tons of ore (Fitch 1980). Primary deposits trend parallel to both bedding surfaces and paleochannels, and within the Westwater Canyon Member have shown a direct correlation between uranium concentration and organic carbon weight percent (Squyres 1970, Kendall 1972). Because the primary ore deposits follow bedding, the ore dips to the southeast at the same dip as the Westwater Canyon Member. Redistributed, post-fault, or stack ore is also in the Ambrosia Lake subdistrict, but is not apparent in the permit area.

The uranium found in the Roca Honda mine permit area is contained within the five sandstone units of the Westwater Canyon Member (Figure 7–5). Core recovery from the 2007 drilling program indicates uranium occurs in sandstones with large amounts of organic/high carbon material. The uranium is dark gray to black and is found between depths of approximately 1,850 to 2,100 ft below the surface. Zones of mineralization are 1 to 25 ft thick, 100 to 200 ft wide, and 200 to more than 1,200 ft long; also characteristic of the ore is pyrite and bleaching alteration (Fitch 2006). Average uranium grades in the permit area are 0.31 percent U_3O_8 for Sections 9 and 10 and 0.225 percent for Section 16. These average grades are based on cutoffs of 6 ft of true thickness and grade of 0.10 percent U_3O_8 (Fitch 2006). Nonmineralized host rock, or waste rock, is much lighter (light brown to light gray) and has background to slightly elevated radiometric readings.

Uranium ore in the permit area trends west-northwest. This trend is consistent with trends of the fluvial sedimentary structures of the Westwater Canyon Member (Falkowski 1980, Kirk and Condon 1986) and the general trend of ore across the Ambrosia Lake subdistrict.

