Excavation monitoring at the Department of Public Health building site in Rocky Hill, CT
A Final Report and Dinosaur Track Catalog for the Department of Construction Services by The Connecticut Geological Survey

Randolph P. Steinen, Ph.D.

Connecticut Geological Survey
Office of Information Management
Department of Energy and Environmental Protection
and
University of Connecticut (Emeritus)

February, 2013

Note: This report contains a description of geological monitoring during excavation at the Department of Public Health (DPH) Laboratory site in Rocky Hill, CT, and the resulting paleontological and geological findings. More than 165 individual fossil footprints were recovered. Some remained on site and have been incorporated into landscaping or displays in and around the building. The remaining specimens are archived by the State Geological Survey.

TABLE OF CONTENTS

Fossil artifacts recovered during excavation at Department of Public Health Laboratory, Rocky Hill, CT: A Catalog

Randolph P. Steinen
Connecticut Geological Survey
Office of Information Management
Department of Energy and Environmental Protection

Summary

More than 165 fossil footprints made by dinosaurs over 200 million years ago were recovered during monitoring of the excavation in Rocky Hill for a new Connecticut Department of Public Health (DPH) laboratory. This report contains a photographic catalog of the recovered fossils along with a description of the geological observations made on the site and in neighboring the area (Appendices 1-4). Most of the fossil resources are archived by the State Geological Survey of Connecticut and are available for educational and scientific use. Many of the larger samples have been incorporated into the landscape around the grounds of the new building.

This recovery would not have been possible without the cooperation and planning of a number of groups. The commitment of the Department of Public Works (now the Department of Construction Services) to preserving antiquities enabled the resource recovery: planning started long before the building construction. The Department of Public Health agreed to absorb the additional costs necessary to support the recovery. The general contractor (Whiting-Turner Contracting Company) and the excavating contractor (Simscroft-Echo Farms General Contractors) and the equipment operators were extremely helpful during the recovery operation.

Introduction

During the summer of 2006 an equipment operator noticed fossil footprints on some slabs of rock during excavation for a new building at the neighboring Veterans' Home in Rocky Hill. This discovery lead to monitoring and recovery of almost 4 dozen fossil footprints during the remaining excavation. Plans were put in place for a similar recovery effort during construction of a new building for the Public Health Department immediately to the west of the Veterans' Home, and in the summer of 2010, more than 165 fossil foot prints were recovered and preserved. This report presents a pictorial catalogue of the fossil footprints recovered at the Public Health Laboratory construction site and the appendices summarize the geologic observations made during both construction projects.

Both sites are located on the south flank of the Rocky Hill Anticline in the Mesozoic Hartford Basin of central Connecticut (Appendix 1, Figure 1). The sites are literally just across the street from the well known trackway in the East Berlin Formation at Dinosaur State Park. The East Berlin Formation contains numerous track bearing layers and local excavators have uncovered tracks at many different places in the immediate area.

Pre-construction investigations suggested that new Department of Public Health Laboratory would be underlain by ledge that likely contained fossil foot-prints made by dinosaurs. Prior to initiation of construction, shallow pits were dug to test the strength of rock to help determine how much blasting would be necessary during excavation. These test pits confirmed the conclusions of pre-construction investigations; the first test pit unearthed several large and small fossil footprints (Appendix 4). This suggested that the strata would yield additional fossils if excavation was monitored in progress. Employees and volunteers from the State Geological Survey of Connecticut[1] monitored the site for two months while most of the excavation occurred and recovered more than 165 fossil footprints.

This document is a catalog of the fossils that were recovered during the monitoring. It includes a data table (Table 1) with descriptive information for each artifact recovered. The size of each sample was measured and a rough weight estimated. Weight of rocks was estimated using Sp.G.= 2.0 (density = 2g/cc), which is probably a little on the light side (*i.e*. the rocks are probably heavier than estimated). The measurements are in English units rather than scientific (metric) units[2] to facilitate its use by educators and the general public (schools, libraries, and museums).

In this catalog the footprints are identified to ichnogenus following nomenclature suggested by Nick McDonald (2010) because McDonald's book is a resource readily available[3] to the general public in Connecticut. Large footprints (>10") are referred to as *Eubrontes* sp.; small footprints (<6") are referred to as *Grallator* sp.; intermediate sized footprints are referred to as *Anchisauripus* sp. The size criteria are arbitrary and the beasts that made the tracks may have all belonged to the same genus (Olsen reported in McDonald), but were of differing age and, therefore, differing size. A distinct footprint not belonging to the above was recognized at this site (DPH-115 and 154). It was not assigned to an ichnospecies. Other species were not recognized at this site.

The collection is being managed by the State Geological Survey of the Connecticut Department of Energy and Environmental Protection, Hartford.

---

1. Randolph Steinen (UConn emeritus professor and compiler of this catalog), Margaret Thomas (State Geologist), Hugo Thomas (Former State Geologist and UConn Emeritus Professor), Peter Drzewiecki (ECSU Professor), Teresa Gagnon (Connecticut Geological Survey; Dinosaur State Park) conducted the monitoring at different times.

2. Conversion: 1inch = 2.54 cm; one pound = 453.6 gm.

3. McDonald, N.G., 2010, *Window into the Jurassic World*. Rocky Hill, Connecticut, Friends of Dinosaur State Park and Arboretum, 106p.

TABLE I.									table p. 1 of 2
ICHNOFOSSILS FROM PUBLIC HEALTH LAB CONSTRUCTION SITE,									
ROCKY HILL; SUMMER, 2010									
Sample #	estimated weight (lbs)	*#Eubr .*	*# Anchis.*	*# Grall.*	Unknown	Total	Type	aka	Lithology
DPH-101	300	1				1	negative		grey-sandstone
DPH-102	160	1	1			2	negative		grey-sandstone
DPH-103	300		2			2	negative		tan-ss
DPH-104	100	1	1	1		3	negative		rusty-weath gry ss
DPH-105	165	2		1		3	negative		rusty-weath gry ss
DPH-106	170		3	1		4	negative		rusty-weath gry ss
DPH-107	600		3	1		4	negative		rusty-weath gry ss
DPH-108	>1000		2	1		3	negative		tan-ss
DPH-109	>750		3			3	negative		silv-gry siltst-fg ss
DPH-110	>1000	3	2			5	negative		tan-ss
DPH-111a	800	1				1	positive		tan-ss
DPH-111b	95	1				1	negative		tan-ss
DPH-112	250	4		1		5	negative	12/07/6	rusty-weath gry ss
DPH-113	unassigned								
DPH-114	25	1				1	negative		rusty-weath gry ss
DPH-115	10				1	1	negative		silv-gry siltst-fg ss
DPH-116	65	1	5	1		7	negative		silv-gry siltst-fg ss
DPH-117	40			1		1	negative		tan-ss
DPH-118	35	1				1	negative	12/07/2	tan-ss
DPH-119	75	1				1	negative	12/07/4	tan-ss
DPH-120	70		1			1	negative	12/07/5	tan-ss
DPH-121	15			1		1	negative	12/07/3	tan-ss
DPH-122	190	1	2	1		4	negative		silv-gry siltst-fg ss
DPH-123	140			1		1	negative		rd-brn ss
DPH-124	14		1	1		2	negative		grey-sandstone
DPH-125	100	1	2	1		4	negative		tan-ss
DPH-126	90		1	1		2	negative		tan-ss
DPH-127	60	1				1	negative		silv-gry siltst-fg ss
DPH-128	40	1	1			2	negative		silv-gry siltst-fg ss
DPH-129	75	1		1		2	negative		rusty-weath gry ss
DPH-130	30		1			1	negative		grey-sandstone
DPH-131	50			2		2	negative		rusty-weath gry ss
DPH-132	50		1			1	negative		grey-sandstone
DPH-133	55	1	2			3	negative		grey-sandstone
DPH-134	25		1			1	negative		grey-sandstone
DPH-135	45						negative		grey-sandstone
DPH-136	50		1			1	Pos/neg		grey-sandstone
DPH-137	70	2	1	1		4	negative		grey-sandstone
DPH-138	80		1	2		3	negative		gry-raindrp ss
DPH-139	75	1	1			2	Pos/neg		gry-raindrp ss
DPH-140	80		1			1	negative		gry-raindrp ss

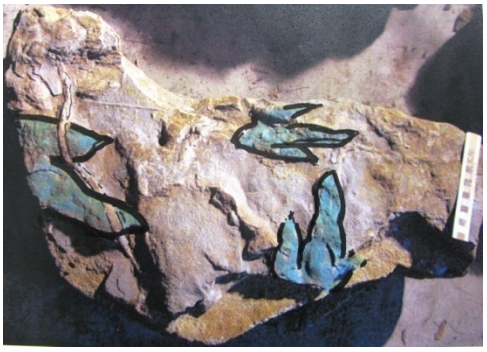
TABLE I.									table p. 2 of 2
ICHNOFOSSILS FROM PUBLIC HEALTH LAB CONSTRUCTION SITE,									
ROCKY HILL; SUMMER, 2010									
Sample #	estimated weight (lbs)	*#Eubr .*	*# Anchis.*	*# Grall.*	Unknown	Total	Type	aka	Lithology
DPH-141	60			1		1	negative		silv-gry siltst-fg ss
DPH-142	30		1			1	negative		grey-sandstone
DPH-143	70		1	1		2	pos/neg		gry-raindrp ss
DPH-144	25		1	1		2	negative		silv-gry siltst-fg ss
DPH-145	40	1				1	negative		tan-ss
DPH-146	125		1			1	negative		tan-ss
DPH-147	100		1	1		2	negative		silv-gry siltst-fg ss
DPH-148	125		1			1	negative		silv-gry siltst-fg ss
DPH-149	85		2			2	negative		tan-ss
DPH-150	165		2	1		3	negative		grey-sandstone
DPH-151	45		1			1	negative		tan-ss
DPH-152	900	2	2	1		5	negative		gry-raindrp ss
DPH-153	1200		2			2	negative		tan-ss
DPH-154	1100	3	2	2	1	8	negative		grey-sandstone
DPH-155	600	4				4	negative		tan-ss
DPH-156	1900	1				1	negative		grey-sandstone
DPH-157	750		1			1	negative		grey-sandstone
DPH-158	1300		1	5		6	negative	12/07/1	tan-ss
DPH-159	350	1	3	1		5	negative		rusty-weath gry ss
DPH-160	280	1				1	negative		gry-raindrp ss
DPH-161	275		3	1		4	negative		rusty-weath gry ss
DPH-162	165		5			5	negative		rusty-weath gry ss
DPH-163	700	1	4			5	negative		rusty-weath gry ss
DPH-164	200	2	1			3	negative		rusty-weath gry ss
DPH-165	250	2				2	negative		grey-sandstone
DPH-166									concretion
DPH-167									mudcracks
DPH-168	140		1	3		4	negative		rusty-weath gry ss
DPH-169		2	2	1		5	negative		
	Total tracks	47	78	39	2	166			

THE CATALOG

DPH-101. *Eubrontes* sp. track on right side of rock. This is a "negative print" that is preserved on the underside bedding surface of a sand layer that filled in the depression originally made by the beast. The track was made in gray mudstone that crumbled during excavation and was not recovered. Although the rock broke along edge of fossil track, most of the track is recovered. The track is 13" measured from the broken edge at the heel to the tip of the middle toe. Note the toe-nail impression at the tip of the upper toe. Several filled (raised) impressions may be poorly preserved tracks. Other marks on the slab may have been made by worms and insect larvae. Rock measures 16" x 32" x 9" and weighs about 300 lb.

DPH-102. *Eubrontes* sp. print on a trampled surface: negative (raised) print. Two filled toe impressions indicate the beast was walking toward the upper left. Third toe (left toe when turned over into correct stratigraphic orientation) obliterated by another beast stepping into it. All the traffic resulted in a poorly preserved specimen. Rock containing fossil measures 12” x 24” x 8” and weighs about 160 lb.

DPH-103 *Anchisauripus* sp. 8” negative (raised) print made by animal walking toward top. Print is not clear and may indicate that animal had mud-caked feet at the time impression was made. Part of a second foot print on bottom left of center. Other tracks/trails of unknown origin. Rock is 12” x 48” x 8” and weighs about 300 lb.



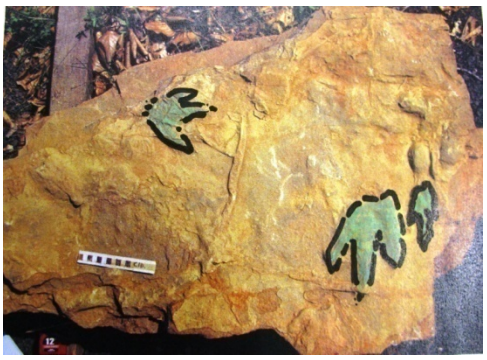
DPH-104 *Grallator* sp., *Anchisauripus*, sp., and *Eubrontes* sp. Several negative (raised) prints. On bottom just to right of center is part of a *Anchisauripus* sp. that measures more than 6". The middle and left toe are preserved. The beast was walking toward the top. Above that is a *Grallator* sp, walking toward the right. It measures 6" toe to heel. On the left side is part of a *Eubrontes* sp., also pointed toward the right. Two toes were recovered on this slab. Note toe-nail impression on upper toe. Just above the large toe is a filled *Grallator* sp. imprint, pointed toward the top. Looking at other areas of the rock, one could be convinced that other prints are poorly preserved. Rock measures 14" x 30" x 9" and weighs about 100 lb.

DPH-105 *Grallator* sp. and *Eubrontes* sp. Several negative (raised) prints. Large *Eubrontes* sp. negative on upper right corner has 11” preserved to the edge. It stepped on at least two other prints, one headed toward the left and the other headed toward the lower right. Upper left has a raised (negative) *Grallator* print that was partially scrapped off. The *Grallator* was headed toward the upper right. It measured 6” toe to heel. Rock measures 16” x 20” x 7” and weighs about 165 lb.

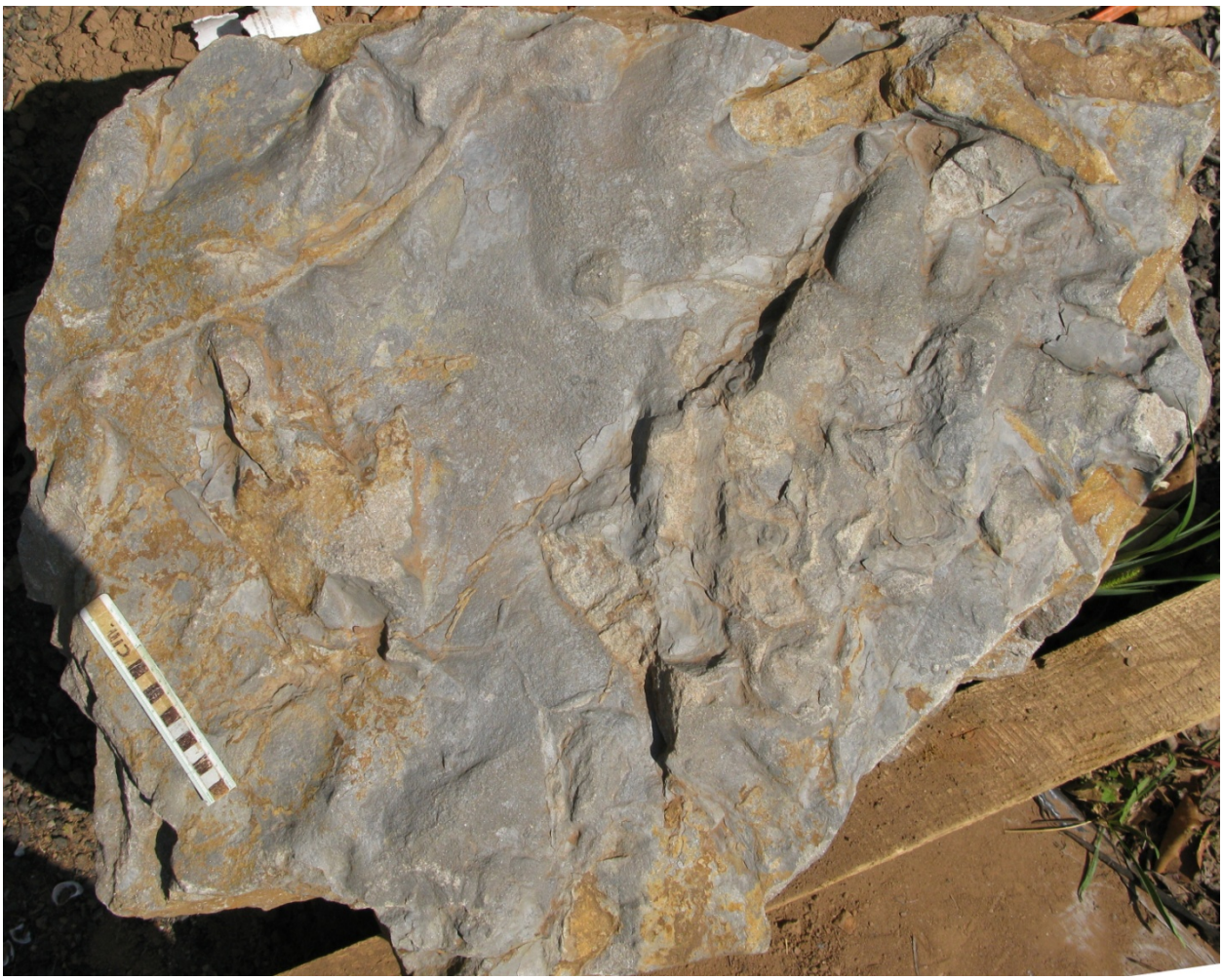
DPH-106 *Anchisauripus* sp. and *Grallator* sp negative tracks on large slab of grey medium-grained sandstone. Original tracks were made in grey shale, remnants of which can be seen on this sample. Two large *Anchisauripis*, both oriented toward the bottom are on the right and top; preserved prints measure >7" for the top one and >9" for the bottom specimen. They probably are both 10-11" in length. They were probably made by two different animals. The *Grallator* sp is on the left top and is oriented to the right. It measures about 5" heel-toe. An *Anchisauripus* sp, measuring 6.5", is in the center bottom and oriented toward the right. Rock measures 29 x 16 x 7" and weighs about 170 pounds.

