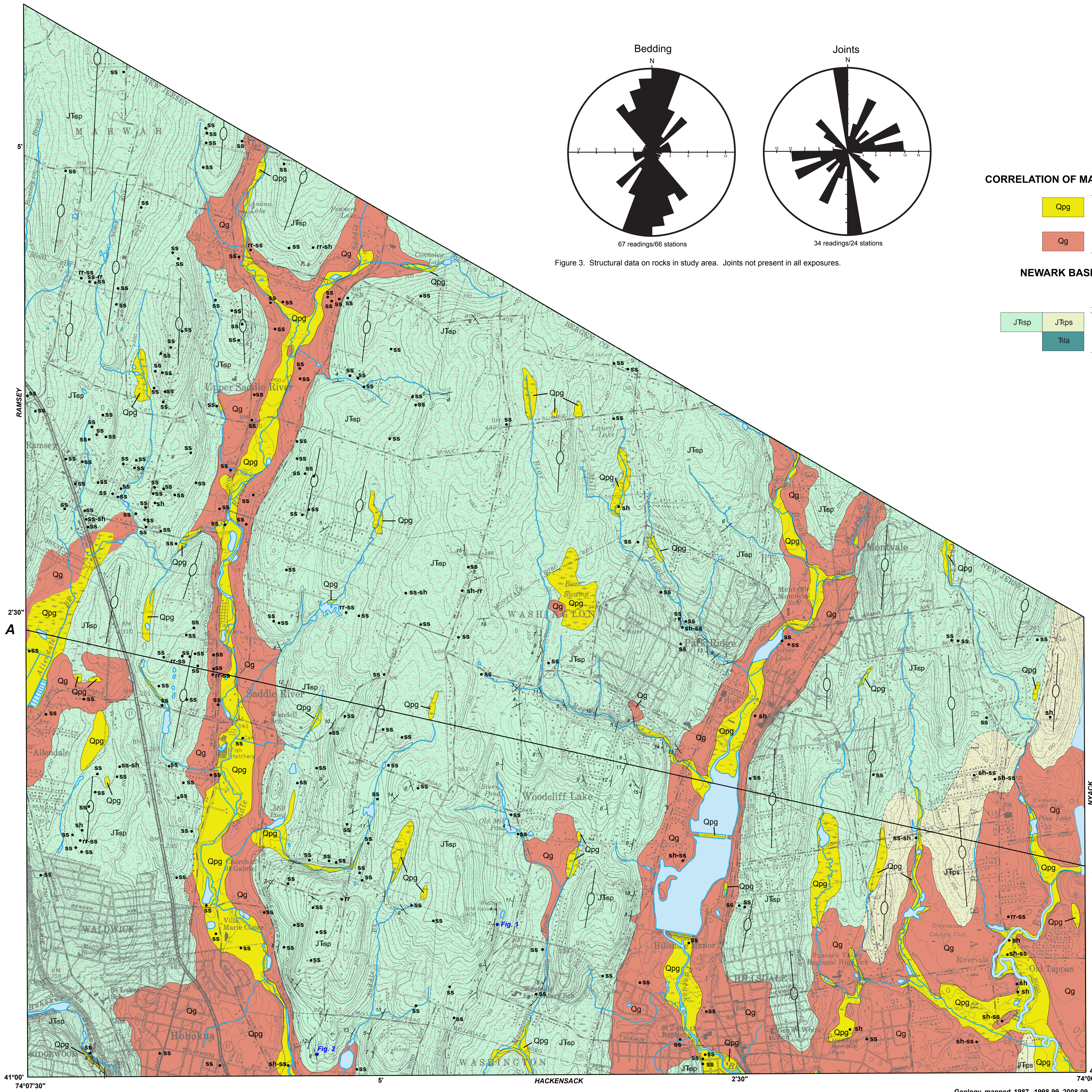
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WATER RESOURCES MANAGEMENT
NEW JERSEY GEOLOGICAL SURVEY

Prepared in cooperation with the
U.S. GEOLOGICAL SURVEY
NATIONAL GEOLOGIC MAPPING PROGRAM