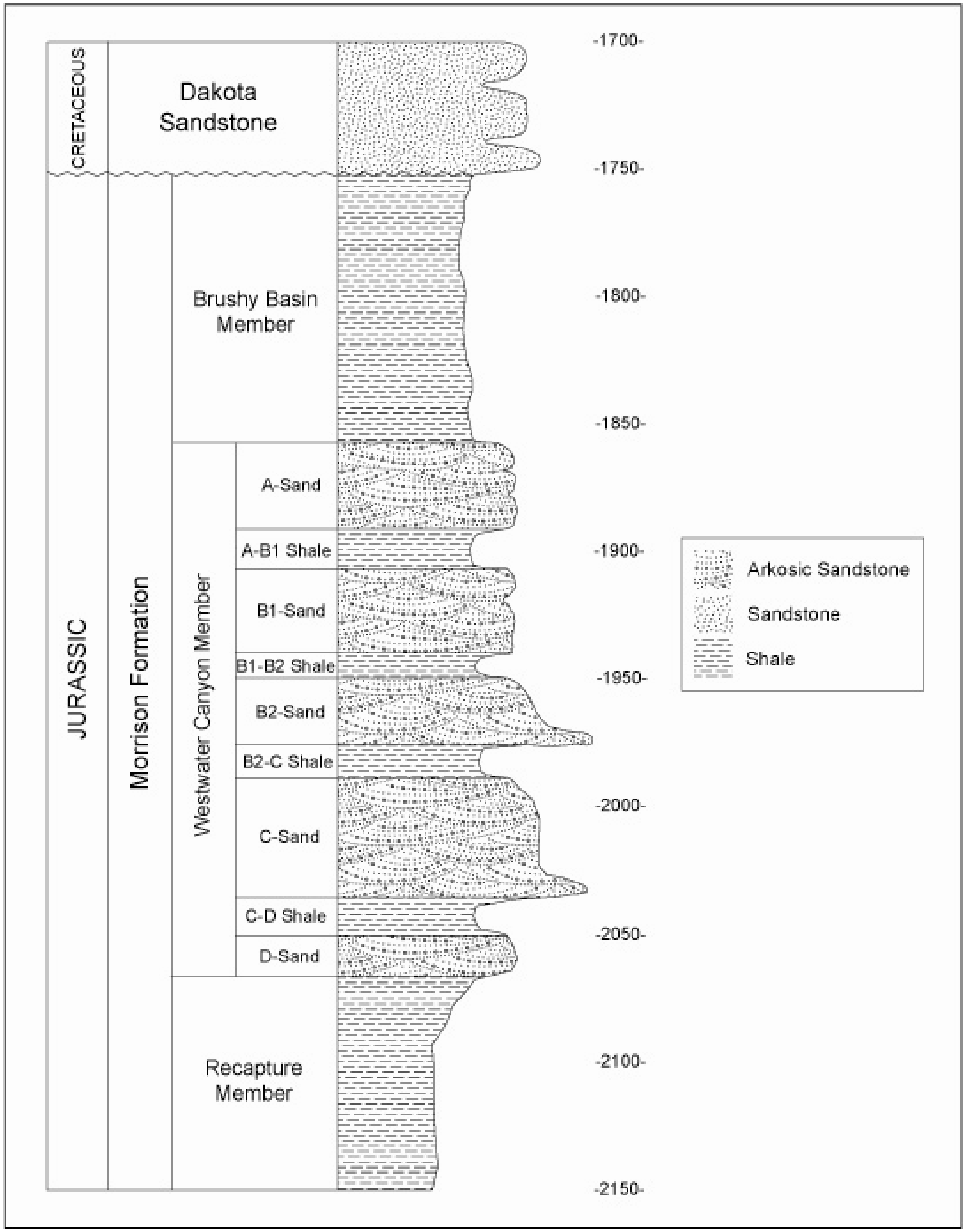

Figure 7-5. Typical Jurassic Stratigraphy at the Roca Honda Permit Area

Paleochannels that contain quartz-rich, arkosic, fluvial sandstones are the primary ore control associated with this trend (Fitch 2006). Previous mining operations within the immediate area suggest that faults in the permit area associated with the San Mateo fault zone post-date the emplacement of uranium (Falkowski 1980); therefore, it can be expected that ore-bearing zones in the permit area are offset by faults.

The ore is typically confined to sandstones in the Westwater Canyon Member, although there is some overlap into the shales that divide the sandstones and also some minor extension (<10 ft) into the underlying Recapture Member. The ore is in all the Westwater Canyon Member sandstones across the permit area, but in Sections 9 and 16, the mineralization is typically found in the upper sandstones (A, B1, and B2). In Section 10, the A and B1 sandstones pinch out in some areas because of a thickening of the overlying Brushy Basin Member, so mineralization in the middle and western portions of Section 10 is typically in the lower sandstones (B2, C, and D).

7.1.4 Nature and Depth of Overburden

The overburden in the Roca Honda mine permit area consists of Upper Jurassic (Brushy Basin Member of the Morrison Formation) and Upper Cretaceous (Dakota Sandstone to Menefee Formation) rocks that overlie the ore-bearing Westwater Canyon Member of the Morrison Formation. Overburden thicknesses range from 1,600 to 2,800 ft and are primarily controlled by topography (i.e., higher elevation equals thicker overburden). The thickening of the overburden reaches 2,800 ft in the southeastern corner of Section 10 (Figure 7–6) and reflects deeper burial as formations dip eastward along the Fernandez monocline toward the McCartys syncline. Thicknesses for stratigraphic units are shown in Table 7–1.

Three cross sections (one each in Sections 9, 10, and 16) were constructed to show the overburden thickness and subsurface structure at the permit area. Cross section locations are shown in Figure 7–6. These sections are based on historical stratigraphic data for the Twowells Sandstone Tongue of the Dakota Sandstone through the Westwater Canyon Member of the Morrison Formation (referred to as “mini logs” on Figure 7–6). The data are contained in the 434 boreholes in the permit area; 155 of the boreholes have complete logs from the surface to the Westwater Canyon Member. Additionally, four new holes were drilled in 2007, three of which (S-2 through S-4) have complete logs from the surface to the Westwater Canyon Member of the Morrison Formation as shown in Figure 7-7. The fourth borehole (S-1) has logs only for the Brushy Basin and Westwater Canyon Members of the Morrison Formation.