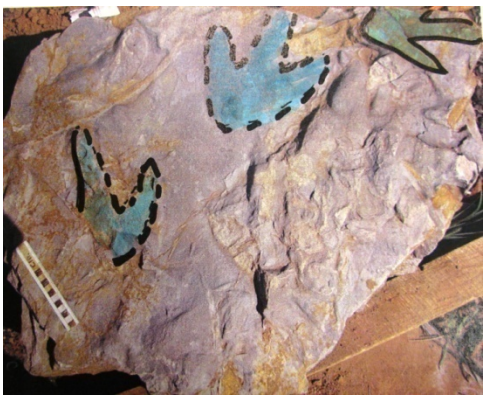
DPH-107. Three negative prints of *Anchisauripus* sp. are 9-10” in length. Two were headed toward the left and one toward the right. An unknown object, probably carried by slow currents, was dragged from top to bottom, across the bedding plane, gouging into the footprint indentation until it hit the edge of the middle tow. There it lifted up and did not gouge the bottom of the lower-most toe. It lifted off the bedding plane at the bottom of the specimen. A fourth print, *Grallator* sp., measures 5” and points toward the left. The small beast stepped on top of the drag mark and dragged his middle toe a short distance across the bedding plane. Tracks were made in grey mud and preserved by filling with grey, medium-grained sandstone. Numerous unidentified impressions may also have been made by animals walking on the mud or perhaps on a thin layer of sand that covered the mud layer. The rock measures 36 x 20 x 20” and weighs more than 600 pounds

DPH-108.



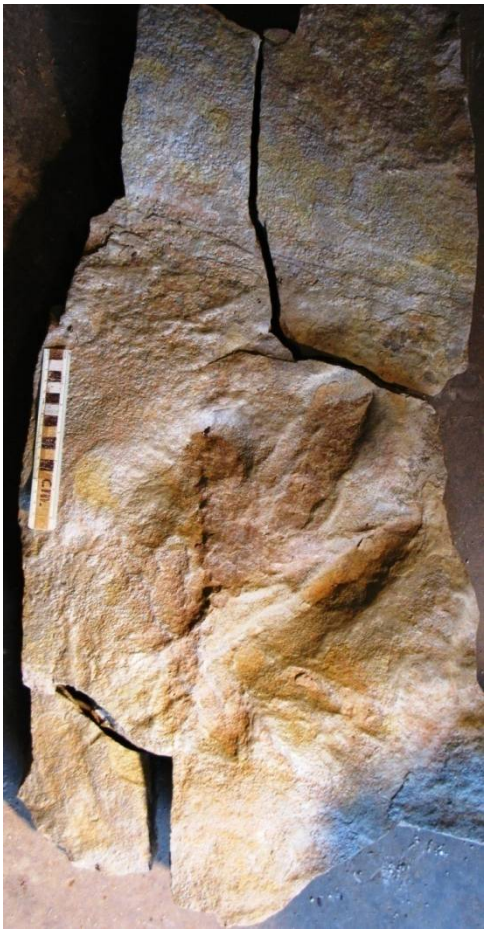
Two *Grallator* sp and an *Anchisauripus* sp., negative prints, in a medium-grained sandstone. The *Grallator* sp prints are both 5" in length. The one pointed toward the right has a much wider spread of the side toes than does the one pointed toward the bottom and may be a young *Anchisauripus* sp. *Anchisauripus* measures 8" and is pointed toward the bottom. Drag mark (? Or possibly a sand-filled desiccation crack) cuts across the tip of the middle toe of the *Anchisauripus*. The *Anchisauripus* is not as clear a print as the *Grallator*, suggesting that *Grallator* imprinted directly on the mud layer and that the *Anchisauripus* imprinted a thin layer of sand that covered the mud after the mud had desiccated. The *Anchisauripus* print is referred to as an underprint. Other impressions may have been made by animals, but could not be positively identified. The rock measures 48 x 30 x 12" and weighs more than one thousand pounds.





DPH-109. *Anchisauripus* sp or *Eubrontes* sp on a bedding plane that was disturbed by passage of several beasts; some walked across grey mud and some walked across thin layers of sand that covered the mud (and hence are underprints). Only three negative prints were highlighted but others certainly present but indistinct. The three outlined all measure 7-9". One in the center near the top is faint and is an underprint. The toe spread suggests it could be a young *Eubrontes* sp rather than *Anchisauripus*. Possibly another underprint is just below. Both point toward the top. Other tracks, trails, or drag marks are present on the bedding plane. Possible desiccation crack on upper left is filled with sand. Rock measures 38 x 29 x 10" and weighs more than 750 pounds

DPH-110. Large slab with faint impressions that possibly are all underprints. They are on a negative surface. Image is a composite of two separate images. Impressions are difficult to make out because they were made on a thin layer of sand that covered the mud layer along which the bed split (forming the slab above). The largest underprint measures 13" and was probably made by the *Eubrontes* sp. track-maker. The slightly smaller prints may be *Anchisauripus*. Hints of other prints may be seen scattered about. The surfaces were likely heavily travelled. The sandstone is medium grained and micaceous. It forms 3" thick beds. It was deposited on top of a grey mud layer, vestiges of which still adhere to the bedding plane. The rock measures 55 x 30 x 9" and weighs more than 1000 pounds.



DPH-111a (left) and **111b** (right) are a matched pair: 111b is the positive print (rotating this page a few degrees to the right will allow the reader to see the track as an impression in the rock) and 111a is on the bottom of the layer that filled in the impression. This track is unusual for this location because was made in a sandstone layer that split apart along a bedding plane with abundant mica flakes. The track is 10" heel-to-toe and likely an *Anchisauripus* sp. Faint impression of a log (?) runs diagonally across the top of both slabs. 111a measures 40 x 25 x 11" and weighs about 800 pounds. 111b is 33 x 16 x 2.5" and weighs about 95 pounds.

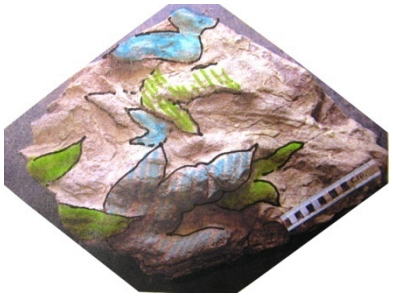
DPH-112 (a.k.a. 12/07/6 in earlier report). This slab with several negative prints was collected during preliminary test-pit excavations preliminary to initiation of construction. At least five tracks can be seen (see inset), pointed toward the left and right. Four are *Eubrontes* sp and one, at the top center, is a *Grallator* sp. The rock is a grey micaceous sandstone with grey feldspar grains and chalky (white) grains of clay that formerly were feldspar. The slab measures 48 x 24 x 4" and weighs about 250 pounds. 6" engineering scale on left side of specimen.

DPH 113. Number unassigned.

DPH-114. *Eubrontes* sp negative track in a gray medium-grained, rusty-weathering micaceous sandstone. Track is approximately 11" long. Rock sample is 16.5 x 8 x 2.5" and weighs about 25 pounds.

DPH-115. 6” negative track-like artifact is thought to be an unidentified species, but it may be a *Grallator* sp. with a wide toe-spread or it may be an unusual way the rock broke. Rock sample is 15 x 4.5 x 3.75” and weighs less than 10 pounds.

DPH-116 Several interpretations of this well trampled negative surface are possible. An imaginative interbretation (bottom right) shows 7 different tracks (*Eubrontes*, *Anchisauripus* and *Grallator*), one atop the other. A more conservative interpretation might identify only one track with a possible second print near the top. Both are 6-7" in length and likely *Anchisauirpus* sp. The lithology of the rock is greyish-brown, medium-grained sandstone. The sample measures 14 x 16 x 4" and weighs about 65 pounds.



DPH 117. *Grallator* or possibly a small *Anchisauripus.* Track is 5.5” toe to heel and the track-maker probably had muddy feet. This is a negative track made by the filling of the track impression by tan medium-grained cross-bedded micaceous sandstone. Bedding is 2-3”. Slab is 12 x 11 x 5” and weighs about 40 pounds.

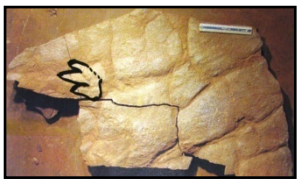
DPH 118 (aka 12-07-2) Fragment of a large negative *Eubrontes* track in a tan medium-grained micaceous sandstone. Sandstone measures 17 x 7 x 4" and weighs approximately 35 lb. .

DPH 119 (aka 12-07-4). *Eubrontes*, neagative in tan to gray medium-grained micaceous sandstone. Thin bits of underlying gray mudstone adhere to overturned surface of sandstone bed. Slab is 18 x 14 x 4" and weighs about 75#.

DPH 120 (aka 12-07-5). Negative print of *Anchisauripus* (possibly a small *Eubrontes*?) measures about 10’ heel to tow. Tan to grayish medium grained micaceous sandstone . Rock measures 22 x 9 x 5” and weight about 70 pounds..

DPH 121 (aka 12-0703). Negative *Grallator* print measures 5.5” heel to toe and is 3.5” wide. Rock is 10 x 8 x 2” and weighs about 15 lb.

DPH 122 Well trampled grey mudstone overlain by grey medium- grained sandstone with rusty weathering bedding planes. Two easily identified negative prints shown along with two interpreted prints (see inset). Largest print is 13” heel to toe. Rock measures 31 x 12 x 7” and weighs about 190 lb.

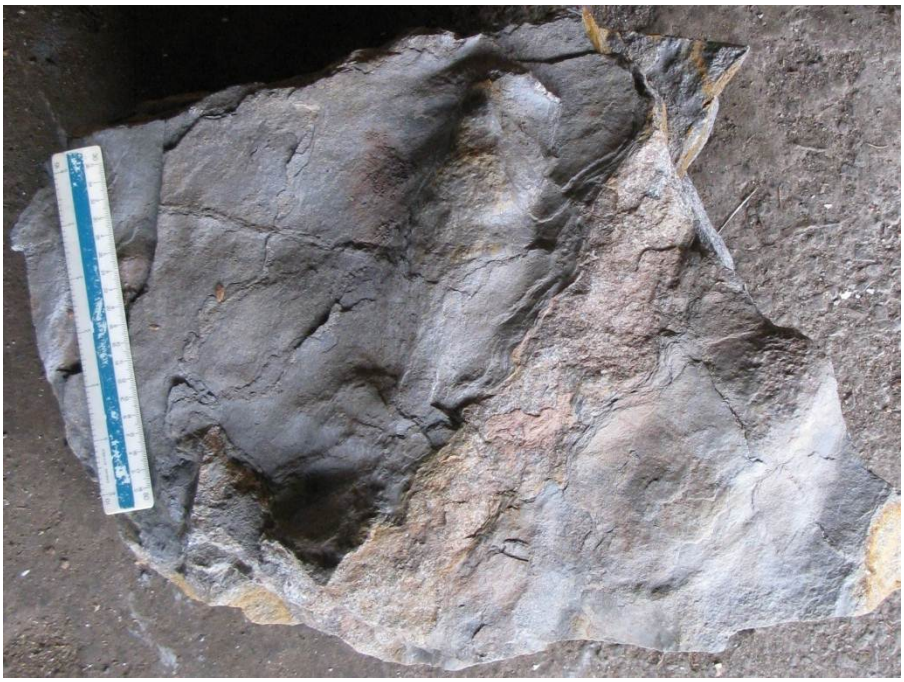


DPH 123 Faint negative print on reddish-grey medium-grained sandstone bearing mudcracks. This was collected in place and positive track was associated with the archived track. The positive track could not be recovered. This is the stratigraphically lowest track identified at the construction site (a lower track bearing horizon was found at the Veterans' Home site). Notice the mud-cracks. The track-bearing horizon was likely a very thin bed of reddish-brown mudstone that desiccated and curled up prior to deposition of the overlying layer. The overlying layer illustrated is composed of reddish-brown, thin-bedded, medium-grained sandstone. These lithologies are associated with ephemeral, often dry, lake deposits. The dinosaurs did not wander out onto the dry lakes very often because of the lack of food. The deposited sediment dried quickly and hardened, rendering the potential for making and preserving tracks in such surfaces is minimal. Illustrated rock slab measures 35 x 19 x 3" and weighs about 140 pounds.

DPH 124 Poorly preserved negative imprints. The reason for poor preservation may have been caused by mud covering the feet of the track makers, or possibly the surface was well trampled and maybe dry and stiff. The interpretation in the small inset is imaginative at best. The rock is gray medium- to coarse-grained sandstone. It measures 6 x 9 x 4” and weights about 15 pounds.

DPH 125 Negative prints on a tan, micaceous medium-grained sandstone. Large print in center is *Eubrontes* with a small *Grallator* just to the right. Two *Anchisauripus* tracks complete the identifiable fossils. Other marks may be partial tracks (tracks that were later stepped upon). Rock measures 31 x 12 x 4" and weighs about 100 pounds.

DPH 126 Poorly preserved negative track impressions superposed upon one another. Probably made by *Anchisauripus* and *Grallator* track-makers. Rock is tan micaceous sandstone. It measures 20 x 14 x 4.5" and probably weighs around 90 pounds.



DPH 127 Negative *Eubrontes* split by a mud-crack filled with coarse-grained brownish colored sandstone. Track was made in gray shaly siltstone which still adheres to the bottom of the overlying gray, medium-grained micaceous sandstone. Slab measures 13 x 7" and weighs about 60 pounds.

DPH 128. Negative *Eubrontes* track made in grey shaly siltstone filled in by tan medium grained sandstone. A second partial track (only the toes are on slab) can be seen on right edge. Rock is 12 x 11 x 4" and weighs about 40 pounds.

DPH 129. *Eubrontes* negative footprint at top left with a *Grallator* on upper center. Other markings of possible track-maker origin in center. Tracks are negative, filled in by rusty weathering grey sandstone. Rock measures 18 x 13 x 4" and weighs about 75 pounds.

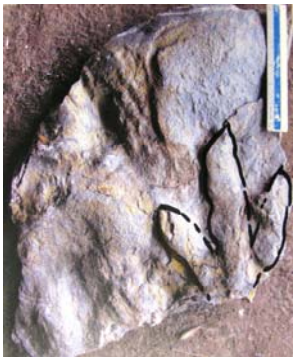
DPH 130. *Anchisauripus* negative made in grey, medium-grained muddy sandstone, filled in (overlain) by gray, medium to coarse-grained micaceous sandstone. Rock measures 15 x 8 x 3" and weighs about 30 pounds.

DPH 131 Two *Grallator* negative prints in rusty weathering grey medium-grained sandstone. Upper print (older) may be large enough to be *Anchisauripus*. Note older print (upper print) is deeper and must have been made when substrate was wetter and therefore softer. When newer print-maker stepped on top of older one, it did not make as deep an impression. An alternative interpretation is that the newer print was made by an animal that did not weigh as much as the earlier print-maker. Sample measures 9 x 13 x 6" and weighs about 50 pounds.

DPH 132. *Anchisauripus* negative print. Impression made in light grey muddy siltstone, parts of which adhere to sample. Impression filled in with medium0 coarse-grained gray sandstone. Sample measures 16 x 12.5 x 3.5” and weighs about 50 pounds.

DPH 133. Negative impressions made by three track-makers. Upper two were probably made by *Anchisauripu*s track maker. Lower track (only two toe-tips make it onto this slab) may be a *Eubrontes*. Sample measures 16 x 12 x 4" and weighs about 55 pounds.

DPH 134 . *Anchisauripus* negative. Thin-bedded fine- to medium-grained sandstone. Sample measures 14 x 11 x 2” and weighs about 25 pounds.



DPH 135 What can you see in this? Inset shows questionable interpretation of the markings on this sample. It is not clear that this is a track. Coarse- to medium-grained sandstone. Sample measures 13.5 x 11 x 4" and weighs about 45 pounds.

DPH 136 Top (left) and bottom (right) of sample with questionable markings. Right image shows equivocal marking possibly made by the *Anchisauripus* track-maker (see inset). Sample measures 15 x 13 x 3.5” and weighs about 50 pounds.

DPH 137 Four or more possible tracks, negative surface. Largest may be *Eubrontes*, smallest *Grallator*. Inset shows one interpretation. Other markings on surface may have been made by other beasts. This sample is not easy to interpret. Sample measures 23 x 9 x 4.5" and weighs about 70 pounds.

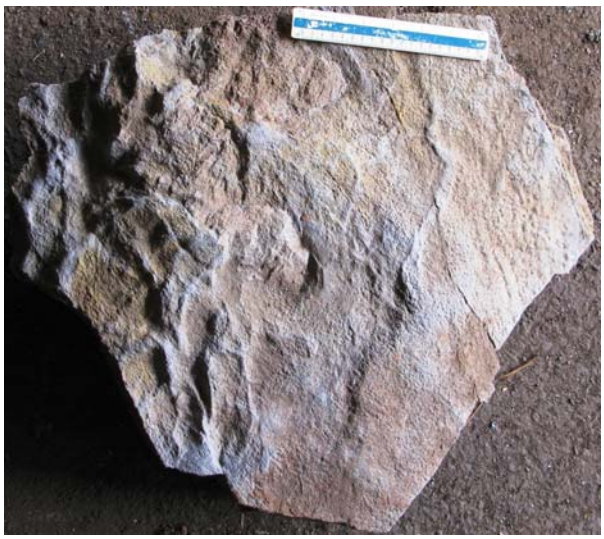
DPH 138 Two poorly preserved negative tracks on a surface that preserved rain-drop impressions. This suggests that the tracks were made in an overlying layer and are underprints. Larger track in center is likely *Anchisauripus*; track on right (not colored ion the inset) is likely *Grallator* sp. Sample is grey coarse- to medium-grained micaceous sandstone. This may be the overlying layer of the upper surface of DPH-139 (below left). It measures 26 x 11 x 4" and weighs about 80 pounds.

DPH 139. This sample has tracks on both its top (left) and bottom (right) surface. Track on top surface is a positive *Anchisauripus* print (impression) on a grey sandstone with raindrop impressions. It may be the mate of DPH 138. Bottom of sample has larger negative (raised) print that may be *Eubrontes* sp. Sample is grey medium-grained micaceous sandstone and measures 24 x 10 x 4". It weighs about 75 pounds.

