

Base modified from U.S. Geological Survey, 1984, scale 1:25,000 North American Datum of 1927; North American Datum of 1983 shown by dashed corner ticks Projection based on New Hampshire State Plane coordinate system (Transverse Mercato 10,000-foot grid ticks based on Vermont and New Hampshire coordinate systems 1000-meter Universal Transverse Mercator grid ticks, zone 18

> DESCRIPTION OF MAP UNITS [Major minerals are listed in order of increasing abundance]

POST-METAMORPHIC INTRUSIVE AND METASOMATIC ROCKS [Dikes are assigned a Cretaceous age on the basis of the 122.2±1.2 Ma (mega-annum) rubidium/strontium (Rb/Sr) age of the Ascutney Mountain Intrusive Complex (Foland and others, 1985), a 133±6 Ma age from a dike in the North Hartland Dam spillway (McHone and McHone, 2012), and on a regional summary by McHone (1984) for similar dikes

volcanic rocks in the Waits River Formation (DSwa and DSwhg) similar divitrification features in the vicinity of Mount Ascutney

Ascutney Mountain Intrusive Complex (new formal name) Ascutney Mountain Stock (Plutonic Rocks) [Foland and Faul (1977) dated the syenite (Ks) at 120±4 Ma and three samples from the granite (Kg) at 120±4 Ma, 119±2 Ma, 118±2 Ma by potassium-argon (K-Ar) on biotite] Aplite dikes (Early Cretaceous)—Light-tan or pink, very fine gabbro and diorite (Kgd) and the hornfels (Kch)

Conway Granite was determined to be 30 to 50 million years older mapped separately within the syenite on the west side of Mount (Jurassic in age) by Eby and others (1992). The unit is distinguished Ascutney. Dikes of syenite that contain xenoliths of gneiss of the from the syenite by the presence of coarse quartz crystals and Mount Holly Complex (for example, station MA-1536 in the GIS noticeably less mafic accessory minerals. Similar to the syenite, it database) intrude the gabbro and diorite of the Little Ascutney stock (Kgd). Syenite occurs as the main stock of Mount Ascutney and also weathers chalky white, but fresh surfaces reveal salmon-pink occurs as dikes (generally less than 1 m thick) in the country rock colored alkali feldspar crystals, milky white plagioclase, and clear surrounding the pluton. Outcrop-scale dikes are shown by strike and (grayish) quartz with minor magnetite, biotite, and ±hornblende. The contact with the surrounding syenite is diffuse and transitional over dip symbols. The unit hosts three abandoned quarries (Mower, several meters. At station 13051 (see GIS database) on the Mount Enwrighte, and Norcross) (Dale, 1909, 1923; Morrill and Chaffee, 1964). The quarried stone was called the "Windsor granite" or Ascutney State Park summit road, the contact can be seen as "Ascutney green" (Dale, 1909, 1923) transitional across a 3-m-wide zone. Within this zone, the granite is finer grained, but there are also pegmatitic zones (~30 cm thick)

of the mountain (Daly, 1903)

and is well exposed at the Ascutney North summit

Syenite (Early Cretaceous)—Light-gray, dark-green to chalky white

weathering to very light gray to rusty weathering, coarse-grained,

ocally porphyritic, biotite-hornblende-perthite syenite. Contains

accessory magnetite and minor clinopyroxene (augite), fayalite, and

quartz (Schneiderman, 1991). Perthite is locally sericitized. The rock

contains accessory apatite, zircon, titanite, monazite, and magnetite

(Schneiderman, 1991) and commonly contains xenoliths. Near the

contact with the country rock (within ~400 m or less), large meter-

scale and smaller xenoliths of hornfels are common. At distances

greater than 400 m from the contact, hornfels xenoliths are rare or

absent. The most common xenoliths are black to dark-grayish-purple,

porphyritic volcanic rock with white, coarse-grained, euhedral to

subhedral feldspar crystals in an aphanitic fine-grained dark matrix.