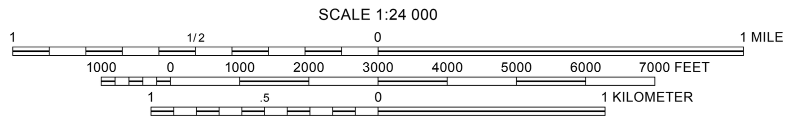


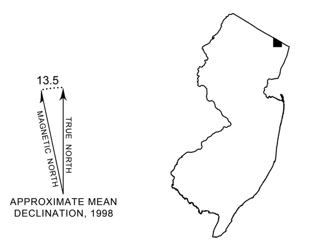
Base from U. S. Geological Survey, 1955

Figure 3. Structural data on rocks in study area. Joints not present in all exposures.

CORRELATION OF MAP UNITS

Qpg
Qg
Quaternary
NEWARK BASIN
JTRsp
JTRps
TRla
Jurassic
Triassic





LOCATION IN NEW JERSEY

Geology mapped 1987, 1998-99, 2008-09
Some bedding data from Parker (1993) and Kummel (unpublished, on file at the New Jersey Geological Survey, Trenton, New Jersey)
Cartography by D. Monteverde, S. Stanford and M. Girard
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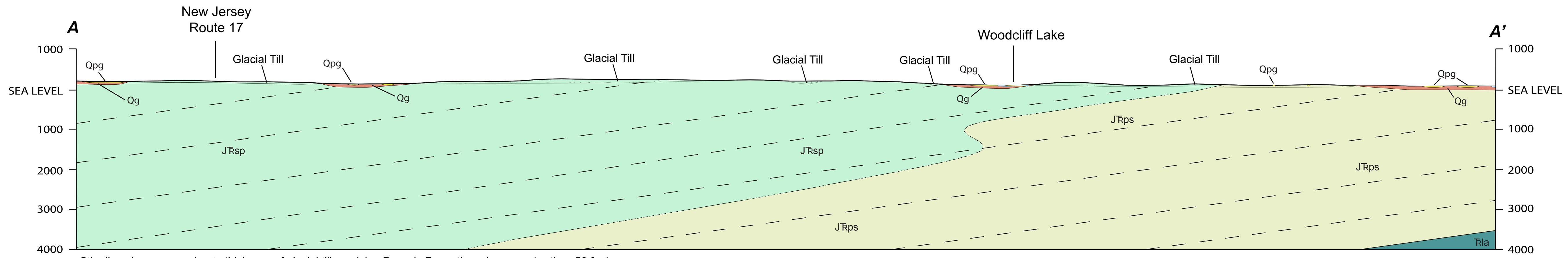
BEDROCK GEOLOGY OF THE PARK RIDGE QUADRANGLE, BERGEN COUNTY, NEW JERSEY

by
Donald H. Monteverde
2011



Stippling shows approximate thickness of glacial till overlying Passaic Formation where greater than 50 feet

INTRODUCTION

The Park Ridge, NY-NJ 7 1/2-minute quadrangle is in extreme northeastern New Jersey and southeastern New York State. The boundary dividing them extends obliquely from southeast to northwest. Park Ridge quadrangle lies within the Piedmont Physiographic Province. North-south trending, broad ridges form a subdued landscape that rises in elevation from less than 100 feet in the southeast to more than 600 feet in the northwest. Three north-south rivers, the Hackensack River to the east, the Saddle River to the west, and Pascack Brook between them, dominate the drainage network. Woodcliff Lake is the largest standing water body.

The New Jersey side is predominantly a suburban landscape consisting of housing tracts cut by two major highways, the Garden State Parkway and NJ Route 17. Both routes continue northward to the New York Thruway and furnish commuters easy routes to New York City. Housing density in highest in the southwestern corner of the quadrangle.