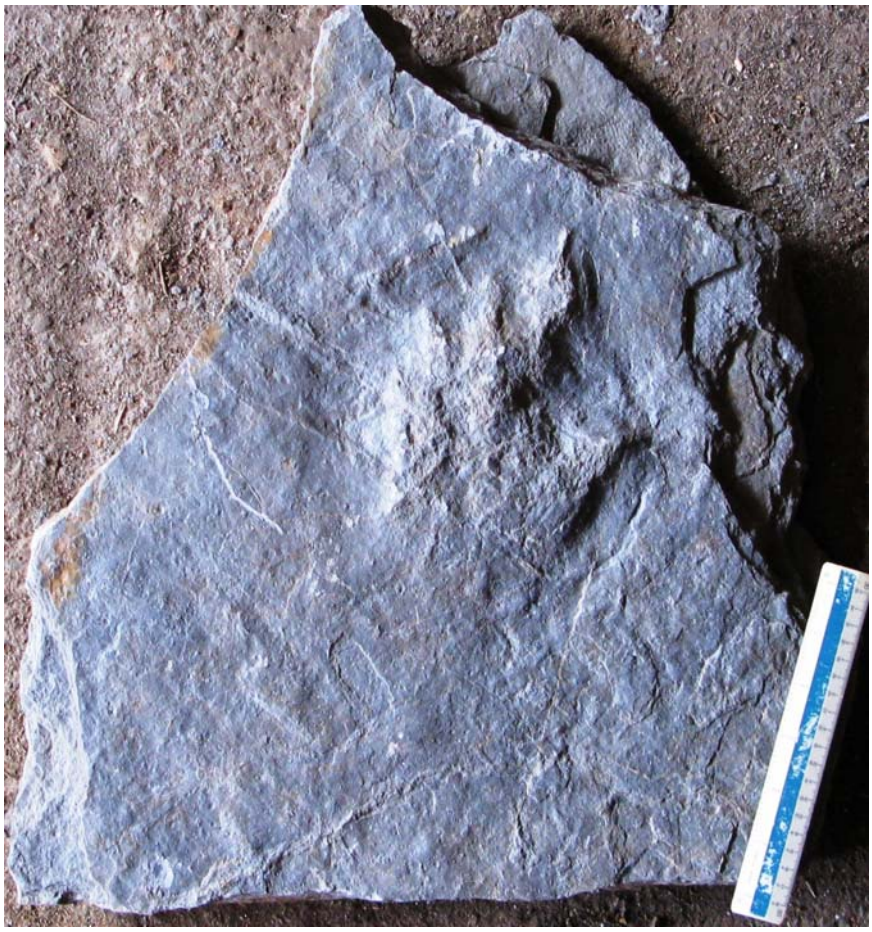
DPH 140 . Large negative *Anchisauripus* sp. track on a grey medium-grained micaceous sandstone with rain-drop impressions. Sample measures 15 x 15 x 5” and weighs about 80 pounds.

DPH 141. Indistinct negative track on a bioturbated dark grey fine-grained muddy sandstone. Impression probably made by *Grallator* track-maker. Inset not made for this sample. Sample is 20 x 8 x 5" and weighs about 60 pounds.

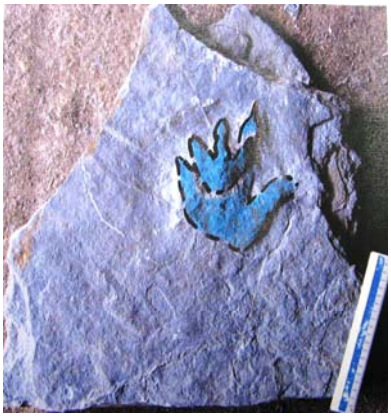
DPH 142. Poorly preserved negative *Anchisauripus* (outlined in blue on the inset) and possibly a *Grallator* on right. Rock is grey fine-garined muddy sandstone. It measures 20 x 10 x 2” and weighs about 30 pounds.



DPH 143. Sample with track fossils on both top (left) and bottom (right) surfaces. Top surface has a positive *Grallator* impression and probably rain-drop impressons. Negative print on bottom of sample is a little larger and probably an *Anchisauripus*. Sample measures 17 x 14 x 4" and weighs about 70 pounds.



DPH 144. Superposed tracks in grey siltstone. Older (larger) track is Anchisauripus. After that track-maker passed a smaller animal stepped on top the older track making the Grallator. Sample 15 x 15 x 1.5” and weighs about 25 pounds.

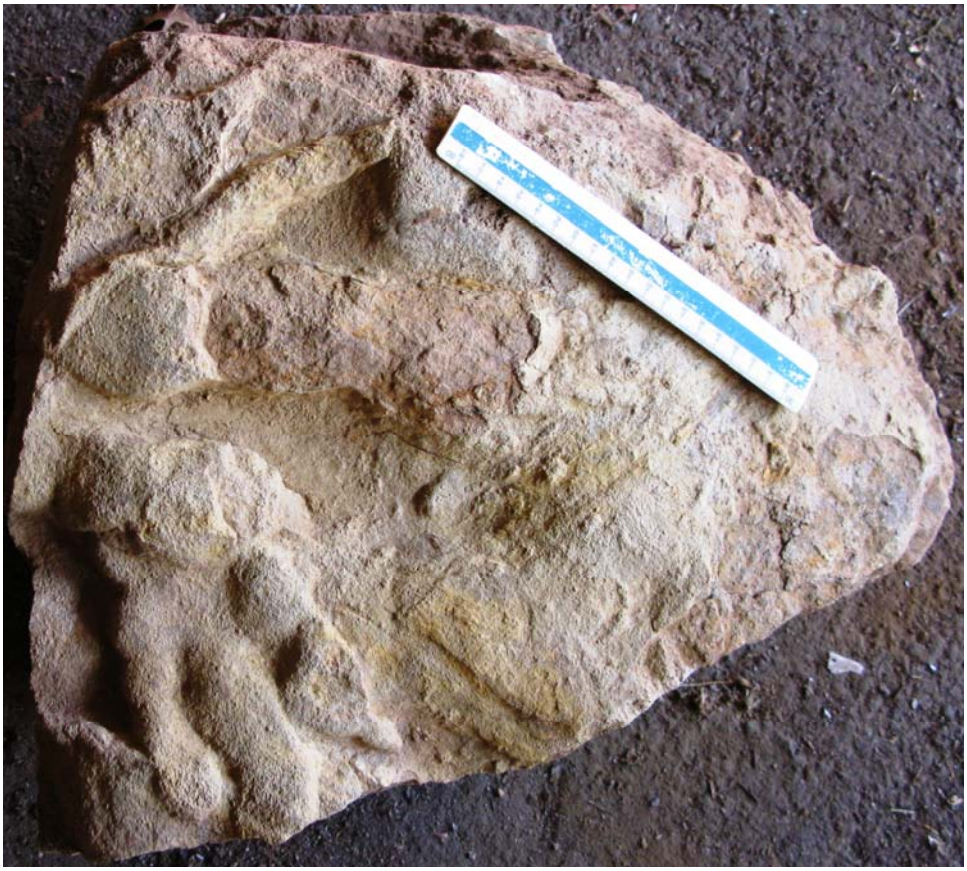


DPH 145. Negative surface with *Eubrontes* impression. Sample composed of tan medium-grained micaceous sandstone. It measures 20 x 10 x 3 and weighs about 40 pounds.

DPH 146. Negative *Anchisauripus* sp make in a grey mudstone that is overlain by tan medium-grained sandstone. A piece of the middle toe was lost during excavation. Sample measures 16 x 15 x 7.5” and weighs about 125 pounds.

DPH 147. Grey bioturbated sandy-mudstone with *Anchisauripus* tracks and possibly *Grallator* at the top. Interpretation (inset) is one of many possible. Sample is 26 x 14 x 4” and weighs about 100 pounds.

DPH 148. Negative *Anchisauripus* track in a grey bioturbated mudstone, filled in with grey medium- to coarse-grained sandstone that contains pyro-bitumen-filled pores. Sample measures 18 x 12 x 8” and weighs about 125 pounds.



DPH 149. Negative tracks are small *Anchisauripus* sp. Sample is tan medium grained sandstone. It measures 12 x 11 x 9” and weighs about 85 pounds.

DPH 150.
Anchisauripus sp negative in grey mudstone filled in with grey medium-grained sandstone with pyrobitumen filled pores. Note mudcracks. Sample measures 22 x 13 x 8” and weighs about 165 pounds.

DPH 151 *Anchisauripus* sp. negative print measures just over 7” in length. Toe pads are preserved. Pale grey to tan sandstone, medium-grained. Track impression was made in greenish-grey siltstone layer, some of which adheres to base of sandstone. It is approximately 23” x 19” and weighs about 45 pounds.

DPH-152. Large slab with several negative prints. Two large *Eubrontes* (top and bottom) may have been made by the same animal. Track at top stepped on top on a track previously made by an *Anchisauripus*. The *Anchisauripus* companion track is on the left just below center. A smaller *Grallator* print is seen on lower left. Poorly preserved rain-drop impressions on the shale surface. Slab measures 64" x 26" x 8" and weighs about 900 pounds. Hammer head is 5" and handle is 16".

DPH-153. Two poorly preserved *Anchisauripus* tracks are negatives and probably are underprints. Scale on right is about 6.5" long (black squares are 1 cm). Note poorly developed ripple marks that trend diagonally down to the right. These are made by wind-generated waves that travelled across the surface of shallow water. Other possible tracks are not specifically described here because of my uncertainty. Rock measures 92" x 33" x 8" and weighs about 1200 pounds.

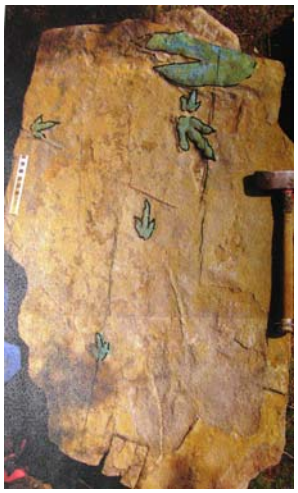
DPH-154. Negative tracks imprinted on a gray siltstone bed, filled in with grey fine-grained sandstone. Two *Eubrontes* tracks (one near top and half of one on bottom left side) made by animal walking toward top of page (as shown here). Several generations of tracks are seen on the left side of this slab. They are the size of *Anchisauripus.* A print of one *Grallator*, walking toward the bottom edge of the slab, is preserved near the middle. An unidentified track, having long and very thin toes, is at very top of slab.Other prints are possible. Slab measures 64” x 31” x 16” and weighs about 1100 pounds.

DPH-155. Negative tracks, filled in by tan, medium-grained sandstone. All the tracks are large and are probably *Eubrontes*. Slab measures 35" x 20" x 12" and weighs about 600 pounds. Scale is 6.5" long.

DPH-156. Oblique photo of tracked surface covered by grey siltstone (above). Irregularities of this surface suggest that many animals walked across for a period of time that caused obliteration of the early formed tracks. Although surface dried during the period of exposure, constant foot traffic compacted the mud preventing cracking. Dry mud also did not take impressions of later animals. Inset (right) shows poorly preserved track(s) possibly *Eubrontes*. Sample is 57” x 43” x 11” and weighs about 1900 pounds.

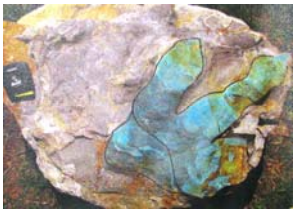
DPH-157. Oblique photo (above) of sample with poorly preserved positive print of *Anchisauripus*. Beast walked across partially dry grey siltstone and left only occasional imprints. Overhead view of track on right. Slab measures 62” x 22” x 10” and weighs about 750 pounds. Scale is 6.5” long. .

DPH-158 (aka #12/07/1) Large rock excavated during pre-construction testing contains several negative *Grallator* prints and *Anchisauripus* prints. One of the *Grallator* track-makers (very small) walked toward the top of the sample leaving three tracks recovered herein. Half of an *Anchisauripus* (top) was recovered. Curved linear features may have been made by floating branches that were dragged across the bottom during a period of shallow water. The curvature may be the combined effect of a current and a cross wind. Several straight drag features extend diagonally across the sample. One just above scale skipped across the bottom and scrapped the shallow part (heel) of a *Grallator* impression but not the deep part (toe). This perhaps represents the current direction. Scale is 6.5" long. Sample measures 57" x 27" x 12" and weighs about 1300 pounds.



DPH-159. Well trampled surface containing many negative imprints, one on top of the other. The clearest are high-lighted on the inset (right). *Eubrontes* on lower right may have impression of a *Grallator* in its "palm". Several *Anchisauripus* prints and other possible *Grallator* prints may be interpreted. Prints were made in grey mudstone and filled with grey sandstone (which can be seen where impressions broke parallel to bedding in the *Eubrontes* toes). Small curved worm track in center. Scale is 6.5". Sample is 34" x 21" x 7" and weighs about 350 pounds.

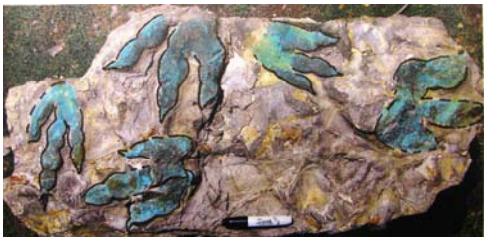
DPH-160. Large *Eubrontes* negative track imprinted in dark grey mudstone , some of which may be seen between the toe impressions. Thick sandstone bed filled in the imprint. Tape measure is two inches at base. Rock measures 20” x 15” x 12” and weighs about 280 pounds. .



DPH 161. Well trampled surface with several tracks negative imprinted on top of one another. *Anchisauripus* and *Grallator* prints are identifiable. Other impressions are not clear enough to identify. The imprinted layer is dark grey mudstone. Grey to tan sandstone fills in the imprints. Marking pen is 5.3" in length. Rock is 21" x 15" x 12" and weighs about 275 pounds. .

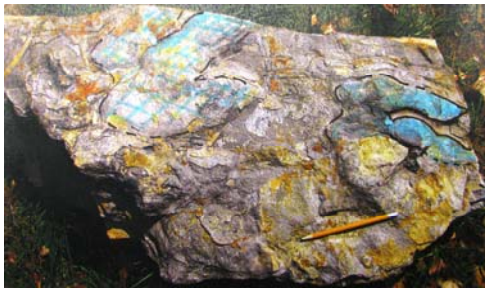
DPH-162. Although many negative tracks or partial tracks may be interpreted on this slab, none are well preserved or even complete impressions. All are about the same length and must have been made by animals about the same size. Some are so faint that they are probably underprints from one or two layers above. All are of the size to be classified as *Anchisauripus*. Impressions made in grey mudstone that was overlain by grey sandstone that has rusty weathering grey bedding planes and fractures. Marking pen is 5.3" in length. Slab approximately 19" x 20" and is 9" thick. It weighs about 165 pounds. .

DPH-163. Well trampled surface on which at least 5 negative tracks may be interpreted. Other poorly preserved tracks likely present also. Largest track is about 10’ in length and may be classified as *Eubrontes*; others are all *Anchisauripus*. Impressions made in grey mudstone that was filled in with grey sandstone, Marking pen is 5.3” in length. Sample measures 41” x 17” x 14” and weighs about 700 pounds.



DPH-164. Negative tracks of two *Eubrontes* and one *Anchisauripus*. Made in grey mudstone that was filled in by lite-grey sandstone that weathers rusty along bedding planes and fractures. Pencil is about 6” in length. Rock slab measures 26” x 16” x 8” and weighs approximately 200 pounds..

DPH-165. Two negative *Eubrontes* tracks made in grey mudstone and filled with lite grey medium-grained sandstone. Pencil is about 6” in length. Rock measures 32” x 15” x 8” and weighs about 250 pounds.



DPH-166. Concretion in tan conglomeratic sandstone with phyllilte pebble clasts. No fossil tracks recognized on this rock. Disc on key chain is 2” in diameter.

DPH-167. Mud-cracked bedding plane in grey mudstone. This is a negative surface (i.e. the sediment that was deposited on top of the mud-cracked layer). No fossil tracks are recognized on this surface. Marking pen is 5.3”.

DPH-168. Negative *Grallator* tracks. Medium-grained grey sandstone filled in the tracks that may have been made on a sand surface rather than on a grey mudstone. Rusty-weathering bedding plane. Marking pen is 5.3” in length. Rock measures 26” x 15” x 5’ and weighs about 140 pounds.

DPH-169. Two surfaces bearing negative tracks. The older surface on left contain one recognizeable Grallator track. The younger surface (one depositional event younger: a thin bed of sandstone was deposited, filling in the Grallator print, is overlain by black mudstone, on which a different set of beats walked. The younger layer has three or four negative prints of *Eubrontes* and *Anchisauripus* .

END OF CATALOG.

Appendix 1. Stratigraphy of a part of the East Berlin Formation on the Department of Public Health Laboratory campus, Rocky Hill, CT.

Introduction

The State of Connecticut built two new facilities (see Figure 1) on the south flank of the Rocky Hill Anticline between 2005 and 2011. During that construction stratigraphic data about the upper part of the East Berlin Formation was collected. This report summarizes information collected at the second building site (Department of Public Health Laboratory).

The East Berlin Formation is composed of sedimentary layers that were deposited in streams and lakes (Klein, 1968; Hubert et al, 1976; Demicco and Gierlowski-Kordesch, 1986) about 200-milllion years ago in a deep valley formed during the incipient breakup of the supercontinent Pangaea. At the time, Connecticut was near the middle of Pangaea, and was located closer to the equator than now (see reconstructions on internet by Scotese 2001 or Blakey, 2001). The climate was warmer. Moreover, the climate cyclically alternated from humid to semiarid and that affected the composition and grainsize of sediments that were deposited. During the humid phases, perennial lakes formed in the region and layers of gray sandstone and mudstone were deposited. During the semiarid phases ephemeral lakes and intermittent streams formed in the region and reddish-brown sandstone ("brownstone") and siltstone layers were deposited. Thus the East Berlin Formation consists of reddish-brown layers punctuated by gray layers. The best exposure of the East Berlin Formation is its type section, which is located about 5 miles to the southwest of the construction site and is described by Olsen et al, 2005.

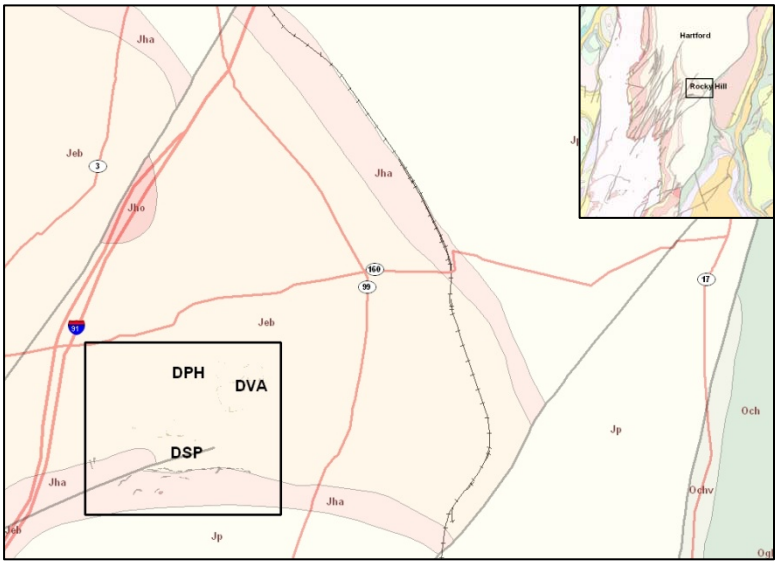


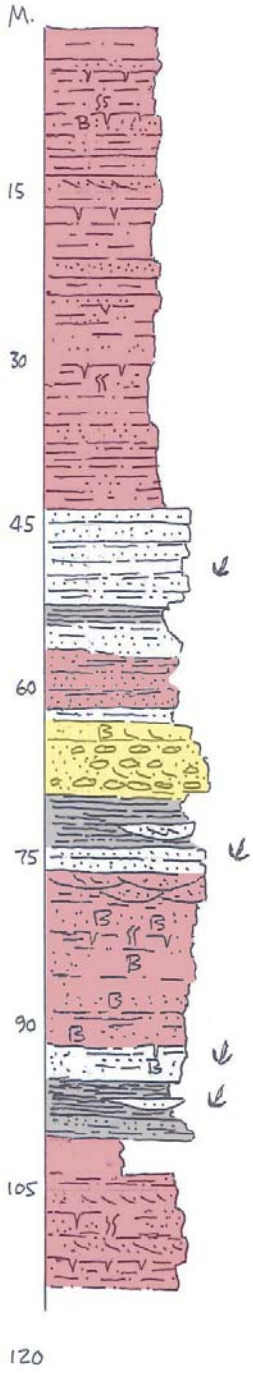
Figure 1. Index map showing Rocky Hill Anticline and location of the Department of Public Health Lab construction site (DPH), the Department of Veterans' Affairs campus (DVA) and Dinosaur State Park (DSP). Map approximately 4 miles wide. Outlined area of Figure 13 shown in lower left. Inset (upper right) shows location of Figure 1 relative to the Mesozoic Basin in the central part of Connecticut. Inset map approximately 30 miles wide. Geology is from Rodgers, 1985.