Figure 7–8 is a northwest-southeast cross section in Section 9 (A-A’) that passes through the south part of Jesus Mesa and shows the gentle southeast dip of strata just west of the Fernandez monocline. A minor fault cuts across the northwest part of Jesus Mesa in Section 9. Additional faults with strictly lateral movement may cross the section line in the south portion of Section 9. Figure 7–9, a southwest-northeast cross section in Section 10 (B-B’), shows some of the dip along the Fernandez monocline; the true dip of this structure would be expressed in an east-southeast oriented cross section perpendicular to the structure. Figure 7–10, a northwest-southeast cross section in Section 16 (C-C’), includes two of the holes drilled in 2007 (S-2 and S-4) and cuts across two normal faults. These faults tilt and offset units in this section, exposing west-facing cliffs of the Dalton Sandstone Member of the Crevasse Canyon Formation.

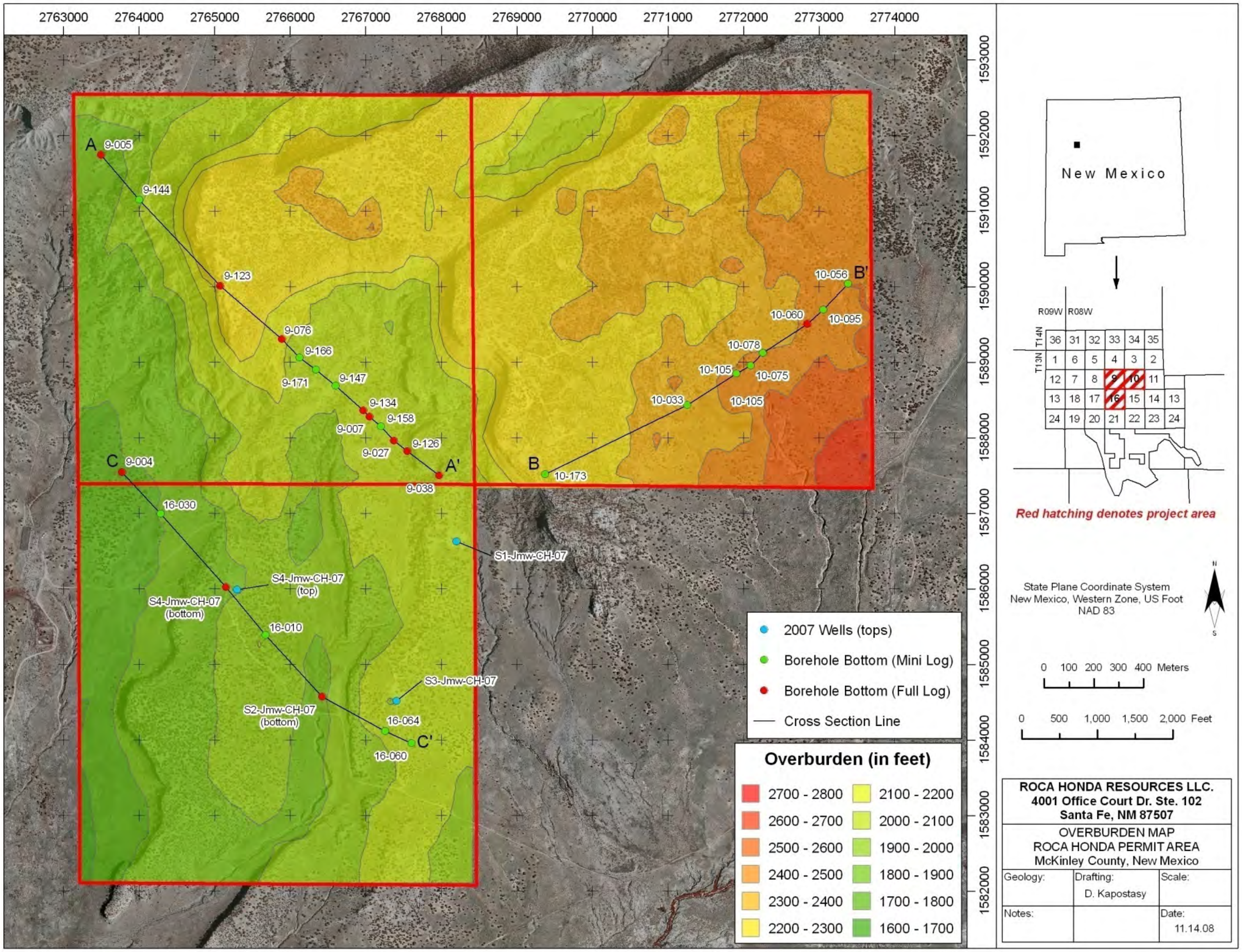

Figure 7-6. Overburden Thickness and Cross Sections at the Roca Honda Permit Area