STRATIGRAPHY

The New Jersey part of the quadrangle contains a thick sedimentary cover deposited by glaciers during the Pleistocene and fluvial material of Recent origin. This sedimentary blanket limits the amount of bedrock exposure which has been exposed through erosion. The bedrock is part of the Newark Basin of Mesozoic age, formed by rifting that led to the modern-day Atlantic Ocean. The Newark Basin extends southwestward into Pennsylvania where merges with the Gettysburg Basin. It is a half-graben bounded on the west by northeast-striking, southeast-dipping border faults. Late Triassic to Middle Jurassic motion on the different border faults as well as several intrabasinal faults controlled basin morphology (Schlische, 1992, 1993; Olsen and others, 1996). The south-dipping Ramapo Fault marks the western edge of the Newark Basin directly west of the Park Ridge quadrangle. Sediments entered the basin through three different fluvial networks: from the southeast in northwesterly-draining streams, from southwest- and southeast-draining fluvial network incised along rider blocks between border fault segments and lastly, along the basin's northern edge in a basin-parallel direction. Source material in this quadrangle exhibits a northeastern provenance (Parker and others, 1988; Parker, 1993, Yager and Ratcliffe, 2010) suggesting a basin-parallel fluvial system deposited the sediment in this region of the Newark Basin. Smoot (2010) categorized these sediments as axial sandstone and conglomerate that are interpreted as terminal fan deposits. Several generations of diabase intruded the basin sediments during the Early Jurassic and regionally reached the paleosurface where thick basalt volcanics formed. Following the Atlantic Ocean opening, 3-5 km of material was eroded from the quadrangle region (Malinconico, 2010) by the Early Cretaceous (Olsen and Rainforth, 2001) and deposited on the continental shelf (Katz and others, 1998; Pratt and others, 1988; Walters and Kotra 1990; Huntoon and Furlong, 1992; Steckler and others, 1993; El-Tabakh and others, 1997) where it joined other weathered material from the continental interior through fluvial channels into the Atlantic coastal region and offshore Baltimore Canyon (Poag and Sevon, 1989; Pazzaglia, 1993).

A mantle of glacial and postglacial deposits overlie the bedrock throughout the quadrangle (Stanford, 2002). These consist of 1) glacial-meltwater sediments, 2) postglacial deposits and 3) till. The meltwater deposits are valley-fill sediments deposited in several glacial lakes and in glacial-river plains in the Saddle River, Pascack Brook, and Musquapsink Brook valleys (Stanford, 2002). Postglacial deposits consist of alluvium, alluvial fan, stream terrace and swamp deposits. Till covers most upland areas and is mapped with the bedrock. Drumlins composed of till as much as 120 feet thick mapped by Stanford (2002) form elliptical ridges that strike approximately north south and are noted on the map.

Several lithofacies of the Passaic Formation have been described by Parker and others (1988), Parker (1993) and Drake and others (1996). These lithofacies document mudstone in the central Newark Basin that grades into a sandy mudstone through sandstone into conglomeratic sandstone, and finally quartzite-clast conglomerate towards the northwestern corner of the basin (Drake and others, 1996). The outcrop pattern of the conglomeratic sandstone and quartzite-clast conglomerate match the pebbly sandstone and conglomerate of Parker and others (1988) and Parker (1993). Smoot (2010) described the sedimentary rocks in the Park Ridge quadrangle as the axial sandstone and conglomerate facies, which were differentiated from the border conglomerate and sandstone facies. Mapping in the western section of the quadrangle identified sandstone to pebbly sandstone as the dominant lithology. Individual beds could be described as conglomerate containing clasts varying from pebbles to boulders. The overall lithology is an arkosic to feldspathic sandstone, to local pebbly sandstone. Clast lithology consists of vein quartz, quartz arenite, brown siltstone and fossiliferous limestone. Conglomeratic beds are clast-supported, rarely imbricated and their erosional basal contacts portray channel morphologies (fig. 1). Sufficiently thick outcrops demonstrate stacked channels (fig. 2). Clast horizons also form lag deposits consisting of layers one clast thick or aligned on reactivation surfaces. Matrix-supported conglomerates also occurr but are greatly subordinate in volume. Ratcliffe (1988) and Yager and Ratcliffe (2010) described fine sands and clay to the east that lie stratigraphically below coarse-grained to medium-grained quartz-pebble sandstone and conglomerate with less mudstone and shale. Driller's well logs (Stanford, 2002) suggest a dominance of sandstone towards the west and a fine-grained facies, identified as shale in driller's logs that dominates the Passaic to the south. This agrees with the descriptions of Ratcliffe (1988) and Yager and Ratcliffe (2010). This data supplied sufficent information to subdivide the Passaic into two facies.