Previous investigation

Observations made during 2006-7 construction projects at the neighboring Veterans' Home and at a subdivision abutting the west side of the DPH site established a stratigraphic column of alternating fine-grained gray beds and reddish-brown coarse- to fine-grained beds that is typical of the East Berlin Formation (Figure 2). Pre-construction cored borings (Appendix 3)

confirmed that the stratigraphy observed at the Veteran's home could be geometrically projected to the DPH site. The upper two fine-grained grey beds were encountered during the boring tests. The building is sited on the middle grey bed (~72-75 m on Fig. 2), which had proved fossil bearing at the Veterans' Home and, indeed, from which fossil tracks had been recovered during preconstruction test excavations at the DPH site. The rock layers are gently tilted toward the south: older rocks are near the surface on the north side of the building and younger rocks on the south side of the building.

Figure 2. Stratigraphic column of a portion of the East Berlin Formation observed at Veterans' Home. Stratigraphy encountered at DPH-Lab site is middle third (~52-80 m) of what is shown below (see Appendix 2 for sediment description). Scale in meters (1m = 3.28').



Reddish brown sandstone and siltstone; medium- and coarse-grained lithic arkose and fine-grained ripple laminated sandstone may contain rip-up clasts; local bitumen bearing porous layers. Sandstone may be "hard". Playa and alluvial plain sequences.

Gray sandstone, "hard", medium-grained with gray siltstone interbeds. *Grallator* and *Eubrontes* tracks. Fine- grained bluish-gray sandstone at base.
Dark greenish-gray and gray silty mudstone; local turbation; dropstones.
Gray micaceous medium-grained sandstone, ripple-laminated; interbedded with greenish gray shaly siltstone, locally turbaded and desiccated.
Yellowish gray and greenish gray siltstone and very-fine grained sandstone; lower part contains porous, medium- and coarse- grained, cross-bedded, bitumen-bearing lithic arkose.

Conglomerate and conglomeratic lithic arkose; phyllite dominant clast type (monomictic in some strata), up to 15 cm; "hard".
Dark gray laminated claystone and gray siltstone. 1-meter lens of foreset bedded medium-grained sandstone locally.
Gray and brownish gray medium-grained sandstone, 1-2 cm beds; track bearing; "hard".
Lenses of reddish-brown medium-grained sandstone, some bitumen bearing.

Interbedded reddish-brown medium- to coarse-grained sandstone and brown turbated siltstone. Porous sandstones bitumen bearing.

Bitumen-bearing gray fine-grained sandstone with gray siltstone interbeds.

Dark gray and gray claystone with siltstone interbeds. Lens of track bearing.silty-sandstone. Thin-bedded light-gray fine-grained sandstone.

Brown and reddish-brown ripple-laminated fine-grained sandstone and desiccated and turbated siltstone. All siltstone at base of exposure. Playa and alluvial plain sequences.

Methods

Recovery of the fossil resources was greatly facilitated by the cooperation and help of the general contractor (Whiting-Turner) and the excavation contactor (Simscroft-Echo Farms) and their equipment operators. Several of the fossil specimens were first spotted by equipment operators. They helped move the heavier specimens.

Because of OSHA regulations, vertical cuts in the rock steeper that 2:1 were not allowed to stand. Vertical exposures of greater than 5 feet were deemed unsafe and approach to make measurements and observations was not permitted. Thus measuring layer thicknesses directly was difficult. In addition, soil and rock dust routinely cascaded over newly excavated rock, making careful observations difficult during active construction. Thicknesses reported here are derived from map measurements and measurements on cores that were recovered during preconstruction testing. Most observations and rock descriptions were made from excavated rock and enhanced by core descriptions. Most fossil footprints were collected from the excavated material and only rarely were specimens observed *in situ*. Although the *exact* stratigraphic position of most samples is not precisely known, the sequence of beds is known.

Observations

Stratigraphy of the building footprint

The oldest layers encountered were excavated from the north side of the building and the north wing. The oldest layers dip southward under the building site Figure 3a.

a.

b.

c.

Figure 3. a. Well cemented sandstone dips southward (toward right) beneath building footprint. Tubes sticking up from the bedding plane are powder receptacles for the blasting. Gray and black shale at base of excavated escarpment on south side of building are overlain by phyllite-clast conglomerate. b, c. Sandstone with pyrobitumen in pore spaces. Black pyrobitumen fills pore space in layers that retain porosity. Sandstone is medium- to coarse-grained, and composed of quartz and feldspar with minor amounts of muscovite mica. Pyrobitumen also coats some of the fracture surfaces. Engineers scale is slightly longer than 6"(less than 6" visible in b.; fingers ~ ½" in diameter). Photographs b. and c. by Teresa Gagnon.

They consist of coarse- and medium-grained sandstone beds, some of which are porous and contain pyrobitumen-filled pores (Figure 3). They range in color from reddish-brown, chocolate brown, reddish-gray, and black. The black layers owe their pigmentation to pyrobitumen filled pores. They are all arkosic sandstones and are interbedded with mud-cracked reddish-brown siltstone and fine-grained sandstone. Most are well cemented and very difficult to excavate. Excavation of these layers was facilitated by blasting. Core samples revealed that some of the beds contain cross-beds on a small scale. One fossil foot print (DPH 123) was found from the upper-most layers of this interval.

These older layers are interpreted as deposits of alluvial plains and ephemerial (playa) lakes. Pyrobitumen in the pores was likely generated from underlying black (organic rich) shale layers (one of which was encountered during construction at the Veterans' Home) including shale from the Shuttle Meadow Formation (not encountered at this site).

a.

b.

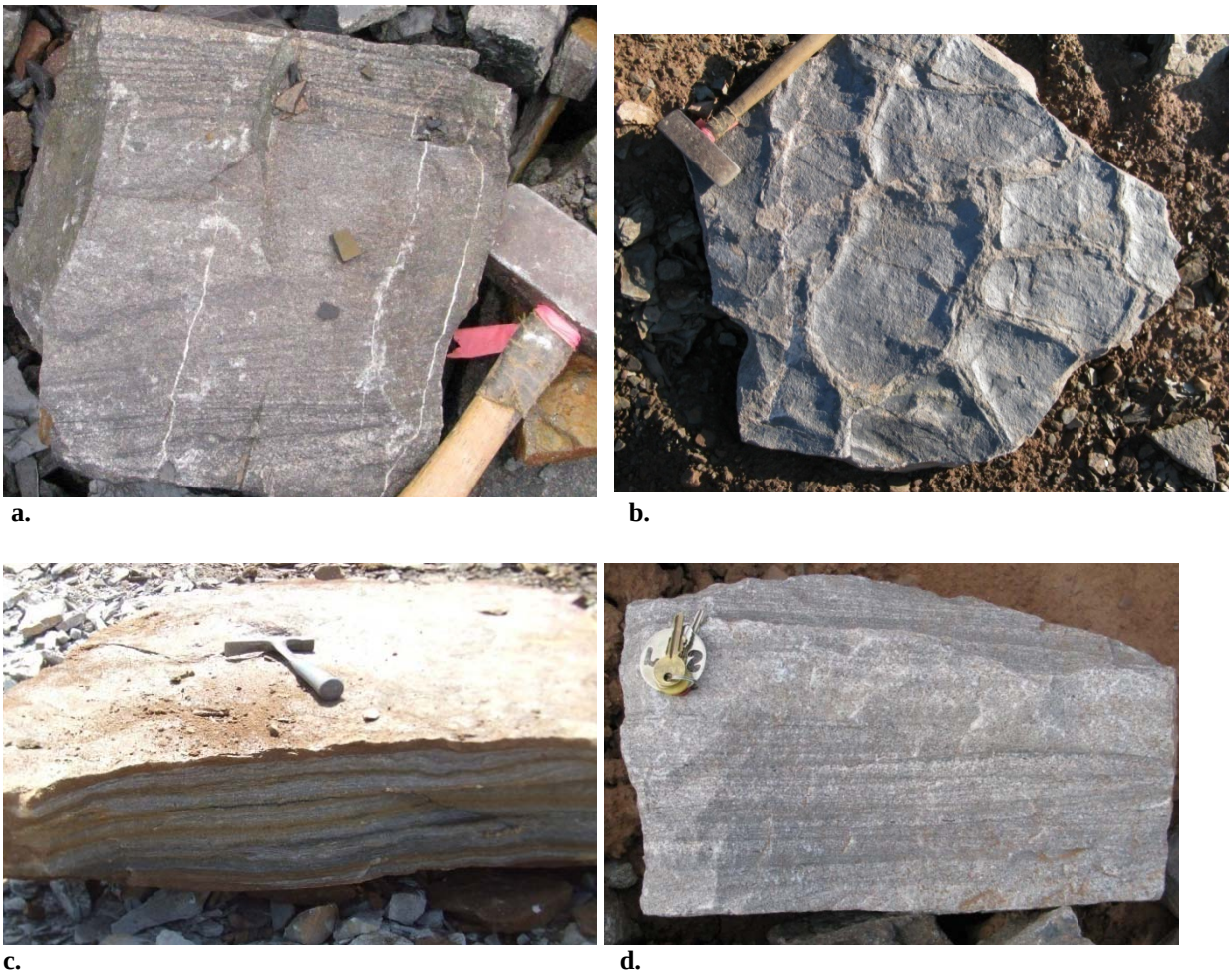
c.

d.

Figure 4. a. and b. Silver-gray siltstone overlies tan mud-cracked sandstone (part of "older strata" of this report). Track bearing sandstone overlies siltstone and is in turn overlain by black shale: a. from center of building (hammer is 12" long), b. from near western end of building. Track bearing layer behind hammer is almost one foot thick (hammer is 14" long). c. Southwest corner of building during installation of foundation and footings, looking eastward. Track bearing sandstone here is only about 10" thick and dips (is tilted) 10° gently southward. (Green backpack approximately 1 foot in diameter) d. Bedding plane of gray siltstone sample appears partially bioturbated. Indentation to which photographer points may be a scour depression or possibly is part of a foot impression.

Gray and black shale and siltstone layers interbedded with medium- to coarse-grained tan and gray sandstone layers, some of which have rust stained bedding planes, overlie the well cemented older strata (Figure 3a, 4a). These gray strata were excavated on the south side of the building's footprint; they contain the track-bearing layers at this site. These layers break apart easily along thin mudstone bedding planes and were excavated without blasting.

Silvery gray siltstone and mudstone overlies the upper mud-cracked reddish grey layer of the "older strata" (Figure 4a). The siltstone is generally mud-cracked and contains interbedded very fine- grained gray sandstone beds, some of which are thin bedded and ribbon like. Black carbon films are found on numerous bedding planes. The sandstone layers in the silvery grey siltstone produced a few fossil footprints (DPH 144, see p.48).



a. **b.** **c.** **d.**

Figure 5. Light gray and tan medium-grained sandstone with interbedded dark gray mudstone. a. Cross bedded well-sorted, medium-grained sandstone. Hammer head, which may be seen in Fig. 5b, is about 5" long. b. Bedding plane of mud-cracked dark gray mudstone overlying medium-grained sandstone. c. Plane-bedded well-sorted, medium grained sandstone with discontinuous mudstone laminae. Hammer 12" long. d. Some of the plane beds show low-angle truncation surfaces. Disc on key-chain about 2" in diameter.

Overlying the gray siltstone are coarse- to medium-grained sandstone and micaceous sandstone with thin mudstone interbeds (Figures 4 and 5). This layer ranges in thickness from almost 4 feet on the east side of the building to about 1 foot on the west side of the building (Figure 4b). The sandstone contains several track-bearing horizons that produced most of the

specimens recovered during the monitoring. Most of the tracks were made in gray mudstone interbeds that generally broke into small pieces during the excavation and hence were not recovered. The tracks were preserved as casts (negative tracks) on base of the sandstone deposited on top of and filling in the mudstone. Some the tracks were preserved on sandstone bedding planes that are slightly micaceous. Many of these proved difficult to recover because they were cut by closely spaced fractures and broke into fragments too difficult to reconstruct. Many of the bedding planes are disturbed, perhaps having been trampled upon by many beasts such that distinct footprints are not discernable (Figure 4d and photographs in the catalog of DPH-124, DPH-135 and DPH-137). Individual sandstone beds range in thickness from a few inches to as much as 6-8 inches. Some are cross-bedded (Figure 5a), some are mud-cracked (Figure 5b), some contain raindrop impressions on their bedding planes (DPH-140). Many of the coarse-grained beds contain about 60% quartz grains and less than 40% feldspar (Figure 5a and 5d), which seems unusually impoverished in feldspar compared to beds above and below. Most of the sandstone is well cemented with little remaining porosity, few beds contain pyrobitumen.

Figure 6. Black shale overlying the main track-bearing layer. The shale contains dark gray siltstone laminae, some of which may be graded. Near the surface bedding planes and fractures are iron-stained, which is probably caused by weathering of pyrite. Hammer head is 5" long.

Black shale overlies the fossiliferous sandstone beds (Figure 4b, Figure 6). The shale is thin bedded, in places laminated with micaceous siltstone interbeds. Many of the siltstone beds are graded. Basal laminae of many siltstone beds swell and thin in a regular cm-scale spacing. Rare parallel-crested ripples are present. Some very fine-grained gray sandstone interbeds are found in places. These are not graded, but have sharp basal contacts and may be rather abruptly overlain by black claystone laminae. Carbonate laminae were not identified. Coprolites (~1mm) are present on some bedding surfaces as are rare fish scales (fish fossils were not found). Small fragments of plants are found on some bedding planes of the shale. Some appear fern-like.

The middle beds are interpreted to have been deposited in and along the margin of a perennial lake that expanded and shrank in response to changing weather patterns and sediment supply. The lake at this location probably was never much deeper than wave-base[1].

---

1. Wave base is the depth which a passing surface wave is capable of disturbing the bottom. It commonly is about ½ the wave length

The lake was eventually filled with coarse-grained conglomerate that may have formed a large deltaic lobe that spread across the shallow lake margin.

The uppermost layers excavated at the building site are well-cemented coarse-grained tan sandstone and conglomerate (Figure 7). The conglomerate contains dominantly phyllite clasts with rare clasts of granite gneiss. Some of the sandstone and conglomerate layers contain large concretions that are cemented by iron-oxide minerals. Cross-bedding is rare. Conglomerate forms the ledge adjacent to the entire southeastern side of the building.

Figure 7.
a. Large slab of phyllite-clast conglomerate (hammer handle is 14" long) is over-turned showing bottom of large scour trough filled with conglomeratic sandstone. What appear to be inclined joints along which the rock broke on right and left sides, are bedding planes within cross-bed sets. b. Granitic gneiss clast in phyllite-clast conglomerate. Gneiss is similar to Glastonbury Gneiss. Pencil about 7" long. c. Concretions in sandstone bed of conglomerate. Hammer handle is 14" long. d. Weathered feldspar grains (see text) in arkosic sandstone (hand-lens in upper left is ~5/8" in diameter).

Figure 8. Black shale excavated in utility trench south of the building. Rock consists of laminated siltstone/shale with rare carbonate layers. Unfortunately it was not seen in situ. Back-filled pieces collected appear correlative with layers at about 14 ft. depth in B-108 in Figure 9. Key about 2 ¼" long.

Stratigraphy south of the building footprint.

Excavation for utilities and driveways temporarily exposed scattered, discontinuous red and gray sandstone and in one location black shale (Figure 8). In addition, one boring south of the building recovered black laminated shale (Figure 9). The borings south of the building recovered core that is correlative with the youngest fossil-bearing horizon from the Veterans' home (i.e. B108). The shale in the core contains drop stones and an intrastratal weathering horizon that were identified in the youngest black shale at the Veterans' Home (exposed in the west water-main trench). The same shale was excavated during installation of the sewer main south of the western end of the DPH lab building. Underlying the black shale are grey-green and yellowish-brown siltstone and very fine-grained sandstone, similar to the stratigraphy encountered at the Veterans' Home. Thus, the stratigraphy immediately surrounding the new building is well correlated with that at the Veterans' Home.

Strata exposed during excavation closer to West Street were not exposed during construction at the Veterans Home and their correlation is uncertain. Coarse- and medium-grained reddish-brown sandstone was exposed in the driveway near the entrance off West Street (approximate location of security kiosk). Feldspar made up 60-80 percent of the rock prior to weathering. The feldspar grains are altered (weathered) to soft white material, possibly kaolin. Muscovite mica and a few percent quartz make up the rest of the rock. Most of the coarse-grained layers are plane bedded. Many of the medium-grained layers, however, are ripple laminated. The intense weathering of the detrital feldspar grains at that location may be related to proximity to a fault which facilitated past fluid migration. Overlying the weathered coarse-grained sandstone is fine- to medium-grained reddish-brown sandstone and interbedded siltstone along the west side of the parcel. On the east side of the parcel, and probably stratigraphically higher, is fine- to medium-grained gray and greenish-gray sandstone and interbedded siltstone.

Structure.

Bedding in the area is roughly 070^{o} (N.70^{o} E) on the eastern end of the building, but around 105^{o} (S. 75^{o} E) on the west end. Southerly dip ranges from 8^{o} to about 15^{o}. Being on the south side of the Rocky Hill Anticline, this is expected. Although several faults are inferred to cross the parcel, direct evidence for only one was observed (Fig. 10, 11).

