Data Collected from USGS Drilling in Lafayette Park, Washington, D.C. in November-December, 1976

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Abstract

In 1976, the U.S. Geological Survey drilled four holes in Lafayette Park in Washington, D.C. These holes encountered two Coastal Plain units (Quaternary (undifferentiated) and the Lower Cretaceous Potomac Group), and then bottomed in Paleozoic metamorphic bedrock. The stratigraphic relations of the Coastal Plain formations indicate that the Potomac Group strata become abruptly thicker from west to east across the park.

Introduction

In November and December, 1976, the U.S. Geological Survey drilled four hollow-stem auger/rotary core holes in Lafayette Park near the White House in Washington, D.C. Structure contouring of the Paleozoic bedrock surface by Darton (1950) and data for the nearby Washington Metropolitan Rapid Transit (METRO) subway (Mueser and others, 1967, Drawings F-PB-4, F-C-20) had indicated an abrupt thickening of the Coastal Plain sedimentary sequence from west to east across this part of Washington. The objective of the 1976 drilling was to acquire data on the Coastal Plain sequence and its contact with the underlying bedrock. Shelby tube and split spoon sampling methods were used in Coastal Plain sediments and mud rotary coring techniques were used in the hard bedrock. Drill hole locations are shown in Figure 1 with the hole numbers indicating the sequence of drilling.

Stratigraphic Results

The details of the area geology are available in Froelich and Hack (1975), McCartan (1990), Fleming and others (1994), Davis and others (2001), and Southworth and others (2001). The lithologic results from the Lafayette Park holes, designated LP1, LP2, LP3, LP4, are shown in figures 2, 3, 4, and 5. All of the holes bottomed in weathered biotite gneiss (bedrock) of presumed Paleozoic age (Fleming and others, 1994). In addition to the Paleozoic bedrock, our drill holes encountered two stratigraphic units common to the Atlantic Coastal Plain; the Cretaceous Potomac Group and the Quaternary (undifferentiated).

The Potomac Group strata overlie the Paleozoic bedrock in the Lafayette Park drill holes. The basal beds are generally gravel containing some fine- to very-coarse-grained quartz sand. The remaining beds are pale green arkosic sand interbedded with thin gravel lenses. Some of the finer sand beds are very clayey and gray due to a concentration of carbonaceous matter.

The Quaternary (undifferentiated) consists of orange to brown, silty to sandy clay. These strata appeared lithologically uniform in our core samples but nearby study sites contain layers of coarse sediment (see Mueser and others, 1966, Knox, 1969).

The drill holes also encountered a thin layer of manmade fill at the surface. This layer is identified by pieces of broken masonry and signs of mechanical disturbance. The base of this layer is difficult to define in drilling samples because of the inclusion of the underlying silty to sandy clay.

Paleontology

A bed of dark gray sandy carbonaceous clay was encountered in the Cretaceous Potomac Group section in holes LP1, LP2, and LP4. A sample of this clay (USGS Palynology Sample R1295) was collected at a depth of 48 ft in hole LP2 and processed for palynomorphs. The sample yielded a sparse, poorly preserved assemblage of low diversity that consists exclusively of terrestrially derived organic matter (e.g., spores, pollen, wood fibers, plant cuticle, inertinite). The assemblage is dominated by bryophyte and pteridophyte spores, but angiosperm pollen are present as very rare elements. Included among the angiosperm pollen types are representatives of *Tricolpites crassimurus* (Groot & Penny) Singh 1971 and *T. sagax* Norris 1967. According to Doyle and Robbins (1977), these two taxa co-occur in their pollen zones II-A and II-B, which have been dated as middle to early late Albian stage of the Early Cretaceous. Further information is available in Groot and Penny (1960), Brenner (1963), and Doyle (1969).