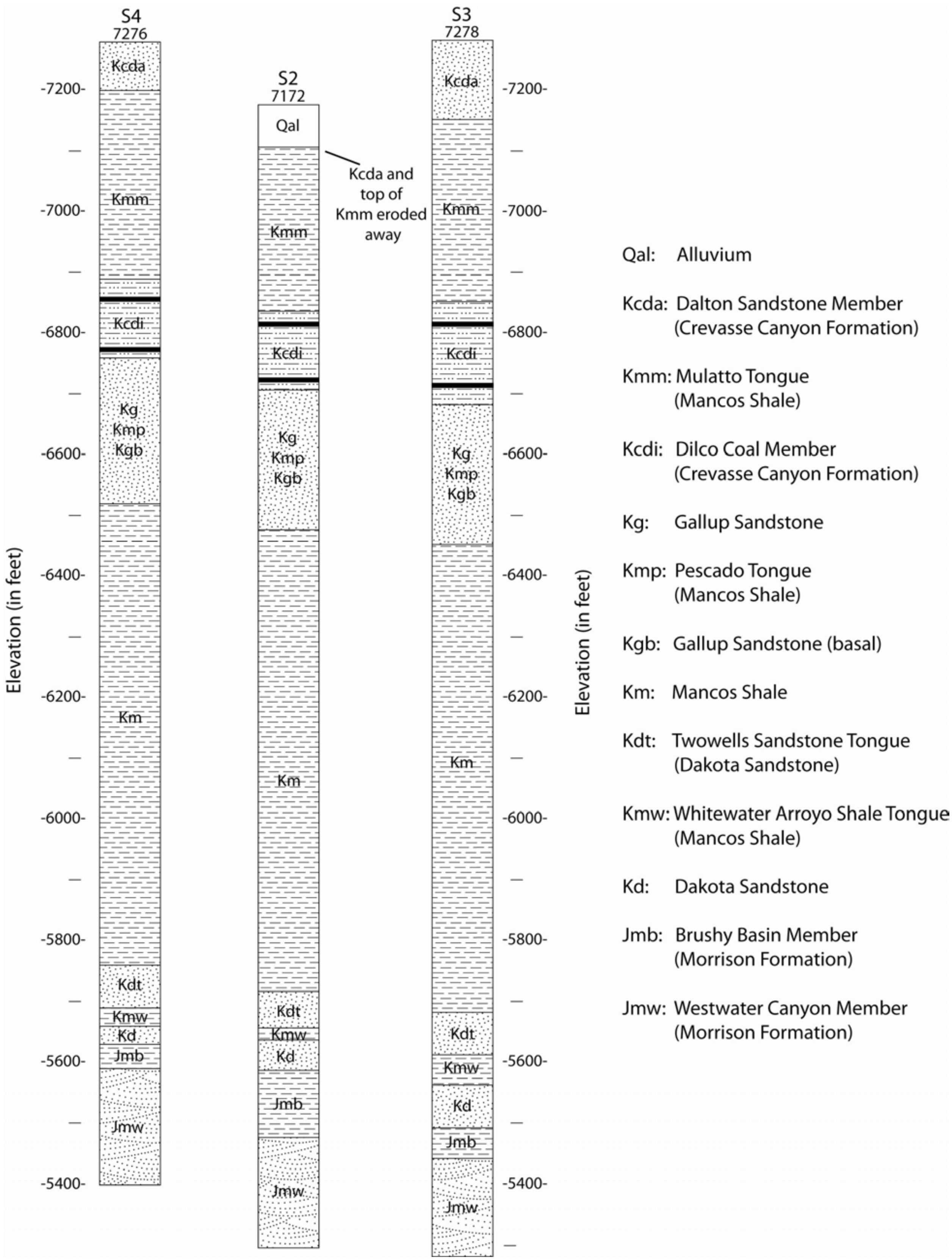

Figure 7-7. Lithologic Logs for Holes Drilled in 2007