Originally called "basic segregations" by Daly (1903), they were later

interpreted as xenoliths (Chapman and Chapman, 1940: Foland and

others, 1985; Schneiderman, 1991). The xenoliths are commonly

softball sized or smaller and angular to subrounded in shape. Areas

with a very high density of xenoliths (up to 70 or 80 percent of the

rock) are mapped separately as plutonic breccia (Kspb), most notably

at Cascade Falls. Large (kilometer-scale) screens of volcanic rock are

Volcanic Rocks present with abundant quartz. These pegmatitic zones are not connected but concentrated in linear zones parallel to the strike of the contact. As the granite transitions into syenite, the rock becomes less quartz rich and richer in mafic minerals. The syenite in this zone is medium to coarse grained, and gradually coarsens farther away from the contact. Aplite dikes are more abundant in places within the syenite near the contact. At station 13111 (see GIS database), the granitic aplite dikes are curved and bifurcated, oriented in many different directions, and appear to be related to the intrusion of the granite. The granite occurs as a stock on the east side of Mount Ascutney and occurs as dikes that are generally less than 1 m thick in the country rock surrounding the pluton. Outcrop-scale dikes are shown by strike-and-dip symbols. The unit hosts three closely spaced abandoned quarries that are shown by one symbol on the south side Medium-grained syenite to quartz syenite (Early Cretaceous)-Light-gray, white to very light gray weathering to rusty weathering, medium-grained, biotite-hornblende-perthite syenite to quartz syenite. Ascutney in greater detail Quartz content ranges from about 5 to 10 percent. The rock is

characteristically finer grained than the surrounding host-rock syenite Little Ascutney Stock (Plutonic Rocks) (Ks) into which it intruded. The contact with the coarse-grained syenite (Ks) is typically sharp, and some angular xenoliths of Ks were found within this unit. Locally, the unit contains volcanic xenoliths similar to the xenoliths within the coarse syenite. Generally, the unit contains less mafic minerals than the coarse-grained syenite, but locally exhibits mafic-rich zones with euhedral hornblende crystals. The unit contains abundant, large (meter-scale) lenses and irregular, interfingering patches of coarse syenite (Ks) and apparently intruded the coarse syenite via closely spaced dikes that interconnected and coalesced. The unit is mapped on the north side of Mount Ascutney

[Where the unit patterns are shown for Kh and Kch in their respective contact metamorphic zones, Kh and Kch overprint other map units] Kch Hornfels (Cretaceous)—Dark- and light-colored, foliated albitecordierite hornfels with only relict foliation (Kch); colors include (1) black to dark-gray, (2) purple to purplish-gray, (3) light-gray to hornfels (Kh) and the rocks of the Waits River Formation is western side of the Ascutney Mountain stock, two rock units (DSwg hornblende and garnet. The major contact metamorphic phases in the inner zone (Kch) are cordierite, spinel (pleonaste), biotite, garnet,

corundum, and epidote (Daly, 1903) with minor and alusite (Nielson, 1973) and fibrolitic sillimanite (Schneiderman, 1989). Calcareous rocks contain diopside and wollastonite, and locally they contain grossularite and scapolite (Nielson, 1973). The Paleozoic foliation is generally preserved in the hornfels up to approximately 30 m from the intrusion, within which is a zone where the hornfels is locally brecciated and cut by syenitic and aplitic dikes. The main contact with the syenite is sharp and subvertical to steeply dipping inward towards the core of the pluton. Daly (1903), Nielson (1973), and Schneiderman (1989) describe the hornfels in detail. Schneiderman (1989, 1991) calculated a pressure of emplacement of the igneous complex at about 1.5 to 2 kilobars and a temperature of emplacement between 890 to 1000 degrees Celsius (°C); conditions equivalent to a

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SYN- TO POST-METAMORPHIC ROCKS KDq Quartz veins (Cretaceous to Devonian)—White- to gray-weathering quartz veins ranging in size from 0.1 to 3 m. The rock may locally contain small amounts of muscovite, chlorite, graphite, sulfides, and carbonate minerals. The unit is shown as a single polygonal map unit, or shown with strike-and-dip or diamond-point symbols; thickness of the unit is exaggerated on the map to show location. The 10-m-thick vein exposed near the southern border of the map (east of Claremont) is mapped as a Mesozoic silicified zone related to brittle faulting