The Lockatong Argillite does not crop out in the Park Ridge quadrangle and is only shown in the cross section. Geologic descriptions and data on this formation have been projected from the Nyack and Yonkers quadrangles to the east (Monteverde, unpublished data) where the argilite has been separated into two facies: an upper coarser-grained arkosic-to-feldspathic sandstone and a lower, more characteristic black siltstone and lesser interbedded arkosic-to-feldspathic sandstone near its contact with the underlying Stockton Formation (Parker, 1993; Drake and others, 1996). Olsen, (1980a, 1980b, 1980c) and Olsen and others (1989) did not use this subdivision of the Lockatong and instead defined the upper coarse-grained facies as part of the Stockton. Olsen, (1980b, 1980c), and Olsen and others, 1989, 1996, 2004) did place the repetitious fining-upwards cycles in this region into their defined member that can be correlated across the Newark Basin as the overall grain size changes from coarse sand through siltstone to mudstone.

STRUCTURE

Sedimentary units dip fairly uniformly west-southwest except where channel margins are exposed. Dip angle and dip direction may vary owing to the nature of braided stream deposits. The most common bedding strike ranges from 00^{o} to 020^{o} with a total range of 30^{o} to either side of north (fig 1). Jointing is uncommon in most outcrops. Joints range widely in strike but dominant trend at 170^{o}-180^{o} (fig. 3). No other evidence of structural development was visible in the sparse rock exposures in the study area.

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DESCRIPTIONS OF MAP UNITS

Qpg Postglacial deposits - Alluvium consisting of pebble- to cobble-gravel, sand, silt, and clay; and wetland deposits consisting of peat and organic silt, clay and fine sand. Dark-reddish-brown, reddish-brown, gray and black, moderately to well sorted, stratified to massive. As much as 15 feet thick. Corresponds to alluvium, alluvial fan, stream terrace and swamp deposits of Stanford (2002)

Qg Glacial meltwater deposits – includes glacial-lake deposits consisting of well sorted, stratified sand and gravel in inclined foreset and overlying topset beds, locally displaying collapse features, laminated to thin-bedded silt, clay and fine sand. Also includes glacial-stream sediments consisting of well sorted, stratified gravel and sand, in horizontal to cross-bedded, thick to thin beds. Gravel consists of sandstone, mudstone, gneiss, and quartzite, sand includes quartz, feldspar, mica and rock fragments. Deposit consists of units combined from Stanford (2002)

Glacial till - blanket of unsorted sediment 10 to 120 feet thick and averaging about 40 feet thick (Stanford, 2002).

JTRsp
JTRps Passaic Formation - (Lower Jurassic and Upper Triassic) (Olsen, 1980a) - Interbedded sequence of reddish-brown to maroon, and white to buff, medium- to coarse-grained arkosic to feldspathic sandstone and coarse-grained arkosic pebbly sandstone (JTRsp) and less common fine- to medium-grained sandstone to shaley siltstone (JTRps). Sandstone is medium to coarse-grained, poorly to moderately sorted, subrounded, dominated by arkosic to feldspathic sandstone consisting chiefly of quartz with white feldspar grains, and lesserclay and siltstone. Pebbly sandstone dominated by pebbles with local concentrations of granules, and uncommon cobbles, subrounded to rounded, rarely imbricated, consisting chiefly of vein quartz but also fossiliferous limestone, red brown sandstone, siltstone and dark-gray chert. Clasts range from 5 to 15% rock and are clast- to matrix-supported in an arkosic-to-feldspathic sandstone. Thin- to thick-bedded, erosive base, pebbles commonly are lags and rare along reactivation surfaces, planar cross-stratified, weak horizontal bedding, channels with pebble lags, in stacked channels: some material is massive. Regionally unit coarsens with larger clast size and volume towards the north-northwest. Formation is approximately 11,000 feet thick in region. Lower contact gradational.