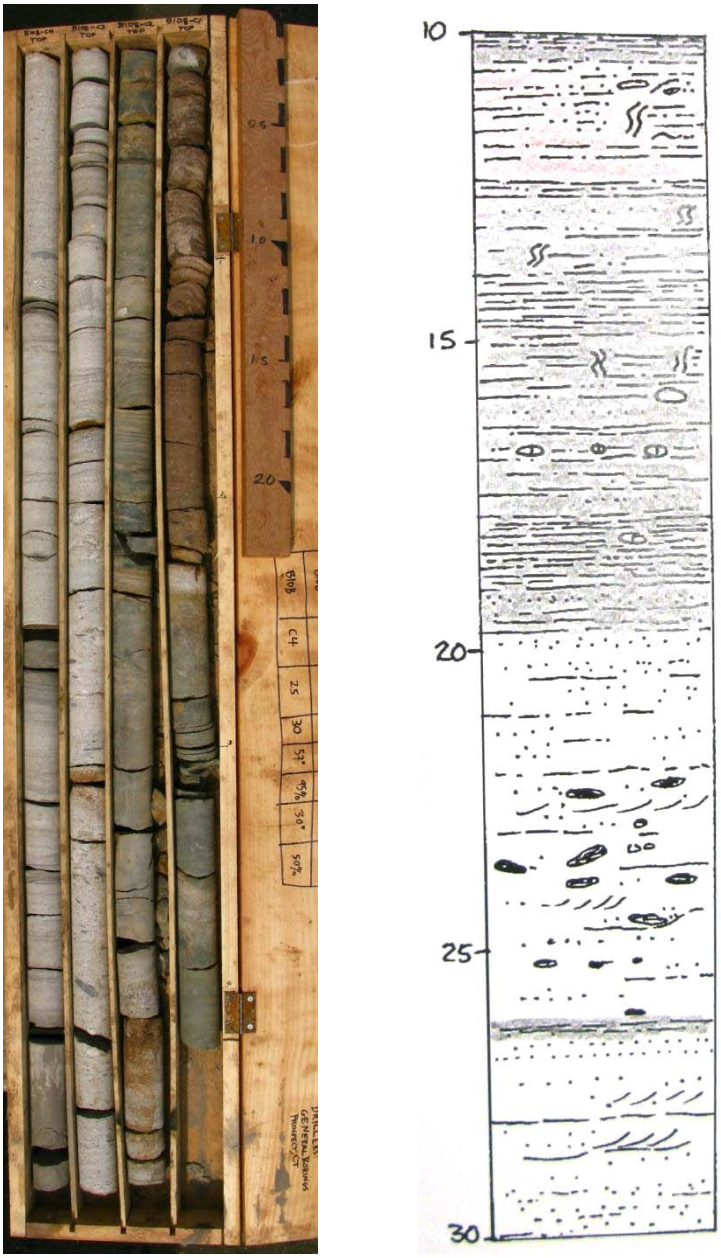


Figure 9. Borehole (B-108) drilled south of the building recovered 20 feet of 2" diameter core. Core storage box is 5 feet long (interior dimension). 10 feet of soil overlies the top of the core. Top of core (closest to surface) is in far right compartment (2' scale, subdivided into 1/10s of feet next to top of core). Deepest core is in far left compartment. Each core segment fits vertically above the one on its left. Box is oriented with the bottom at the bottom of the page (i.e. it is right side up). Diagram on right schematically depicts stratigraphy of the core (footage on left of column records depth below surface elevation). Dropstone easily visible at about 16' depth (about 1 ft. below top of 2nd column from right) as a light gray rounded clast in a medium-gray mudstone. For description see Appendix 3.

a. **b.**

Figure 10. a. Fault exposed during excavation of basement for laboratory (July, 2010). Fault drops phyllite clast conglomerate on right (south) against gray sandstone and siltstone, seen on north side. Test-pit#1 (Figure 11) was excavated at far end of view seen here. b. Track bearing layer on north side of fault, which can be seen in the background. Light colored layer on south side of fault (left side of image) is phyllite clast conglomerate. Rock along strike of conglomerate, but on opposite side of fault (right side of image) is black shale. Picture taken during early stages of excavation when most of the tracks were found. Veterans' Home dormatory on other side of (blue) fence. (Photograph 7b. by Teresa Gagnon)

Figure 11. Exploratory test pit#1, excavated in December 2008, encountered a fault at its south (deep) end. The pit was located at the eastern end of the proposed building. Picture on left looking south at the fault plane. Picture on right, which looks east, was taken from far right side of left hand view. Fault plane, on the right-hand side of this picture, dips steeply toward the south-southeast. Gray siltstone on left is overlain by track-bearing sandstone. Both are truncated by the fault, which dropped conglomeratic sandstone against the underlying siltstone. This fault was not recognized as such when the test pit was excavated. Photographs by Teresa Gagnon.

A fault of small displacement cuts diagonally across the building in the basement excavation. Evidence for the fault is truncation of the resistant phyllite clast conglomerate (Figure 10). Fracture surfaces, presumed to be parallel to the fault, are oriented 062^{o} and dip steeply (78-88^{o}) to both the northwest and southeast. Fault displacement is down to the southeast. The fault plane dips steeply toward the southeast and the fault is a normal fault. It is possible the fault also had left-lateral strike-slip movement. The fault plane surface was not observed during basement excavation, but was excavated in one of the test pits (Figure 11).

Near-vertical slicken-lines (Figure 12), recovered on fractures several feet distant from the fault, suggest (but do not prove) movement on the fault was near-vertical.

Figure 12. Near vertical slicken lines on fracture surface in tan medium- to coarse-grained sandstone excavated north of small fault. Slicken-lines suggest vertical movement on some (but not all) fractures. Keys on top of rock surface (see circle) are about 2 ¼" long for scale.

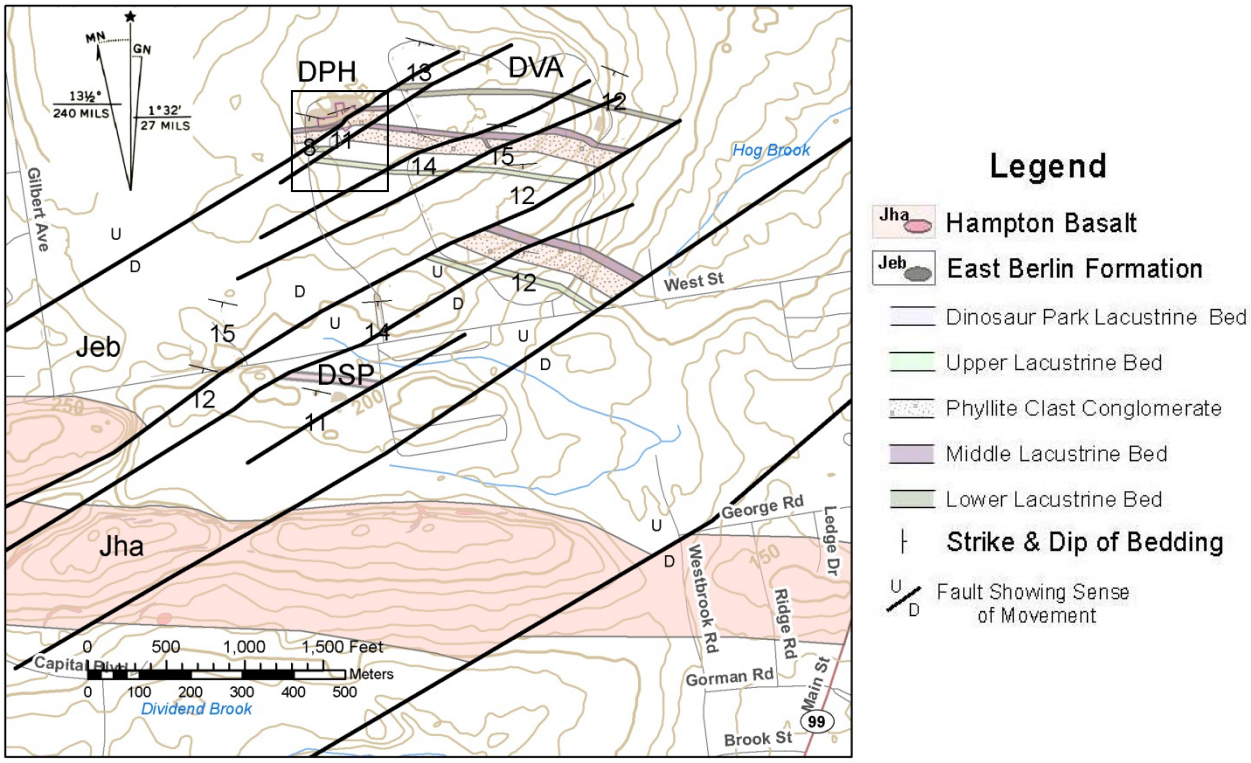


Figure 13. Geologic map of area showing both permanent (natural) outcrops (darker color; mostly exposures of the Hampton Basalt [red]) and exposures of rock (East Berlin Formation) in excavations for utility trenches and building foundations. Topographic contours shown in brown interval (CI = 10 ft). Stratigraphic units mapped are the three black shale layers (associated with the track-bearing horizons) documented at the Veteran's Home and the phyllite-clast conglomerate . A black shale layer below the track bearing layer, encountered in a core from Dinosaur State Park, is also shown. Box shows borehole location map in Appendix 3, Figure 1. (From Drzewiecki and others, 2012)

Geologic map. Combining observations made on the DPH parcel with those made on the DVA parcel allows construction of a geologic map of the area (Figure 13). Numerous faults are interpreted from trying to fit the observed lithologies exposed during various excavation with the

interpreted stratigraphic column (Figure 2). At a scale of 1:125,000, Rodgers (1985) mapped only one major fault. At a scale of 1:24,000, Gray (1978) and more recently, Depan et al. (2008) and Drzewiecki and others (2012) could show several faults based on offset of the Hampton Basalt topography. The map below shows numerous faults, most of which have only a few feet of displacement. Only a few can be traced for any distance because of lack of exposure.

Discussion

The type section for the East Berlin Formation is along old Route 372 in Berlin, CT (Lehman, 1957). Since then, new highway construction exposed more of the formation at the intersection of Routes 9 and 15 nearby (Olsen, 1989; Olsen al., 2005). There, six major black shale sequences were exposed (see Figure 14). The track layers at Dinosaur State Park correlate stratigraphically with the third lacustrine sequence below the Hampton Basalt (Olsen et al., 2005).

Most of the fossil foot prints described in this report were recovered from sandstone layers that are interbedded with black and gray shale. This layer is correlated with the middle lacustrine sequence at the Veterans' Home, from which the initial fossil discovery was made (see Figure 2). At the Veterans' Home two other track bearing horizons were identified, both are associated with two other black shale layers. Construction at the Public Health Laboratory site did not expose either of the other track layers because soils were sufficiently thick that the underlying ledge was not exposed. It is probable that those two horizons, if exposed at the Public Health parcel would have yielded additional tracks.

It is of some importance to determine if the stratigraphy exposed at the two construction sites correlates to that exposed at the type section. Figure 14 shows a proposed correlation. It is based on the observation that at the type section the perennial lake sequences are grouped in two packages of three (referred to as "modulated Van Houten Cycles" by Olsen: see Olsen et al, 2005 for references) separated by a thicker than usual red-bed package. Within each package of three, the perennial lake beds are interbedded with 8-12 m of red-beds. The thick red-bed sequence separating the packages is about 30 m thick. The stratigraphic section at the VA/DPH site consists of a package of three perennial lake beds separated by red-beds that are about 15 meters thick. The package underlies a red-bed section of at least 45 m at the Veterans' Home. If the thick red-bed sequences are correlative, then the perennial lake cycles at the VA/DPH site correlate to the lower package at the type section and the thick red-beds correlate with the thicker red-bed sequence separating the two packages at the type section.

This correlation is problematic (Steinen and Drzewiecki, 2012, and in prep). The section at the VA/DPH site is coarser-grained in general than the type section. The red beds are thicker than their correlative red beds at the type section. Both these discrepancies can be explained by the fact that the VA/DPH section is closer to the Eastern Boarder Fault and the source area. The lake beds themselves are, however, thinner than those at the type section. This does not conform with the general relation of increasing thickness of the black shale with increasing proximity to the boarder fault demonstrated by LeTourneau (1985). Finally, as proposed, the youngest black shale at the VA/DPH site correlates to the Westfield fish bed, that contains a persistent thin tuff bed (Olsen et al, 2005; Olsen, 2010). The tuff bed has not been identified at the VA/DPH site.

Alternatively, the perennial lake package exposed at the VA/DPH sites either correlates with the younger perennial lake package (modulated Van Houten Cycle) at the type section or is older than any of the cycles exposed at the type section. It does not seem structurally plausible to correlate the VA/DPH section to the younger perennial lake package. More stratigraphic information is needed to test the hypothesis that the perennial lake package at the VA/DPH sites is older than any of the cycles exposed at the type section.

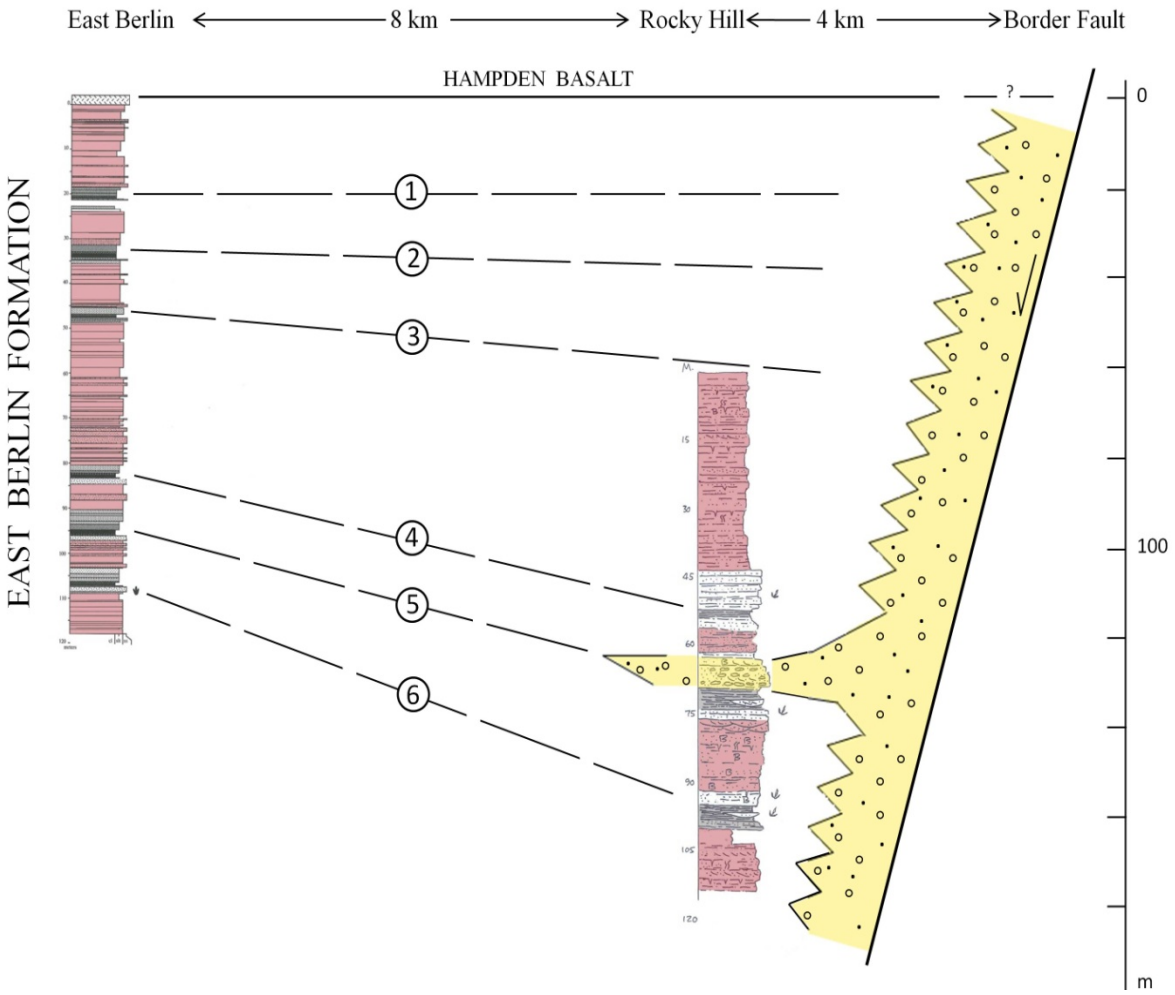


Figure 14. Proposed correlation of interpreted stratigraphic section of East Berlin Formation at the Veterans' Home/Public Health Laboratory with that at the type section in East Berlin (see Steinen and Drzewiecki, 2012, for discussion). Stratigraphic column from East Berlin is from Fig. 20 of Olsen et al, 2005 (color has been added). Rocky Hill stratigraphic column is Figure 2 of this report.

References

Blakey, R.C., 2001, http://jan.vcc.nau.edu/~rcb7/globaltext2.html

Demicco, R.V., and Gierlowski-Kordesch, E.H., 1986, Facies sequences of a semi-arid closed basin: the Lower Jurassic East Berlin Formation of the Hartford Basin, New England, USA: Sedimentology 33:107-118.

Depan, Matthew, Dwyer, Allen R., Beiler, K. Milardo, J, Schroeder, T., Drzewiecki, P., Thomas, M.A., Steinen, R.P., 2008, New geologic mapping in the structurally complex Hartford South Quadrangle, Connecticut. Geol. Soc. America Abstracts with Programs, v. 30.

Drzewiecki, Peter A., Schroeder, Timothy, Steinen, Randolph P., Thomas, Margaret A., 2012, The Bedrock Geology of The Hartford South Quadrangle with map and cross sections, State Geological and Natural History Survey of Connecticut, Department of Energy and Environmental Protection, Quadrangle Report No. 30, 1:24,000, 1 sheet, 2 appxs, 39p.

Gray, N.H., 1978, Bedrock Geological Map of the Hartford South Quadrangle, State Geological and Natural History Survey of Connecticut, Department of Energy and Environmental Protection, unpublished map file.

Hubbert, J.F., Reed, A.A., Dowdall, W.L., and Gilchrist, J.M., 1978, Guide to the redbeds of Central Connecticut: Field Trip, Eastern Section, SEPM; CGNHS Field Guide #1, 129p.

Klein, G. de.V., 1968, Sedimentology of Triassic rocks in the lower Connecticut Valley. Guidebook for Field Trips in Connecticut, NEIGC 60th Ann. Mtg., C1-C19.

Lehman, E.P., 1957, Bedrock geology of the Middletown Quadrangle with map: CGNHS Quad. Rpt. QR-8, 40p.