NEW HAMPSHIRE PLUTONIC SUITE Granite (Devonian)—Massive to moderately well foliated, ±garnet±microcline-muscovite-biotite-quartz-plagioclase granite to trondhjemite dikes and sills. The dikes cut an early bed-parallel foliation (S₁) in the Silurian to Devonian rocks and pre-date the development of the S₂ foliation. The unit may be shown on the map by a strike-and-dip symbol only. The stock at Bald Mountain intrudes the Littleton Formation and yields a uranium-lead (U-Pb) sensitive high-resolution ion microprobe (SHRIMP) zircon age of 395±5 Ma (Walsh and others, 2014). The Bald Mountain granite was previously mapped as either "granodiorite gneiss and related rocks" ("Db" of

Thompson and others, 1990) or as volcanic rocks in the Littleton Formation ("Dlv" of Lyons and others, 1997) **Pegmatite (Devonian)**—White- to pink-weathering, massive, ±garnetourmaline-biotite-muscovite-quartz-K-feldspar pegmatite. Pegmatite layers are mainly concordant with the dominant foliation and layering, but locally they crosscut the rocks they intrude. Mapped pegmatite is restricted to the southeastern part of the map where the pegmatite is deformed by the D₂ deformation fabric in these rocks. The unit is shown as polygonal map units, or shown with strike-and-dip or reddish-pink diamond symbols; thickness of the unit may be exaggerated on the map to show location

[Age from McWilliams and others, 2010] Metasedimentary Rocks Dgm Meetinghouse Slate Member (Lower Devonian)—Silvery gray to quartz phyllite and schist with beds of biotite-muscovite quartzite. All major minerals form the dominant foliation with syn- to late-fabricforming biotite porphyroblasts. Accessory minerals include epidote, apatite, rutile, ilmenite, and magnetite. Quartzite layers vary from mm-scale to 20 cm thick. The unit becomes "pinstriped" near the

east side of the Meriden antiform. The lower contact is gradational with Dgq, and the upper contact is the Monroe thrust fault Dgq Feldspathic quartzite, granofels, and metapelite member (Lower **Devonian**)—Light-gray, tan-weathering, massive, micaceous, feldspathic quartzite and micaceous plagioclase-quartz granofels interbedded with lesser dark-gray carbonaceous chlorite-biotitemuscovite-plagioclase-quartz slate, phyllite, or schist. Locally, where the unit is slightly calcareous, it contains round-weathering pits as much as a few cm across. The unit contains approximately 50 to 90 percent quartzite and granofels in beds that generally range in thickness from 2 to 100 cm. The core of the Meriden antiform (Dgq) consists mainly of quartzite, and locally consists of 10 percent or less of metapelite. Layering becomes tectonically "pinstriped" near the Monroe thrust fault. The lower contact is gradational with the Waits River Formation. The upper contact is either (1) a facies change, where it is in contact with upper members of the Gile Mountain Formation; or (2) tectonic in nature, where it is in contact with the Ammonoosuc Volcanics and Partridge Formation. The unit is well exposed in Cornish on Kenyon Hill, Parsonage Hill, and Spaulding Hill Dgqs Gray quartzite and metapelite member (Lower Devonian)—Darkto light-gray, locally sulfidic, lustrous, carbonaceous chlorite±garnet±

Monroe thrust fault due to mylonitization. The unit is exposed on the

MAP LOCATION

biotite-plagioclase-quartz-muscovite schist and phyllite, locally interbedded with thin gray quartzite, tan to gray feldspathic quartzite, and gritty micaceous plagioclase-quartz granofels. Quartzite is generally less than 50 percent of the unit. The unit is similar to the phyllite and schist member (DSws) of the Waits River Formation, but generally has more quartzite beds, and is also similar to the metapelite member of the Gile Mountain Formation (Dgq), but has fewer quartzite beds. Typical exposures occur in Windsor on Horseback Ridge Metavolcanic Rocks