The age of the Quaternary (undifferentiated) unit could not be established in our drill holes, but a Pleistocene age was reported by Knox (1969) from a 3 ft thick layer of peat exposed ten ft below street level in the foundation excavation for the Dolly Madison House. The Dolly Madison House is adjacent to the northeastern corner of Lafayette Park on the east side of Madison Place. Knox (1969) notes that the deposit is small because it is absent in a 66 ft deep pit located 165 ft southwest of hole LP3 (Fig. 1) (see also Mueser and others, 1966). None of our drill holes encountered this layer, so it must be isolated to the area east of the park. The characteristics of the Quaternary (undifferentiated) strata from the Lafayette Park area are consistent with those of nearby peat-bearing deposits studied by Wentworth (1924) and Hay (1924).

Conclusions

Our drill data show that the thickness of Cretaceous and younger (Coastal Plain) strata along our west to east line of drill holes in Lafayette Park abruptly increases from 62 to 94 ft in a horizontal distance of 325 ft. In this line of section, the thickness of the Cretaceous Potomac Group strata increases from 24 to 53 ft, whereas the Quaternary (undifferentiated) thickness increases from 31 to 38 ft. This evidence indicates that the base of the Coastal Plain strata descends rapidly in an eastward direction as shown in cross sections by Mueser and others (1967, Drawings F-PB-4, F-C-20) along the local METRO lines at Lafayette Park and Eye Street. The pollen in sample R1295 indicates that the Potomac Group strata are Early Cretaceous (middle to early late Albian), and pollen from a nearby pit indicates that the overlying Quaternary (undifferentiated) unit is Pleistocene. The change in thickness of these units either could be from structural and (or) depositional processes in Cretaceous to pre-Quaternary time.

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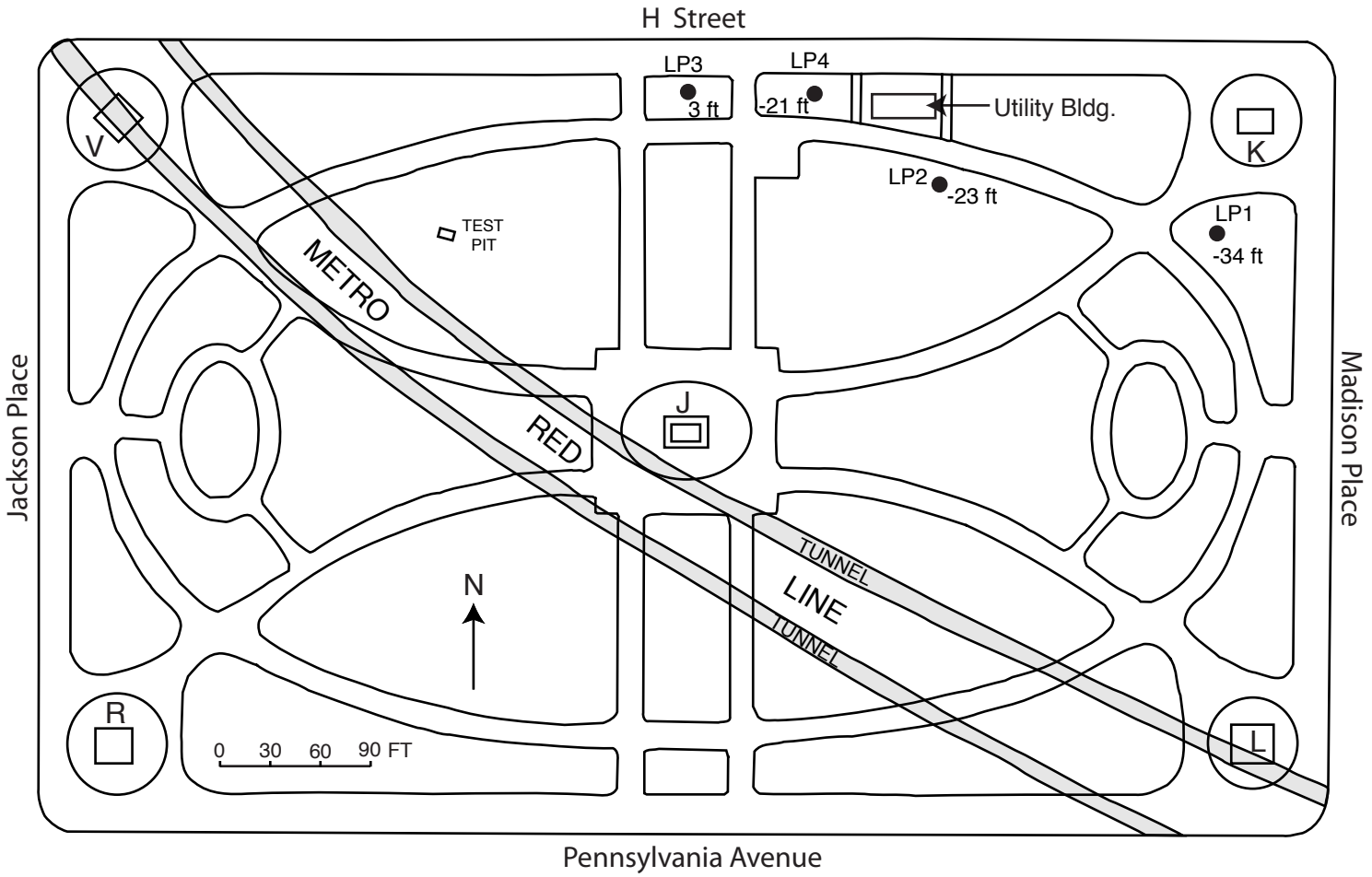