LeTourneau, P.M, 1985, The sedimentology and stratigraphy of the Lower Jurassic Portland Formation, central Connecticut, Unpub. M.S. thesis, Wesleyan Univer., Middletown, CT, 247p.

Olsen, P.E., Schlische, R.W., Gore, P.J.W, and others, 1989, Field Guide to the Tectonics, stratigraphy, sedimentology, and paleontology of the Newark Supergroup, eastern North America: Int. Geol. Cong. Guidebooks for Field Trips T351, 174p.

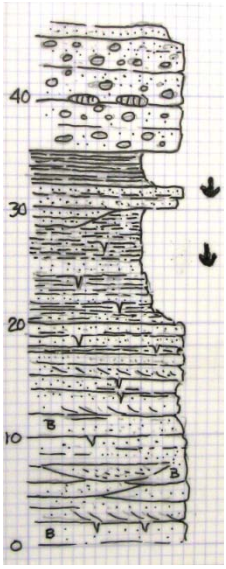
Olsen, P.E., Whiteside, J.H., LeTourneau, P.M, and Huber, P., 2005, Jurassic cyclostratiography and paleontology of the Hartford Basin, Guidebook for Field Trips, 97th Ann. Mtg., NEIGC , p55-105.

Rodgers, John, 1985, *Bedrock Geological Map of Connecticut*. Connecticut Geological and Natural History Survey, in cooperation with U.S. Geological Survey, Connecticut Natural Resources Atlas Series, 1:125,000, 2 sheets.

Scotese,C.R., 2001, http://www.scotese.com/earth.html (PALEOMAP Project)

Steinen, R.P, and Drwiewicki, P.A., 2012, Correlation of East Berlin (early Jurassic) Van Houten Cycles temporarily exposed during construction in Rocky Hill, CT: A conundrum. Geol. Soc. Am. Abstracts with Program, Northeastern Section, v. 44.

Appendix 2. Stratigraphic column of rocks exposed during excavation of basement for DPH Laboratory, Rocky Hill, CT.



6. Silty sandstone and very fine-grained sandstone, brown and yellowish brown.
5. Phyllite-clast conglomerate; medium-to coarse-grained sandstone matrix. Nodules in some layers.

4. Dark-gray shaly mudstone and shale. Some laminated; some laminae graded.
3. Thick-bedded, track-bearing sandstone with mudstone interbeds.
2. Silvery-gray to greenish gray siltstone and very fine-grained sandstone; thin bedded to shaly. Rare track-bearing layers.

1. Gray medium- to coarse-grained sandstone with mud-cracked mudstone interbeds; overlies redish-brown to reddish-gray medium-grained sandstone with pyrobitumen.

Scale in feet. Detailed description of these six units on next page.

Appendix 2 (cont). Litholigic description of stratigraphic column at DPH.

6. Interbedded brown and yellowish brown mottled very fine-grained silty-sandstone and siltstone. Turbated with sand-filled burrow traces. Black irregular stains on bedding-planes. Depositional environment uncertain; possible alluvial plain.

5. Phyllite-clast (Littleton) conglomerate; medium-to coarse-grained sandstone matrix; some layers with coarse white mica clasts. Interbedded with medium- to coarse-grained sandstone. Extremely rare clasts of granitic gneiss (possibly Glastonbury Gneiss). Local layers with large (decimeter sized) concretions. Base of some beds eroded into underlying layers. Rare foreset cross-bedding. Thickness approximately 10 ft. Depositional environment interpretation: distal end of alluvial fan, prograding over and/or into shrinking perennial lake.

4. Dark-gray shaly mudstone and shale: interbedded micaceous siltstone, laminated mudstone and very fine-grained sandstone beds. Sandstone beds 0.1-0.5 in. thick and generally not graded but most overlain by siltstone or mudstone interbeds. Siltstone beds up to a centimeter in thickness, many measured in microns. Thin-bedded to laminated; some beds/laminae graded or have a coarser basal lamina. Basal lamina on some pinch and swell regularly with millimeter wavelengths. Siltstone lamina tend to be lighter gray (weather rusty-brown adjacent to fractures through which meteoric groundwater has seeped) while mudstone lamina tend to be darker gray (carbonate laminae not recognized at the DPH site although carbonate laminae were recognized at the DVA site). Non-desiccated. Some bedding planes contain organic, presumably plant, relics; plant inpressions (stems) are scarce. Fish scales are scarce. Burrows were not recognized. 3-4 feet thick. Depositional environment: perennial eutrophic (anoxic?) lake.

3. Thick-bedded, medium- to coarse-grained gray sandstone with gray to dark-gray mudstone interbeds 1-5 mm thick. Coarse sandstone beds with unusually high-percentage (60+%) of quartz. Some bedding planes with tracks, many with turbated surfaces (tracks rendered unrecognizeable). Possible coproliltes and rain-drop impressions. Rare desiccation cracks. Pyrobitumen on some fractures. Thins to both east and west. Beds are locally porous; most porosity filled with limonite (possibly weathered ankerite residue), some with pyrobitumen. 1-4 feet thick. Depositional environment: lake margin deposit, possibly distal alluvial plain/fan.

2. Silvery-gray to greenish gray siltstone and very fine-grained sandstone; thin bedded to shaly. Carbon films on many bedding planes, plant fragments mud-cracks. Some ribbon laminated fine-grained sandstone/mudstone couplets. Rare track-bearing layers. 3-8 feet thick. Depositional environment: shallow lake and lake margin.

1. Gray medium- to coarse-grained sandstone with mud-cracked mudstone interbeds; overlies reddish-brown to reddish-grey medium-grained sandstone, locally cross-bedded, some with channel-like lower bounding surfaces. Many layers porous, some with pyrobitumen in pores and along contained fractures. “Hard” requiring blasting to excavate. Breaks into 3-6” thick slabs. Lower beds with pyrobitumen-filled pores that appear dark gray and browish gray. Up to 30 feet excavated. Depositional environment: alluvial plain/shallow ephemeral lake.

Appendix 3. Description of preconstruction cored borings.

During the Fall of 2008 several test borings were made on the DPH campus. Fourteen of the borings were drilled with a nominal 2" core barrel that recovered rock used for geotechnical evaluation and stratigraphic correlation. The cores were logged in the field by Stephen Brousseau, Staff Engineering Technician for Haley and Aldrich, Inc. They were boxed and given to the State Geological Survey for archiving. Below are descriptions by Steinen who also logged some (but not all) the cores in the field. Depths are recorded, following the engineering tradition, in feet rather than scientific notation. Locations of the cored borings were surveyed at what would become the corners of the building. Dip of bedding indicated but not oriented and presumed to be southerly. Top (top of bedrock) and bottom of cored interval indicated by diagram/description top/bottom. Core recovery ~100% at all locations.

Correlation of borehole stratigraphy with the generalized stratigraphic column (Appendix 1, Figure 2) is shown on p. A3-18.

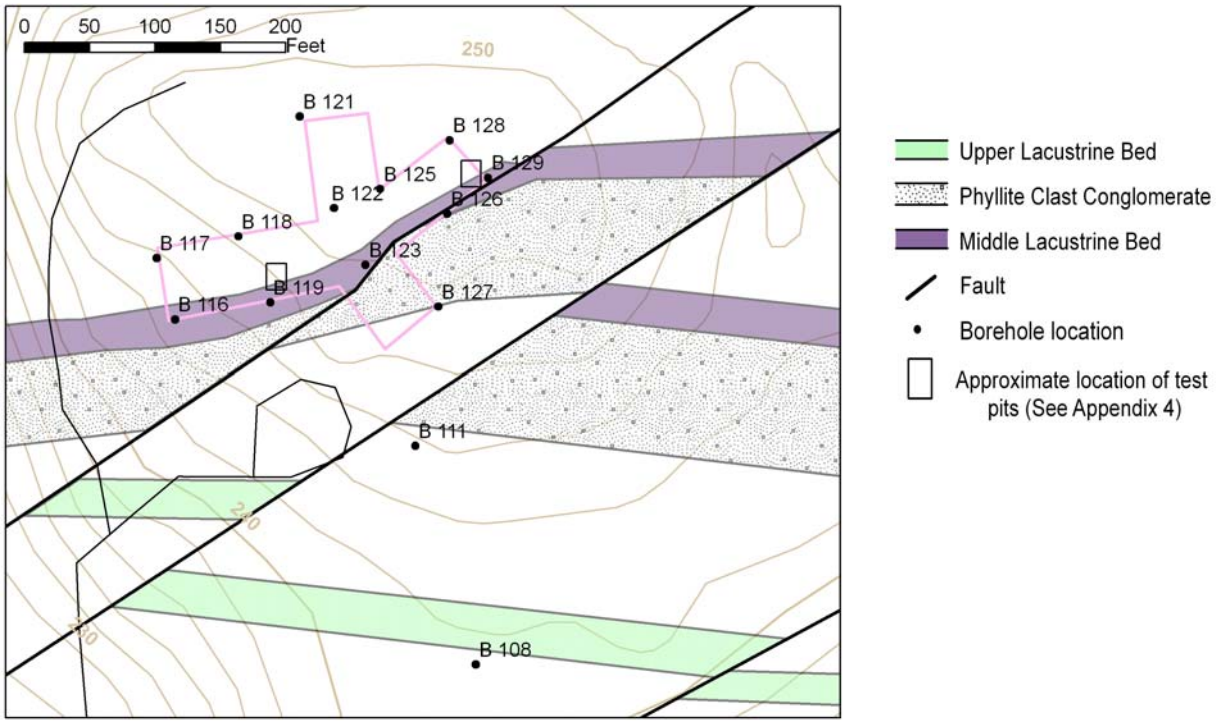
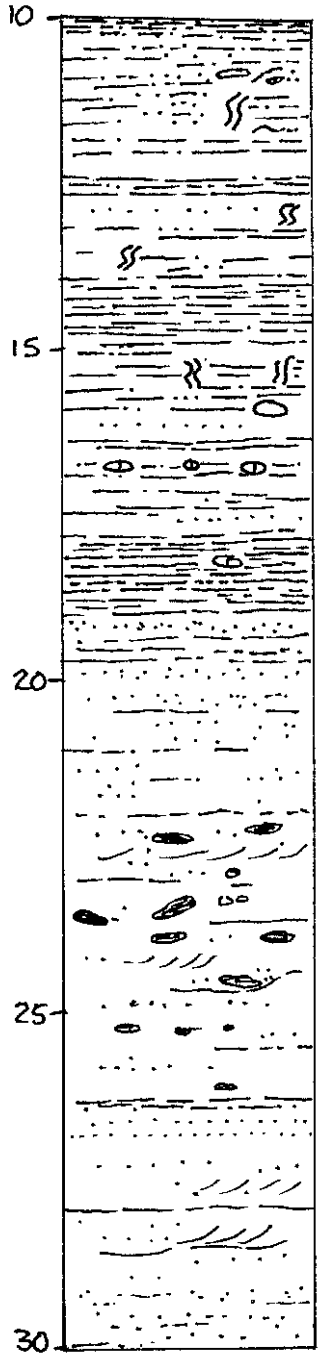


Figure 1. Map of north part of DPH campus showing building footprint and location of cored boreholes. Building footprint (approximate) shown in pink. Road locations are approximate. Map location shown on Figure 13 of Appendix 1.

Figure 2. DPH boring #B-108. Depth (in feet) below surface indicated on left of each column. Description (see picture on Figure 16)

Top of core (TOC)



Dark gray silty sandstone with dark gray siltstone.
Dark reddish-brown siltstone with irregular sandstone interbeds; turbated with breccia intraclasts. Local pedogenic alteration.

lower: mostly siltstone with minor sandstone.
Very dark gray to black siltstone.
Sandy churned siltstone with very fine-grained sandstone interbeds.

Sandy with "dropstone".

Concretions in gray siltstone.

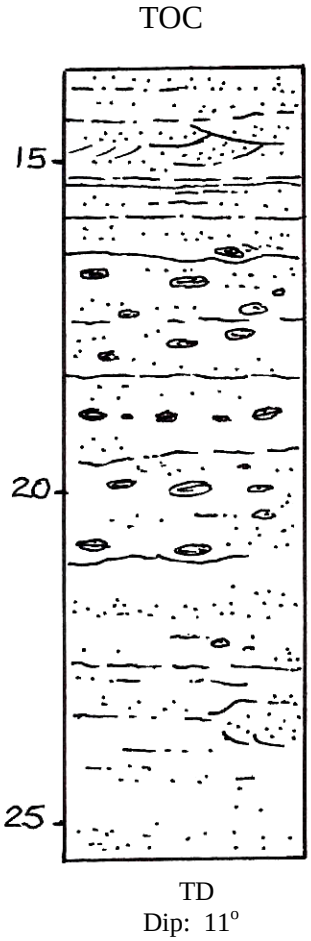
Gray sandstone, bedded and cross-bedded with some medium- to coarse-grained interbeds

Gray medium-grained sandstone with phyllite clast conglomerate. Cross-bedded in places. Clasts up to 2+ cm. (~1") in length.

Gray bedded and interbedded fine- to medium-grained sandstone with siltstone beds and partings. Some cross-bedded.

Bottom of core (TD: total depth)
Dip: 5^{o} (cores were not oriented: dip direction presumed to be south+/-)

Figure 3. DPH borehole #B-111
Description (see picture on Figure 17)



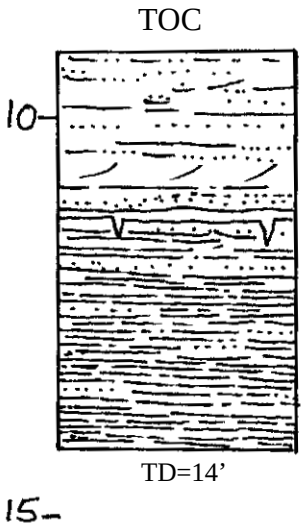
Gray medium-grained sandstone, bedded and cross-bedded, several black siltstone partings.

Dark gray very fine-grained sandstone and siltstone, thinly bedded.

Phyllite clast conglomerate and conglomeratic sandstone, clasts up to 1 cm (<1/2'); some possibly imbricated.

Gray fine-grained sandstone with thin medium-grained beds; some cross-bedded.

Figure 4. DPH boring #B-116
Description (see picture on Figure 18)

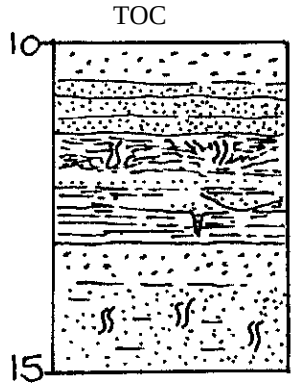


Gray fine- to medium-grained sandstone grading up to fine grained sandstone with gray siltstone partings; lower part cross-bedded.

Gray sandstone/siltstone mix.

Bedded gray siltstone, very fine-grained sandstone; millimeter laminae, some churning near top. Decreasing sandstone laminae and increasing sandstone lenses toward bottom.

Figure 5. DPH boring #B117
Description (see picture on Figure 19)



Dip: 10°

Gray to black medium -grained sandstone, porous with pyrobitumen in pores, poorly bedded.

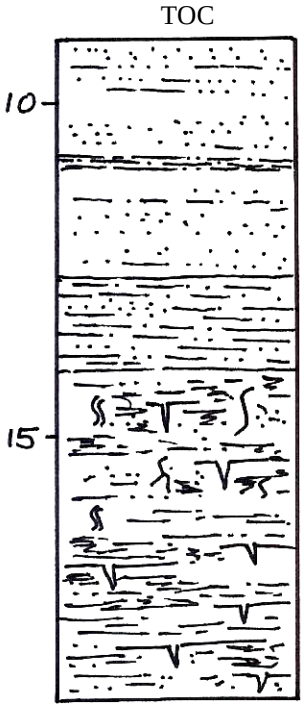
Parallel bedded, gray, fine- to medium-grained sandstone, non-porous with siltstone partings.

Gray siltstone interbedded with fine- or medium-grained sandstone layers. Upper part churned; mudcracks and sand lenses lower.

Gray to black medium-grained porous sandstone with bitumen in pores.

Reddish-brown medium-grained sandstone, silty; poorly bedded, churned; white feldspar grains floating in siltstone near top.

Figure 6. DPH boring #B-118
Description (see picture on Figure 20)



TD=14’

Gray fine- to medium-grained sandstone; parallel bedded with siltstone partings.

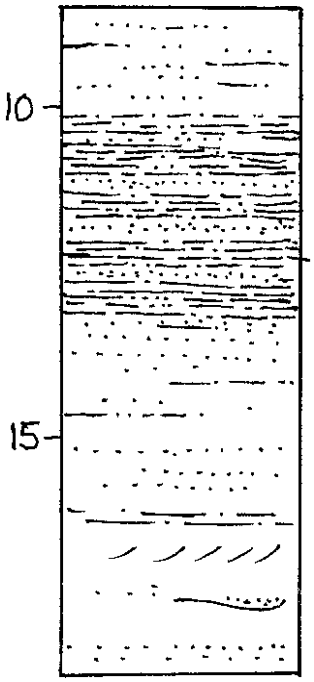
Dark gray siltstone.

Dark brown and reddish-brown siltstone with sandy layers.

Sandstone/siltstone mix; reddish-brown, churned and mudcracked with white feldspar grains floating in siltstone. Local pedogenic alteration.

Figure 7. DPH boring #B-119
Description (see picture on Figure 20)

TOC



Gray, medium-grained sandstone, weakly bedded.

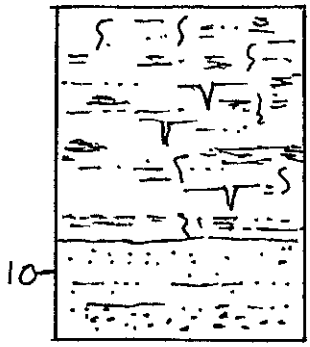
Gray siltstone with interbeds of very fine-grained sandstone.

Reddish gray very fine-grained sandstone; plane bedded with some siltstone interbeds. Medium-grained sandstone toward base.