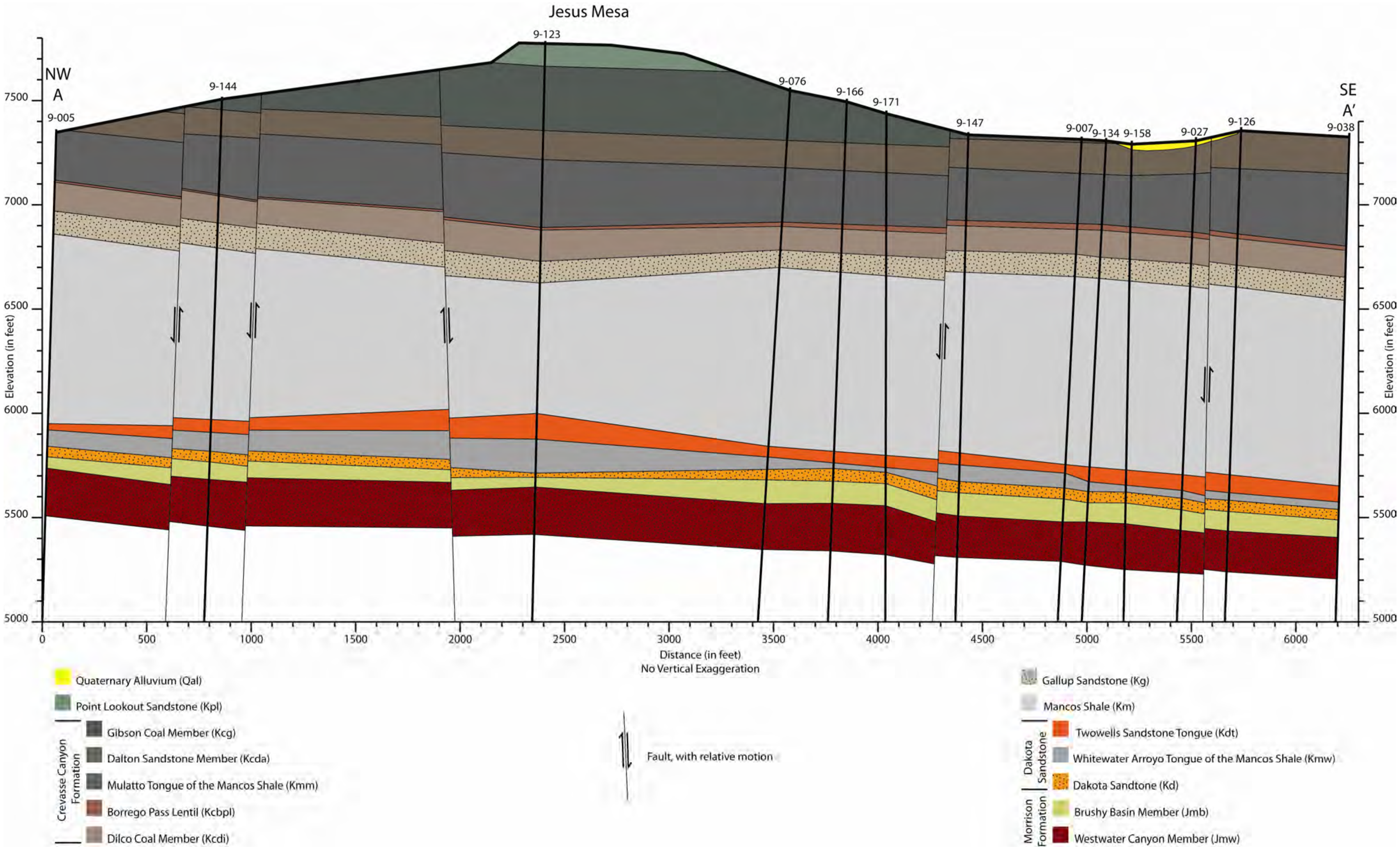

Figure 7-8. Section 9 Northwest-Southeast Cross-Section (A-A')