Explanation

LP2 ● -23 ft — Drill hole showing hole number and altitude of base of Cretaceous strata

TEST PIT — Test pit of Mueser and others (1966) referenced by Knox (1969)

R — Monument; K = Kosciuszko, L = Lafayette, R = Rochambeau, V = Von Steeben, J = Jackson

Figure 1: Map of Lafayette Park showing U.S. Geological Survey drill holes (LP1, LP2, LP3, LP4), test pit of Mueser and others (1966), METRO Red Line tunnels and park structures.

DRILL HOLE SITE LOG

Drill Hole Lafayette Park (LP-1) Date Nov., 1976 Total Depth 98 ft

Location East end of Lafayette Park immediately south of Koscivszko Monument

Collar Elevation +58 ft Logged by D. Prowell

Driller USGS BERG Drill Crew Lat./Long. lat 38° 53′ 59″ N., long 79° 02′ 09″ W.

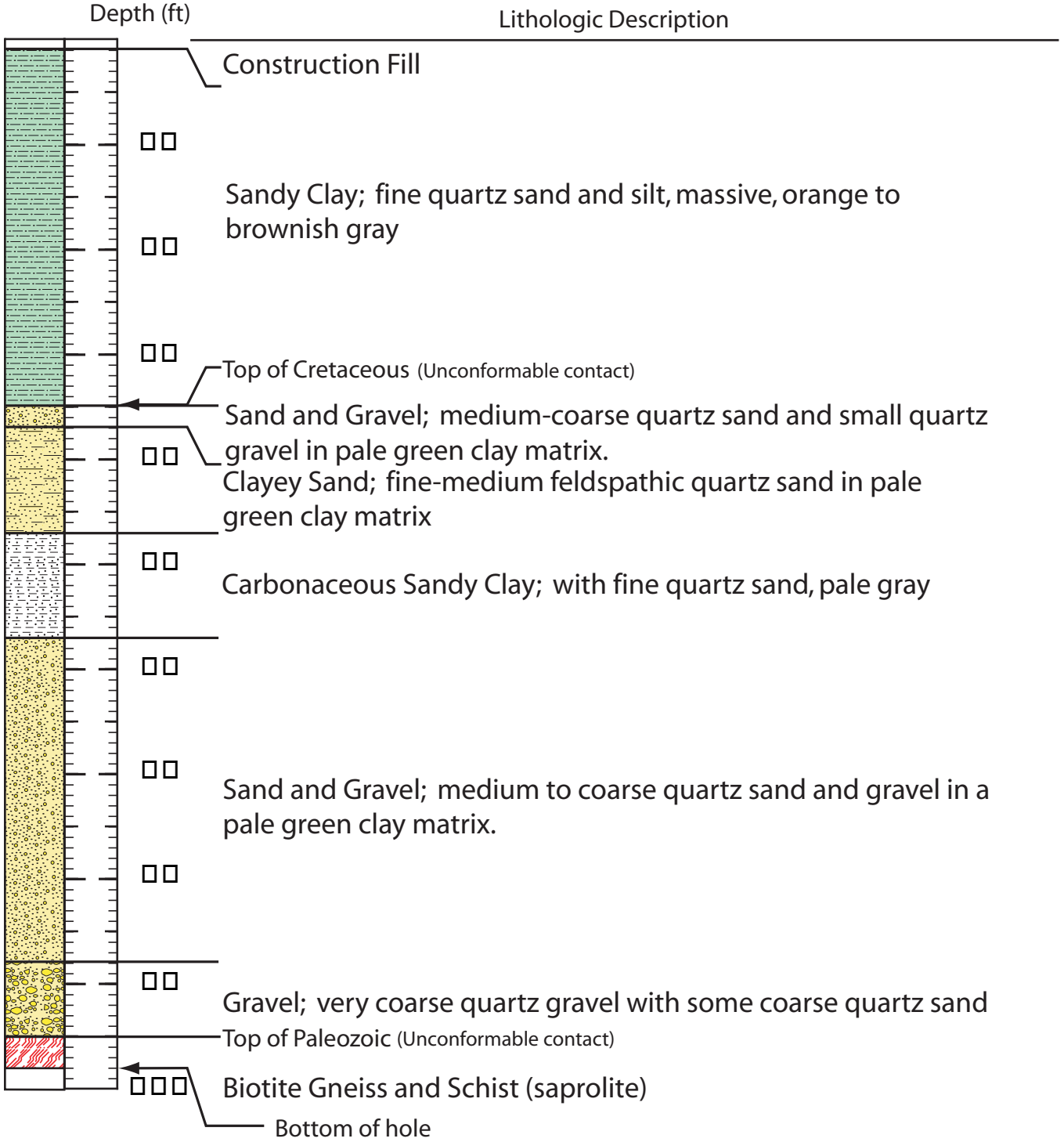

Figure 2: Drill site log of Lafayette Park hole LP-1.

DRILL HOLE SITE LOG

Drill Hole Lafayette Park (LP-2) Date Nov., 1976 Total Depth 100 ft

Location North end of Lafayette Park 95 ft. WSW of Koscivszko Monument

Collar Elevation +60 ft Logged by D. Prowell

Driller USGS BERG Drill Crew Lat./Long. lat 38° 53′ 59″ N., long 79° 02′ 11″ W.