TD=19’

Figure 8. DPH boring #B-121
Description

TOC=6’

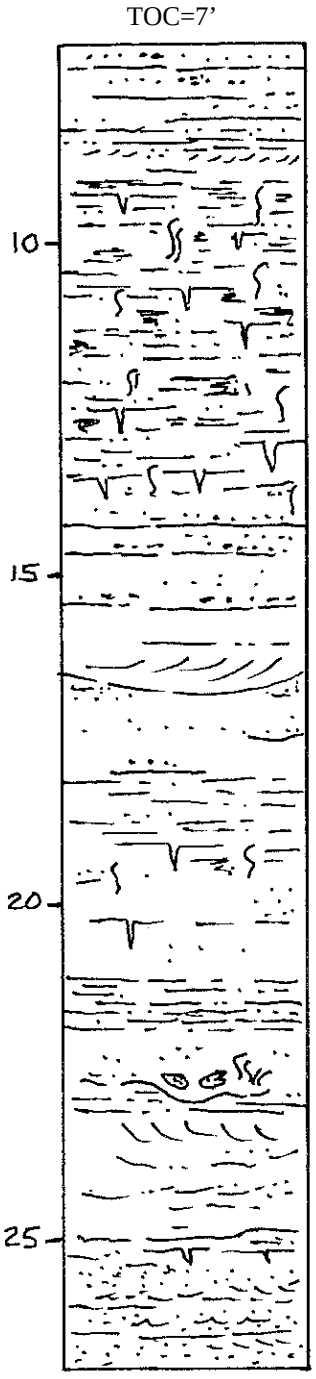


Reddish-brown siltstone/sandstone mix; churned with floating white feldspar grains. Local pedogenic alteration. Pyrobitumen in porosity at top.

Reddish-gray fine- to medium-grained sandstone; weakly bedded, coarsening toward base; pyrobitumen in pores at base.

TD=11’

Figure 9. DPH boring #B-122



Description

Reddish-gray to brownish-gray coarse- to medium-grained sandstone, parallel bedded; porous, but lacking in bitumen.

Reddish-brown siltstone/sandstone mix with mudcracks and floating coarse grains of white feldspar; churned. Extensive pedogenic alteration.

Playa sequences.

Medium-grained cross-bedded sandstone.

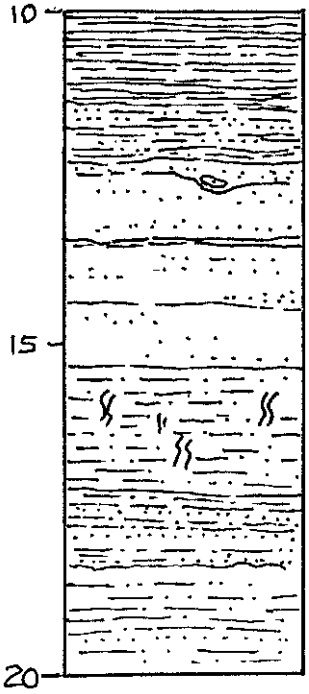
Rip-up clasts in churned layer.

Ripple laminated sandstone, reddish-gray.

Reddish-brown ripple laminated sandstone with siltstone partings.

Figure 10. DPH boring #123
Description (see picture on Figure 19)

TOC



Black shale, fissile with thin dolomite laminae, gray to rusty. Thin discontinuous light-gray laminae.

Becoming silty with siltstone interbeds.

Gray fine-grained sandstone with rip-up clasts, grading down to faintly bedded medium-grained sandstone with pyrobitumen in pores.
Gray shale parting.
Gray fine- to medium-grained sandstone: two fining-up beds; contorted bedding.

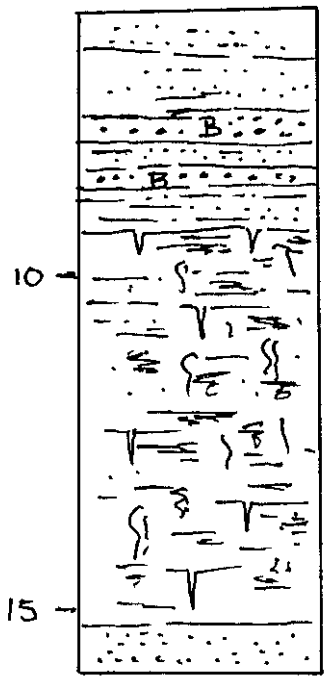
Highly turbated (churned) gray siltstone with very fine-grained sandstone interbeds.

Interlaminated gray siltstone/very fine-grained sandstone; some burrowed; siltstone laminae ~ 3 mm., sandstone laminae ~ 1 mm.

TD
Dip: 8^{o} top,
12^{o} bottom.

Figure 11. DPH boring #B-125
Description

TOC=16’



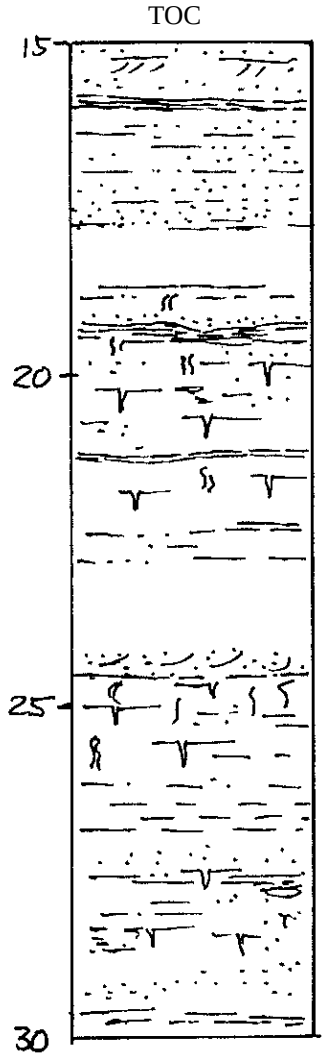
Reddish gray and black sandstone, medium- to coarse-grained, porous in places with pyrobitumen. Tan/buff along fractures.

Dark reddish-brown siltstone/sandstone mix; churned, mudcracked with floating coarse grains of white feldspar. Extensive pedogenic alteration.

Fine- to medium-grained reddish-gray sandstone.

TD=16’
Dip: 8^{o}

Figure 12. DPH boring #B-126
Description



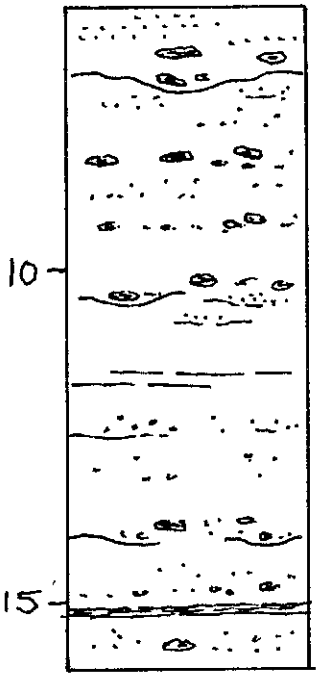
Gray fine- to medium-grained sandstone, some cross-bedded; micaceous; dark gray siltstone partings.
Dark gray siltstone, thinly laminated with very fine-grained sandstone.
Gray fine- to medium-grained sandstone; some coarse grained; poorly bedded or unbedded.

Reddish-brown silty sandstone and sandy siltstone; extremely turbated, possible "dinoturbation"(?); medium to coarse floating white sand grains; indistinct mudcracks; some beds churned internally; thin sandstone and siltstone layers. Probable pedogenic alteration.

Pedogenically altered siltstone/sandstone mix.

Figure 13. DPH boring #B-127
Description

TOC=6’



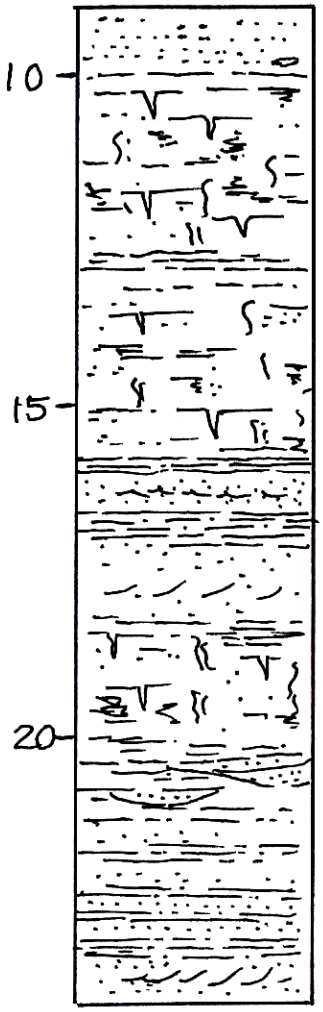
Brown to gray coarse- to medium-grained sandstone, conglomeratic with phyllite clasts at base.

Dark gray to black shaly-siltstone parting.

TD=16’

Figure 14. DPH boring #B-128
Description (see picture on Figure 18)

TOC=9’



Fine- to medium-grained crossbedded sandstone; some small rip-up clasts.

Churned silty sandy mixture with extensive pedogenic alteration; mudcracked, coarse white feldspar grains floating in dark red brecciated matrix.

Brown shaly siltstone
Fine-grained ripple-laminated sandstone.
Brown shaly siltstone.

Fine- to medium-grained reddish-gray sandstone; crossbedded.

Churned mudcracked silty sandy mix; pedogenic alteration.

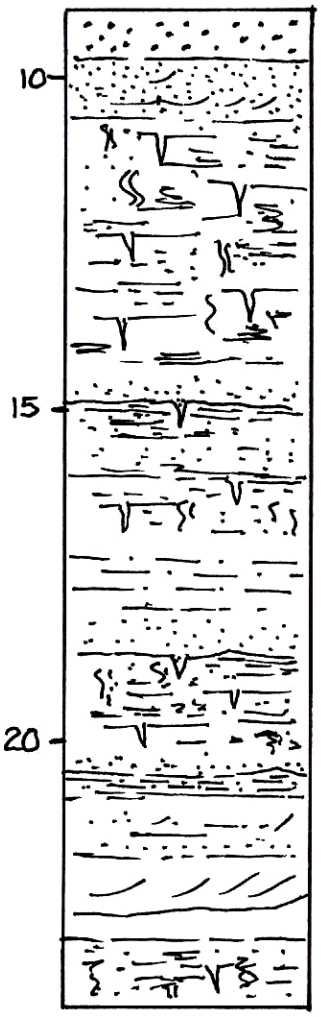
Interbedded reddish-brown siltstone and fine- to medium-grained sandstone with coarse-grained sand lenses near top.

Very fine-grained sandstone, grayish-red, ripple laminated; siltstone partings in upper part.

TD=24’

Figure 15. DPH boring #B-129
Description

TOC=9’



Medium- to coarse-grained sandstone, dark reddish-brown, porous (no bitumen).
Fine-grained reddish-brown sandstone; crossbedded.

Dark reddish-brown siltstone/sandstone mix; churned, mudcracked; extensive pedogenic alteration.

Interbedded playa sequences.

Crossbedded fine-grained sandstone.

Pedogenically altered siltstone/sandstone mix.

TD=24’
Dip: 10^{o}

Figure 16. B108. Top of core is at top in right hand compartment. Core in each compartment to left is deeper than core to its right and fits at the bottom of the core to its right. Scale (board) is 2 ft in length with 0.1 ft subdivisions. See description on Figure 2 of this appendix.

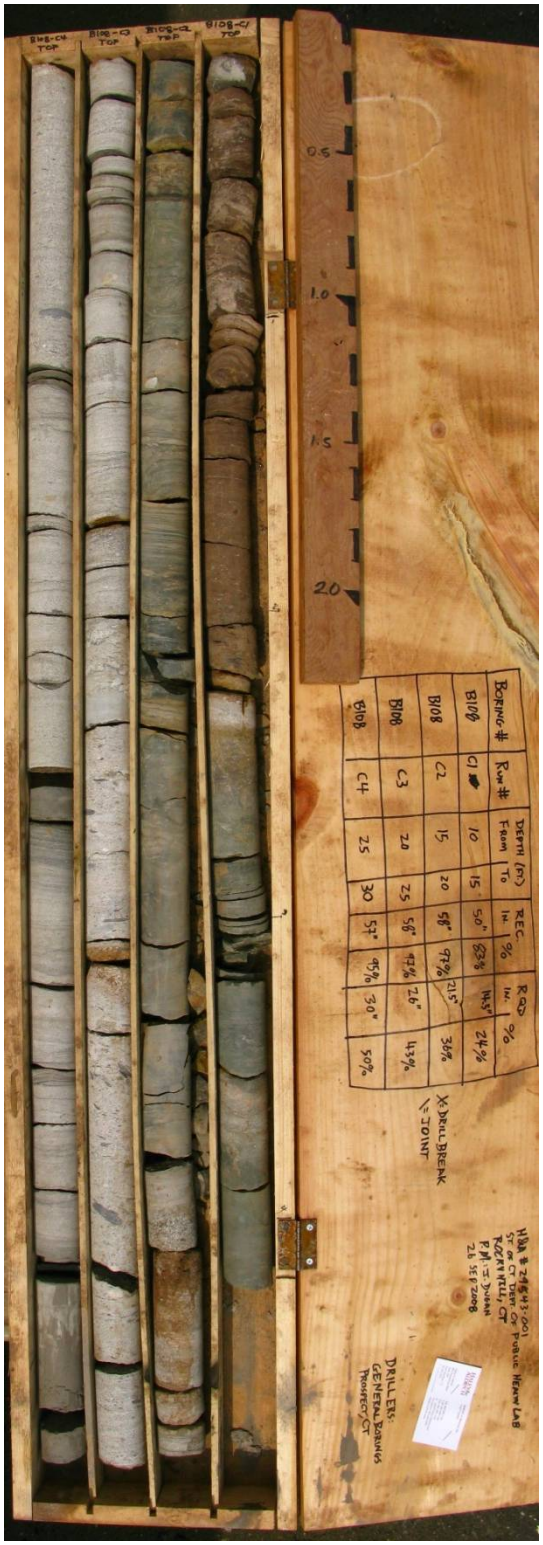


Figure 17. BH111 (description on Figure 3).
Scale (upper left in photo) 2’ with 0.1’ subdivisions.

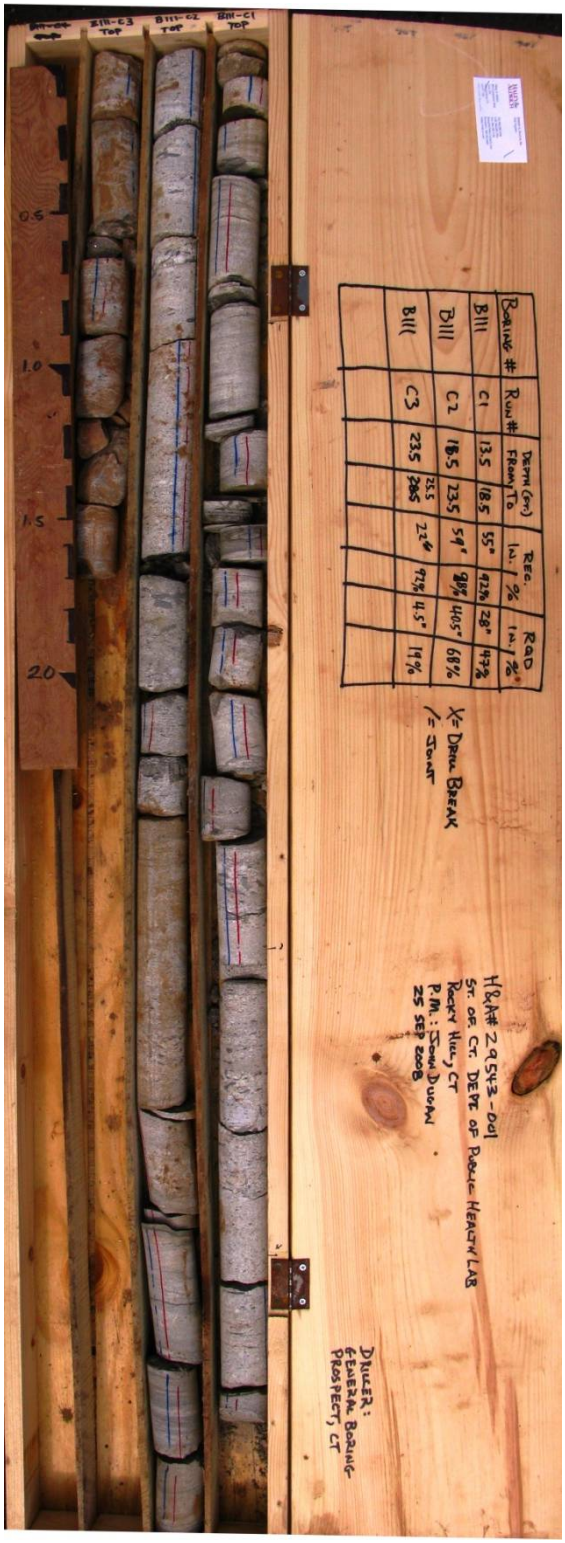


Figure 18. BH116 and BH 128.
BH 116 is in right hand compartment (see description on Figure 4). Top of core is at top of right hand compartment. BH 128 is in three compartments to left (see description Figure 14). Each compartment to left is deeper than one to its right and it fits below the one to its right. Scale is 2 ft. in length and is subdivided into 0.1 ft.

Figure 19. BH117 is in right hand compartment (see description on Figure 5). BH 123 is in two left hand compartments (see description on Figure 10). Scale is 2 ft in length and has 0.1 ft subdivisions

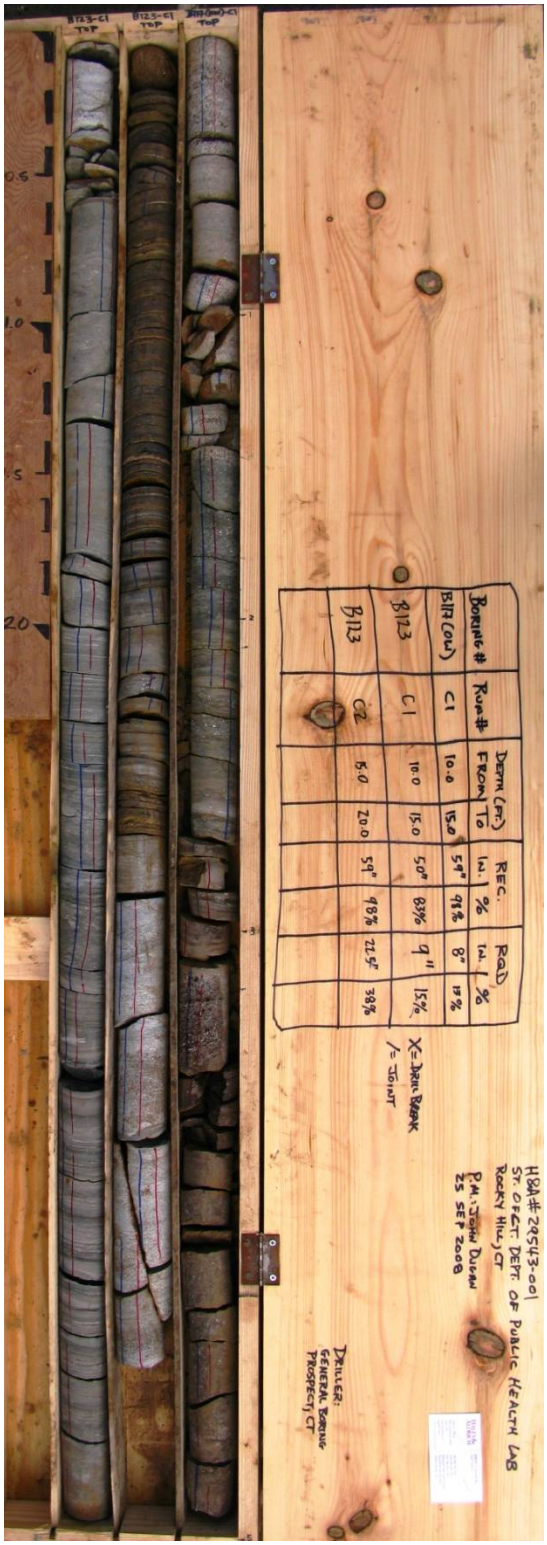


Figure 20. BH118 and BH119.
BH 118 is in two compartments on left (see description on Figure 6) and BH 119 is in two on right (see description on Figure 7). Scale is 2 ft in length and has 0.1 ft subdivisions.