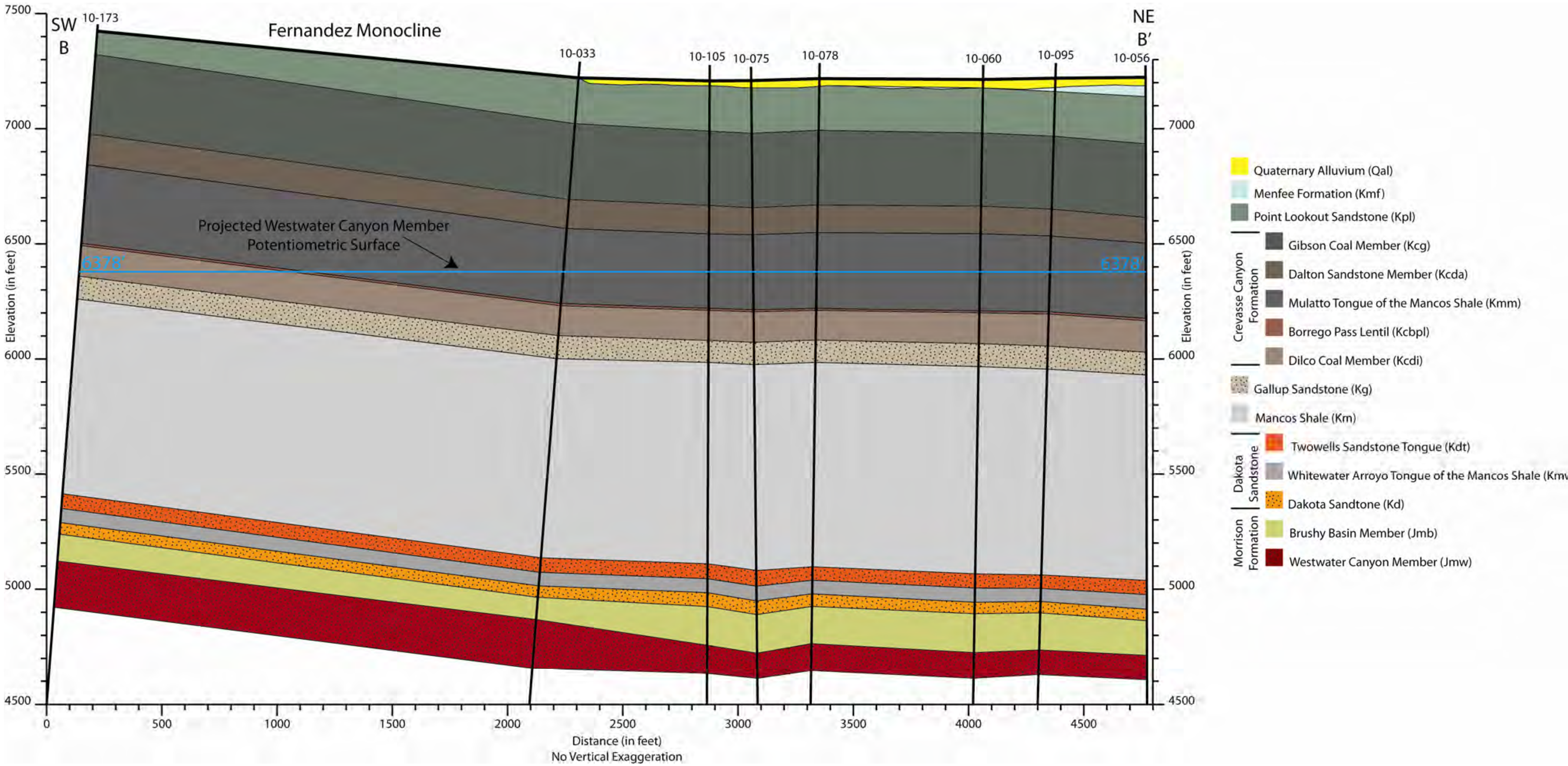

Figure 7-9. Section 10 Northeast-Southwest Cross-Section (B-B')