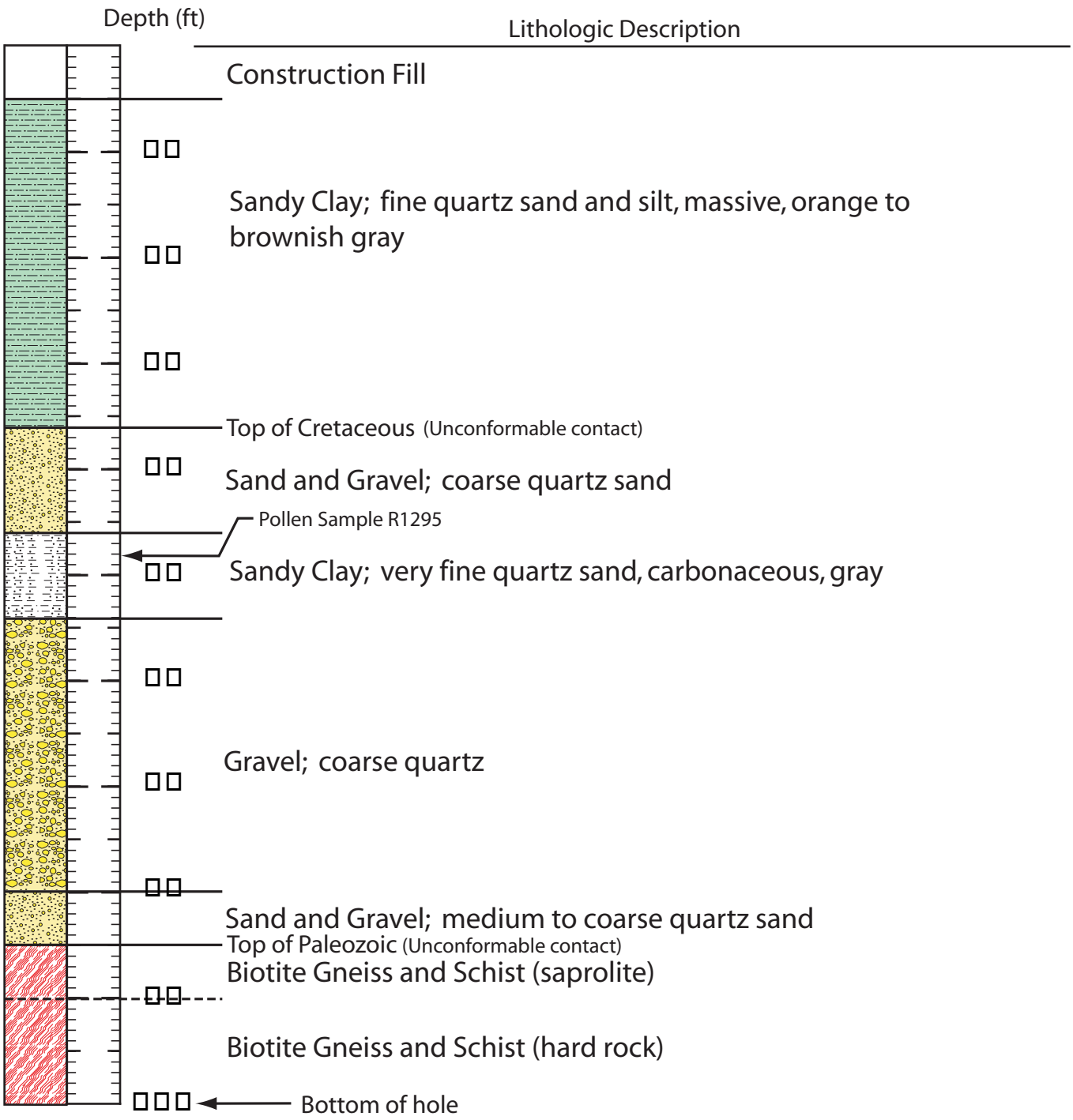

Figure 3: Drill site log of Lafayette Park hole LP-2.

DRILL HOLE SITE LOG

Drill Hole Lafayette Park (LP-3) Date Nov., 1976 Total Depth 67 ft

Location North edge of Lafayette Park centered due north of Jackson Monument

Collar Elevation +62 ft Logged by D. Prowell

Driller USGS BERG Drill Crew Lat./Long. lat 38° 54′ 00″ N., long 79° 02′ 13″ W.