TRla Lockatong Formation (Upper Triassic) (Kummel, 1897) - (shown only in cross section) Cyclically deposited sequences of mainly gray to greenish-gray siltstone and white to buff arkosic sandstone and local pebble conglomerate. Siltstone is medium- to fine-grained, thin-bedded, laminated, platy to massive. Arkose (TRla) is similar to that of the Stockton Formation and is massive to cross-bedded. Symmetrical ripples indicate bidirectional flow. Maximum thickness of unit regionally is about 700 feet (Parker, 1993).

EXPLANATION OF MAP SYMBOLS

Contact - Dashed where approximately located; dotted where concealed

Planar features

11 Strike and dip of inclined beds

Other features

Drumlin (location from Stanford, 2002)

Rock quarry, abandoned

• ss Lithologic identification from drill-log data (Stanford 2002). Dot locates drill hole, abbreviated label identifies lithology; where ss = sandstone, sh = shale and rr = red rock

Fig. 2 Location of bedrock exposures shown in figures 1 and 2

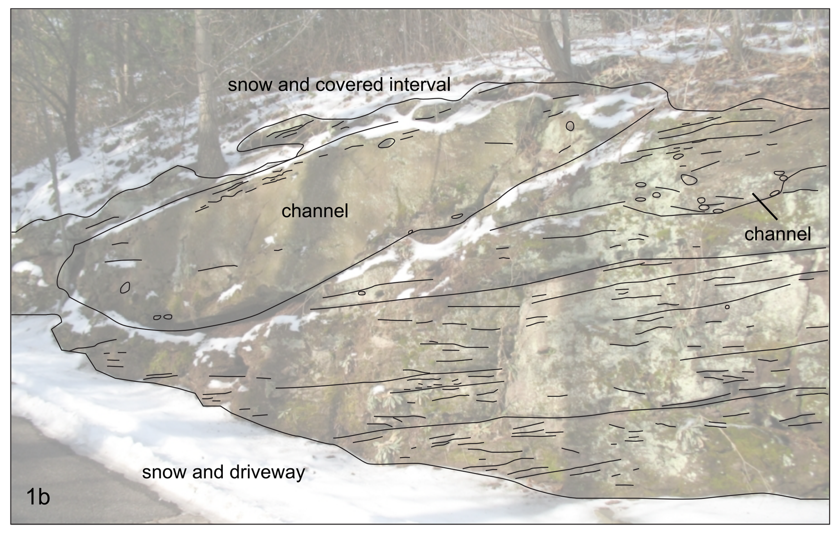

Figure 1. Photograph (1a) and line drawing (1b) of channel eroded down into sandstone beds. Smaller channel is at lower right. Clasts more numerous at base of channel.

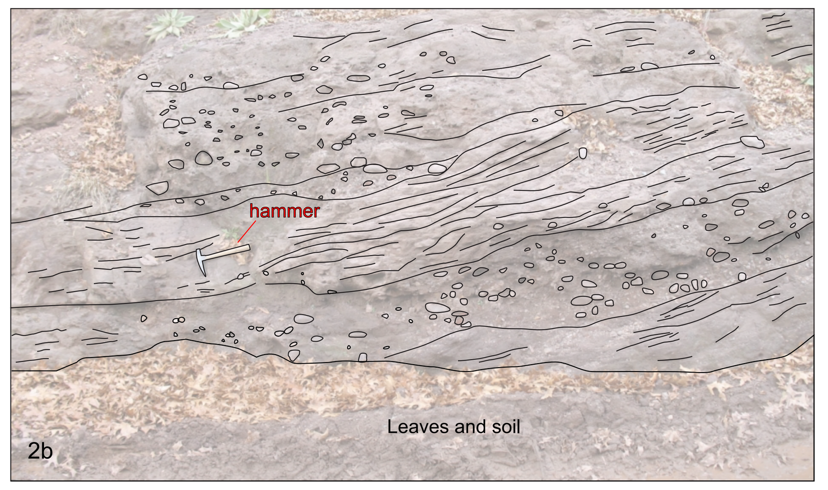

Figure 2. Photograph (2a) and line drawing (2b) of pebbly sandstone beds. Smaller channel is at lower right. Clasts more numerous at base of channel and scattered elsewhere.