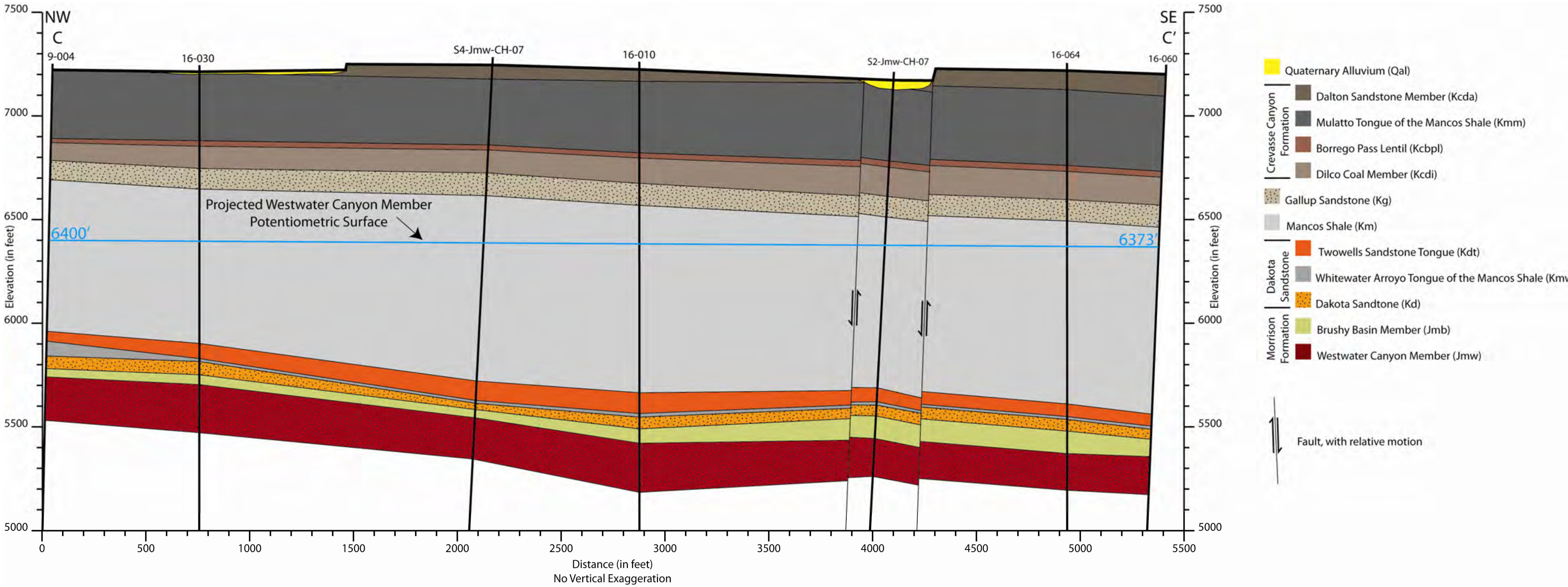

Figure 7-10. Section 16 Northwest-Southeast Cross-Section (C-C′)

The majority of the overburden is composed of shale and sandstone, with lesser amounts of coal and siltstone. These rock types (except coal) are relatively stable and resistant to chemical alteration. Current plans call for underground mining, and geochemical alteration of the overburden will be limited primarily to the surface.