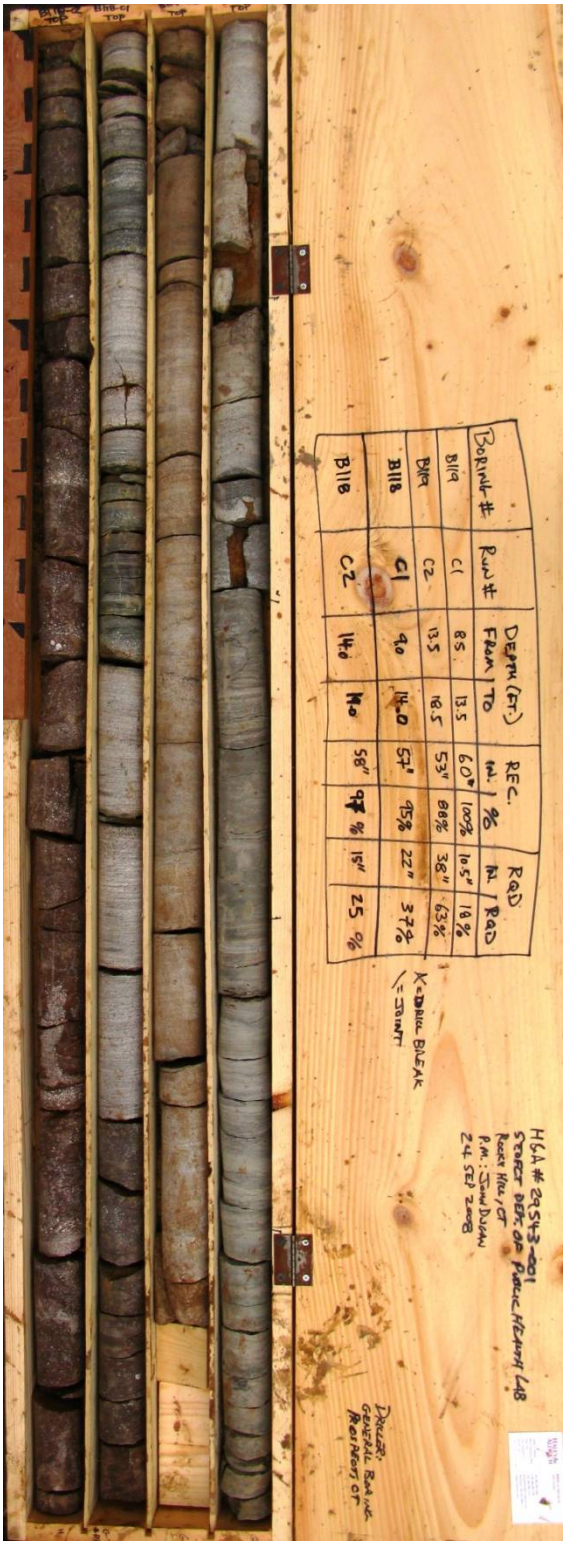
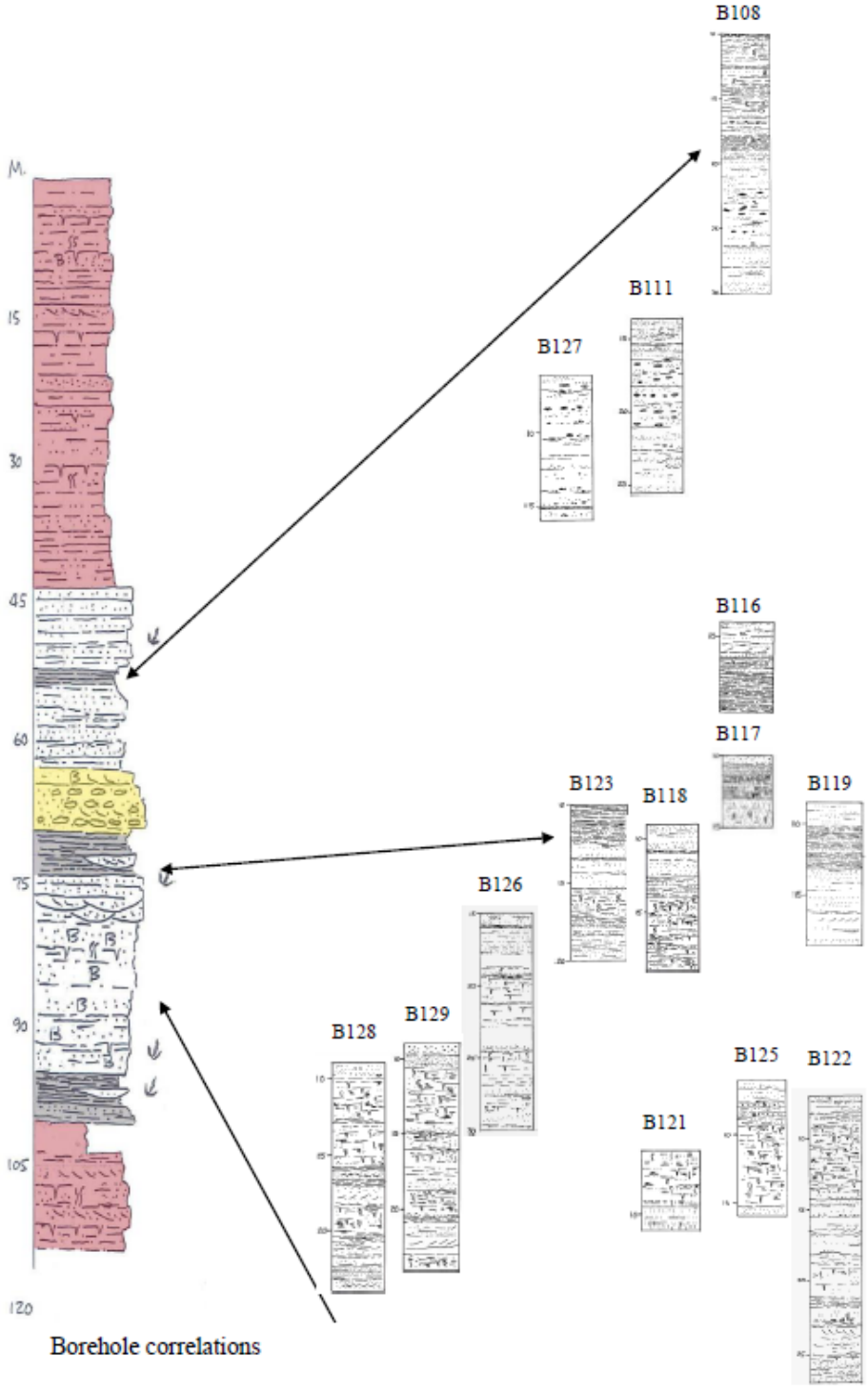


Figure 21. East Berlin Formation exposed during construction at the DPH and DVA: Correlation of DPH boreholes described in this appendix with stratigraphic column at DVA shown in Appendix 1, Figure 2. Stratigraphic column thickness in meters (subdivisions are 15 m) whereas the borehole depth subdivisions are 5 feet. Scale of the boreholes is expanded relative to that of the stratigraphic column.



Appendix 4. Stratigraphy of exploratory excavation pits at (proposed) DPH Laboratory, Rocky Hill, December, 2009 [1]

Summary: Two test pits were excavated at the proposed site for a new Department of Public Health laboratory in Rocky Hill (see map p.A3-1). These excavations were dug primarily to learn about how the rock properties would affect excavation and secondarily to learn more about the stratigraphy of the rock and its potential to yield dinosaur track fossils. This report describes the stratigraphy observed and the paleontologic specimens recovered.

Exploratory pits were excavated at two locations at opposite ends of the proposed building. The first (Exploratory Pit #1) was dug at or near B-129 which is at the southeastern corner of the proposed building site. The second exploratory pit (Exploratory Pit #2) was dug 10' northeast of B-119 which is near the southwestern corner of the propose building site. Appendix 4-A describes the stratigraphy of the exploratory pits.

At both sites the orientation of the rock layers was striking nearly east-west and dipping (were tilted) 12^{o} to the south. The rocks were cut at both sites by steeply dipping (~70^{o} N) fractures that trended 066^{o} (east-northeast). Minor displacement (faults measured in inches) was observed along some of the fractures in Exploratory Pit #1. Fractures up to ½ inch in width at Exploratory Pit #2 were filled with clear to white quartz that had minor iron staining on the inner (last formed) crystals.

Exploratory Pit #1 (Figure A4.1). Based on the location near B-129 a series of southward dipping reddish-brown siltstone and sandstone interbeds were expected. Similar rocks at the Veterans Home east of here had not yielded fossil footprints. Gray micaceous sandstone and greenish gray siltstone were found. The upper sandstone layer contained siltstone and micaceous interbeds that promote bedding plane splitting and the potential for exposing preserved fossil footprints which indeed were found. A dozen tracks and several fragments of track were recovered at the test pit (see Appendix 4-B).

Figure A4.1. Exploratory pit when excavation was about half completed. Sandstone at headwall contains fossil footprints.

[1] **This appendix is from a letter to Jeffrey Bolton, Department of Public Works, dated December 15, 2009.**

The stratigraphy was unexpected. Gray layers (lower two gray lake-bed layers encountered at the Veterans Home) were expected either farther south or farther north of this location. The gray siltstone possibly was dropped down along a minor fault that was not exposed during the exploratory digging. The stratigraphy encountered in B-129 may lie just under the deepest layers encountered in the test pit (current interpretation). Resolution of this interpretation awaits excavation of the basement for the proposed building.

Fractures and low-displacement faults encountered in this test pit were also encountered in the Veterans Home excavations and were predicted at this location based on the test borings of September, 2008.

Exploratory Pit #2 (Figure A4.2). Based on the location about 10' northeast of B-119 gray sandstone and siltstone were expected in this test pit. The gray siltstone layer recovered in the test boring at 10' depth was encountered at the surface in the test pit. The upper sandstone in the boring was just encountered in the head-wall of the test pit. Below the lower sandstone unit was another gray siltstone layer B-119 did not drill into. This pit had prominent fractures that were filled with white quartz (veins).

This area was expected to be fossiliferous but no fossil footprints were recognized during the excavation.

Figure A4.2. Exploratory Pit #2 with schematic stratigraphic column (for description of column see p. A4-5).

Discussion. Fossils were found at Exploratory Pit #1 where previously they were considered less likely to be found. Fossil footprints were not found at Exploratory Pit #2 where previously they were considered more likely to be found. This underscores our contention that there is NOT one single layer that is track bearing. Indeed, at least four fossil bearing zones were identified at the Veterans Home site. Tracks are more likely to be found in gray beds that initially were deposited along the margins and in shallow waters of ancient lakes that existed in this area 200 million years ago. The dinosaurs walked around in other environments and footprints have been found in reddish brown layers as well. They are just less likely to be preserved in reddish-brown layers.

The bedrock in both excavations is relatively unweathered. The terminology used by the engineers apparently equates weathering with ease of excavation. The weathered bedrock described in the engineering report is interbedded fine-grained sandstone and shale in the exploratory excavation pits observed.

Recommendations. The discovery of one or more track bearing horizons in Exploratory Pit #1 confirms the prediction that fossil tracks would be encountered during the construction of the

proposed Department of Public Health Laboratory. There are numerous track bearing horizons in the rocks on which the foundation of the building will be sited. The fossil dinosaur tracks are valuable educational and scientific resources that warrant the effort to collect and archive. A reasonable protocol to discover and preserve these resources should be promulgated and utilized during excavation at the site. Specimens found on rocks sufficiently small[2] to easily transport should be set aside when spotted for removed to a secure storage facility. Rocks containing tracks that are too large for easy transport could be set aside for later incorporation into the landscaping of the grounds surrounding the site, perhaps near the proposed gazebo.

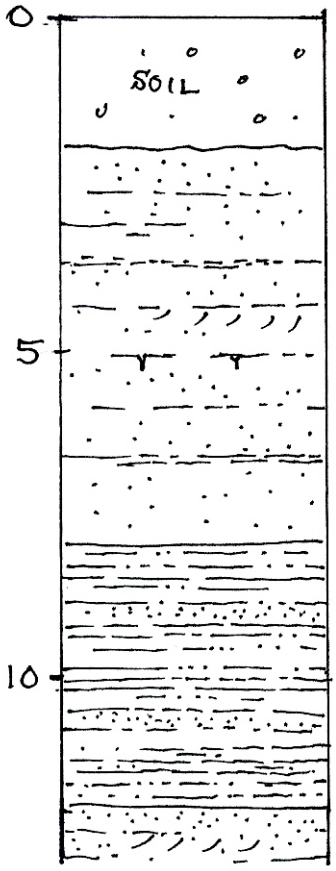
The Connecticut State Geological Survey (Department of Environmental Protection) can provide monitoring of the site during excavation and archiving of recovered specimens.

[2] Small enough to fit into a small station-wagon: less than 4' maximum dimension and less than 150 +/- pounds.

APPENDIX 4-A. Stratigraphy of Test Pits.

Exploratory pit #1: N 41.65684°, -072.65594° (center of backfilled area near B-129).

Feet



Surface: glacial soil (unconsolidated).

Medium- to coarse-grained gray sandstone with pyrobitumen in some porous layers, somewhat micaceous and breaks apart with pressure. Bedding planes with fossil tracks load casts and rare mud-cracks. Cross-bedded in some layers. All recovered tracks from this interval.

Greenish-gray siltstone with carbonaceous films (fossil twigs?) on some bedding surfaces. Fissile in part; brown-stained bedding planes.

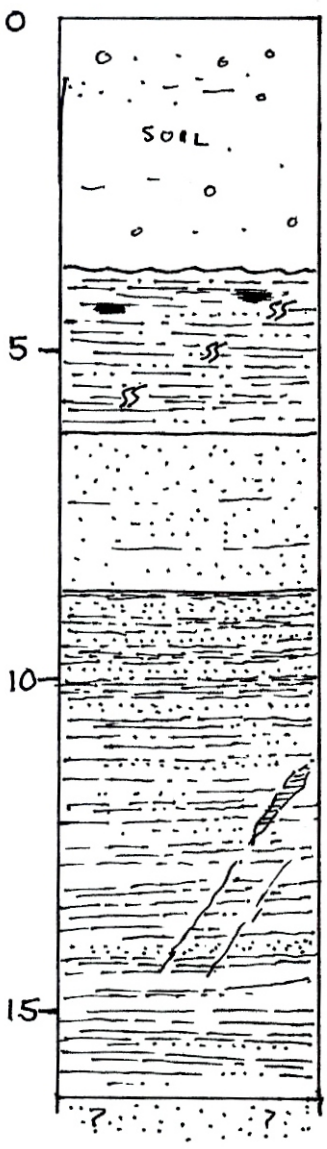
Medium-grained gray, non-porous sandstone; some cross-bedded. Hard.

TD ~12'

Bedding orientation: 083°, 12°S. Fractures and small fault orientation: 066°, ~70°N

Exploratory pit #2: N.41.65673°, -072.65670° (north end of pit near B-119).

Feet



Surface: glacial soil (unconsolidated).

Gray and dark-gray siltstone/mudstone, bioturbated, poorly laminated with black carbonaceous films of fossil vegetation fragments on bedding planes.

Medium-grained sandstone, plane bedded, some iron-stained pores. Breaks into thick blocks; some pyrobitumen on fracture surfaces.

Fine-grained gray sandstone with gray interbedded dark-gray siltstone. Rusty stained bedding-plane fractures gives unit a brownish color.

Gray siltstone with thin fine-grained sandstone interbeds; some ripple laminated. Numerous quartz-filled fractures up to ½" (1 cm) in width, extend into overlying unit.

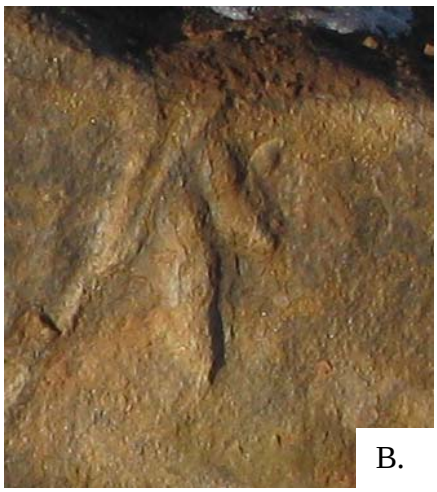
T.D. 16.3' (uncorrected) on hard layer, likely sandstone.

Bedding orientation: 105°, 12°S. Fracture orientation as in Pit #1.

APPENDIX 4-B: Catalog of fossil footprints found during exploratory excavations.

12/07/1. Large slab left at the site measures approximately 4'x2'x1.5'. Four complete tracks (negative prints) are preserved along with at least two partial prints.

A.



B.

12/07/1 A. Enlargement of two prints at lower right and center. Larger (*Eubrontes* sp.?) print is about 8" (20 cm) long. Smaller (*Grallator* sp. ?) print is about 4" (10 cm) long. B. Enlargement of print (*Grallator* sp. ?) at upper right. Print is about 6" (15 cm) in length.

12/07/2. *Eubrontes* sp. (?); negative print of one toe (dextral) plus part of the middle toe. Pencil is 6” (15.2 cm) in length.

12/07/3. *Grallator* sp (?). Negative print. Pencil is 6” (15.2 cm) in length.

12/07/4. *Eubrontes* sp (?) , negative print of two toes. Pencil is 6” (15.2 cm) in length.

12/07/5. *Eubrontes* sp (?) Negative print. Pencil is 6” (15.2 cm) in length. Track is 8-9” (toe-heel) which is a little short.

12/07/6 Negative print of *Eubrontes* sp (?). Claws at end of toes clearly visible. Hammer head approximately 2” (5 cm) in width. Fossil footprint about 14” (35 cm) in length.