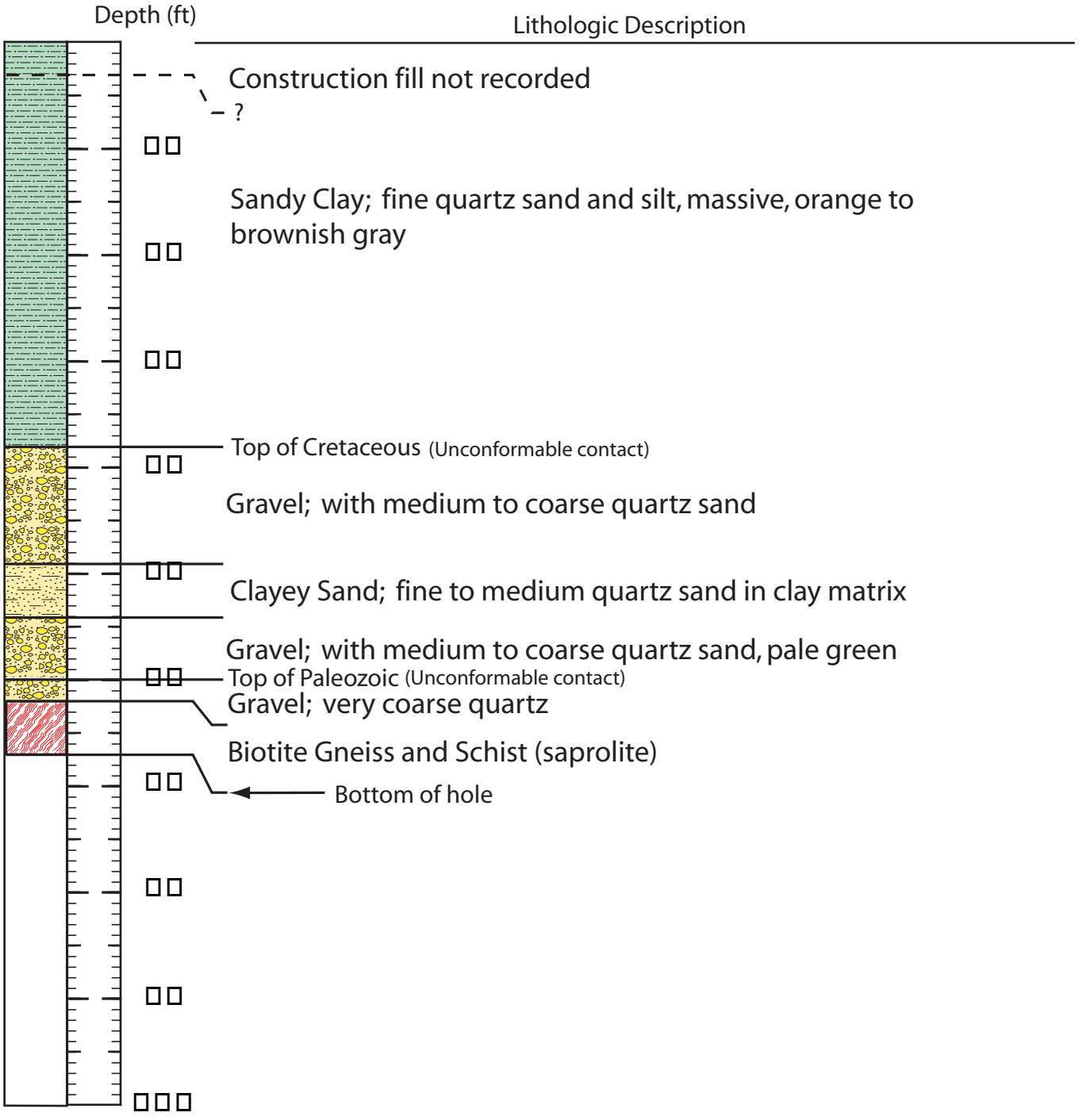

Figure 4: Drill site log of Lafayette Park hole LP-3.

DRILL HOLE SITE LOG

Drill Hole Lafayette Park (LP-4) Date Nov., 1976 Total Depth 98 ft

Location North edge at center of Lafayette Park 25 ft. west of utility building

Collar Elevation +60 ft Logged by D. Prowell

Driller USGS BERG Drill Crew Lat./Long. lat 38° 54′ 00″ N., long 79° 02′ 12″ W.