Historically, acid mine drainage has not been a major problem in the Grants Mineral Belt. The material excavated during shaft construction and operations will primarily be overburden from rocks overlying the Westwater and material from the Westwater Formation, i.e., the ore zone. The only materials overlying the Westwater Formation in the permit area that have a potential to contribute to acid drainage are the thin coal beds in the Dilco Coal and the Gibson Coal Members of the Crevasse Canyon Formation. The Dilco Coal Member is in the subsurface in the permit area. Its disturbance will be inconsequential as it will be limited to transecting the formation during construction of the production and/or ventilation shafts.

The Gibson Coal Member crops out in Sections 9 and 10 and is composed of shale, siltstone, sandstone, and thin (<5 ft thick) coal beds. A content of 0.6 percent sulfur from trace amounts of pyrite in the Gibson Coal Member (Kirschbaum and Biewick 2000) could lead to the production of acidic drainage; however, laboratory studies show that shale/coal with sulfur contents less than 1 percent rarely produce significant acid drainage (Morrison 1985).

The Dilco Coal has an average thickness of 120 ft and a maximum thickness of 128 ft in the permit area. The Gibson Coal Member has a maximum thickness of 240 ft in the permit area.

In the Westwater Canyon Member, clay minerals are the primary iron-bearing phase (Riese, 1980). The Westwater Sandstone contains areas where the dominant iron mineral is hematite, and areas where the dominant iron mineral is limonite (Saucier, 1980). However, since both limonite and hematite consume pyrite when they form, this material has little potential to generate acid solutions.

7.2 Sampling Objectives

The sampling objective is to further define the geology in the permit area as it relates to the ore body, overburden, and surface geologic features.

7.3 List of Data to be Collected

The proposed action to fill the data need is summarized in Table 7–2.

Table 7-2. Data Need Identified for Geology

Data Need	Plan to Address Data Need
Complete surface geologic mapping at a larger scale in the Roca Honda permit area.	Field geologic mapping will cover all of Sections 9, 10, and 16. Work to date has included field observations during the 2007 drilling season on Section 16, along with limited work in Sections 9 and 10. Geology has also been mapped using aerial photographs of the permit area. Additional field work will consist of spot checking geology to confirm photogeologic mapping of the area and measurements of geologic features in the field. This information will be used to revise and supplement the geologic map of the Roca Honda permit area that presently consists of parts of two USGS 1:24,000 scale maps.

7.4 Methods of Collection

Field geologic mapping will cover all of Sections 9, 10, and 16. Work to date has included field observations during the 2007 drilling season on Section 16, along with limited work in Sections 9 and 10. Geology has also been mapped using aerial photographs of the permit area. Additional field work during 2008 will consist of spot checking geology to confirm photogeologic mapping of the area and measurements of geologic features in the field. This information will be used to revise and supplement the geologic map of the Roca Honda mine permit area that presently consists of parts of two USGS 1:24,000 scale maps.

7.5 Parameters to be Analyzed

Parameters to be analyzed are the additional field work confirming current geologic mapping of the area.

7.6 Maps Providing Sampling Locations

The Roca Honda Permit Area (Sections 9, 10, 16) and the immediate surrounding area as shown on Figures 7-2 and 7-3 generally make up the "sample location" for this activity.

7.7 Sampling Frequency

RHR's field geologist(s) will confirm the current geologic mapping performed by USGS as necessary.

7.8 Laboratory and Field Quality Assurance Plan

The field work will be performed by Strathmore for RHR in compliance with Strathmore's *Quality Management System* (QMS) *Program* and a *Field Quality Assurance Plan* (FQAP) specifically for this SAP. The QMS and FQAP provide a framework to which the personnel involved in data collection and analysis are expected to perform. Experienced geologists will review the geologic logs and aerial photographs.

7.9 Brief Discussion Supporting Proposal

The objectives of the proposed data collection are to delineate and confirm geologic conditions across the Roca Honda permit area. The historical geological logs and the core and logs from the 2007 Strathmore boreholes provided valuable information. The recent aerial photography also enhanced the historical data from the area. This information will be used to revise and supplement the geologic map of the Roca Honda permit area that presently consists of parts of two USGS 1:24,000 scale maps. Additional site visits, access to other nearby geology data, and any future drilling programs will continue to provide data to update geological knowledge of the area.

7.10 References

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