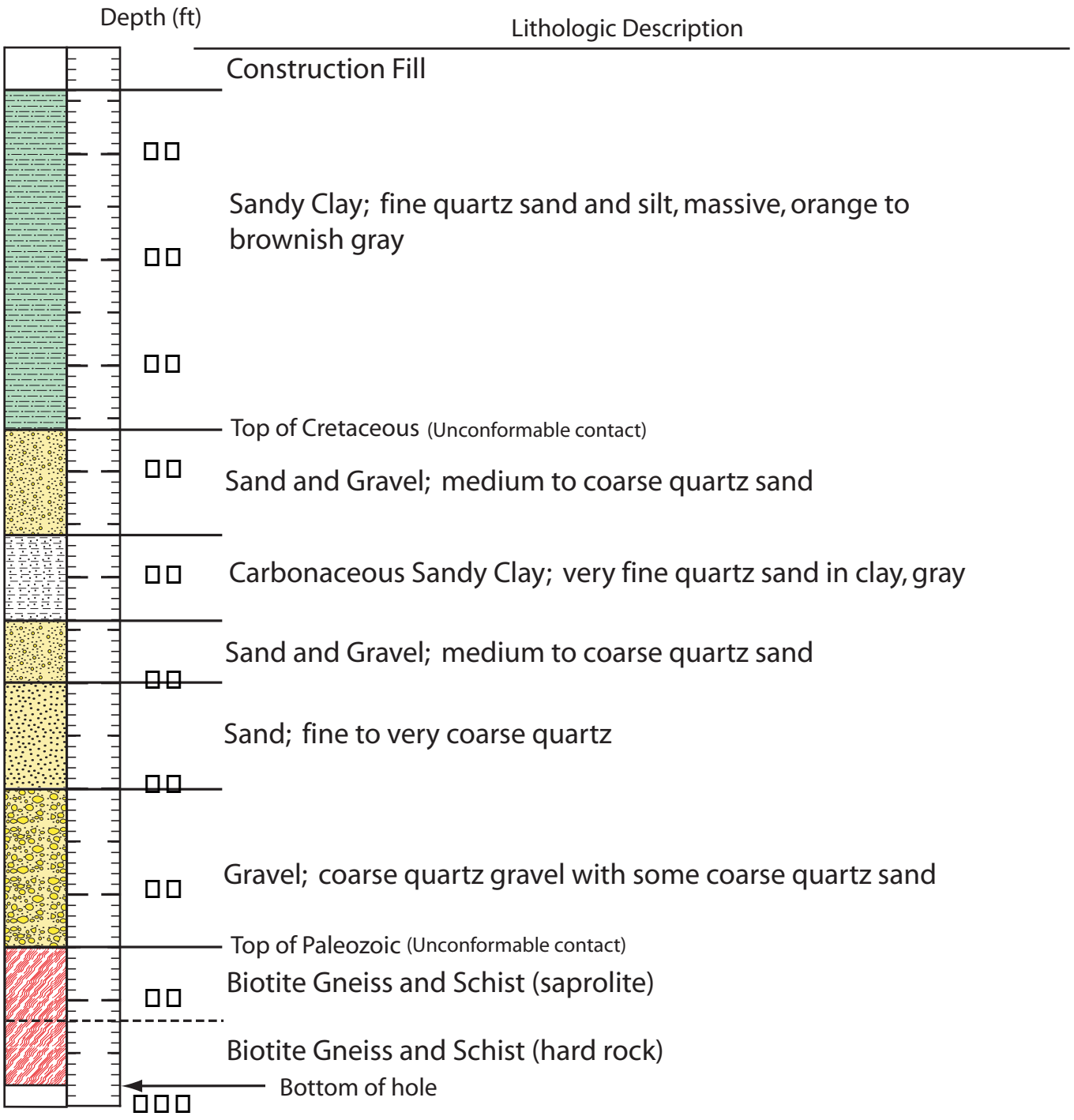

Figure 5: Drill site log of Lafayette Park hole LP-4.