Greenstone member (Lower Devonian)—Green to greenish-black, fine- to medium-grained, massive to schistose, ±carbonate-epidoteactinolite-plagioclase-chlorite greenstone and silvery gray-green ankerite-plagioclase-chlorite-quartz schist. The unit is interpreted as metamorphosed volcanic and volcaniclastic rocks. Small discontinuous exposures are present southwest of Cornish Flat with a more extensive belt exposed on the western limb of the Meriden antiform. The unit is poorly exposed in an unnamed stream on the north side of Dingleton Hill WAITS RIVER FORMATION

[Age from McWilliams and others, 2010] Metasedimentary Rocks

DSwl Limestone and schist member (Lower Devonian and Silurian)—Dark- to light-gray, locally sulfidic and rusty weathering, lustrous, carbonaceous chlorite±garnet±biotite-plagioclase-quartzmuscovite schist and phyllite with characteristic interbedded dark-blue-gray, dark-brown punky weathering, impure siliceous limestone or marble, quartz-rich calcareous schist, and gray calcareous to non-calcareous quartzite. The phyllite contains less than 10 percent chlorite and plagioclase, accessory biotite and garnet porphyroblasts in the garnet zone, and rare biotite porphyroblasts in the biotite zone. The limestones contain trace to 5 percent muscovite, 20 to 40 percent quartz, and 60 to 80 percent calcite with accessory apatite. The unit is distinguished from the adjacent metasedimentary units by the abundance of brown-weathered limestone and rusty calcite-bearing schist. Beds of limestone range in thickness from 1 cm to 1.5 m and may constitute 10 to 90 percent of an exposure; bedding in the metapelite is generally not visible. Contacts with adjacent units

are gradational to sharp and are mapped where limestone beds decrease in abundance and thickness. Contacts with DSws are interpreted as facies changes and may not necessarily imply stratigraphic order. The unit is well-exposed along Interstate 91 DSws Gray phyllite and schist member (Lower Devonian and Silurian)—Dark- to light-gray, fine-grained, lustrous, carbonaceous chlorite-muscovite-plagioclase-quartz schist and phyllite. In places, the unit contains interbedded thin gray quartzite, tan to gray feldspathic quartzite, and gritty plagioclase-quartz granofels that is similar to Dgq; mapped separately in one location as DSwq (where thick enough) in the south-central part of the map, east of Gird Lot Road in Weathersfield. Beds range in thickness from 3 to 10 cm. Locally, the unit contains trace amounts of very thin (1 to 2 cm) brown-weathering limestone beds. The schist contains biotite and

Geology mapped by Walsh (1994–1995; 2010–2014), Ratcliffe (1994–1995), Proctor (2010), Valley

manuscript map by J.B. Thompson, Jr. (dated April 1988) that was obtained from Harvard University

The geology in Corbin Park in the eastern part of the map was compiled from an unpublished

Digitized by Walsh and Meghan E. Mason; assisted by Malayika M. Cincotta

Edited by David A. Shields

generally has fewer quartzite layers Metavolcanic Rocks Laminated schist and granofels member (Lower Devonian and Silurian)—Heterogeneous unit consisting of (1) laminated (mm-scale) to layered (cm-scale), green and white, in places rusty weathering, fine- to medium-grained, muscovite±biotite-chloritequartz-plagioclase schist; (2) silvery green, fine- to mediumgrained, muscovite±biotite-chlorite-quartz-plagioclase schist; (3) gray-green, medium-grained, muscovite±biotite-chlorite-quartzplagioclase granofels; (4) gray to light-gray, ±carbonate±garnetbiotite-chlorite-muscovite-quartz-plagioclase granofels in 5-cm- to 2-m-thick beds with coarse (1- to 8-mm-diameter) plagioclase and quartz porphyroclasts; (5) green, fine-grained, quartz-epidotechlorite-plagioclase schist or greenstone; and (6) silvery gray, rusty weathering, calcite-muscovite-chlorite-quartz-plagioclase schist. The unit contains accessory ilmenite porphyroblasts and porphyroclasts 1- to 5-mm long, and in places, is pitted where it contains accessory carbonate. The unit is interpreted as a heterogeneous assemblage of metamorphosed volcaniclastic and

garnet in the western part of the map. The unit is similar to Dgqs, but

Schist member (Lower Devonian)—Silvery gray to dark-gray, fine- to medium-grained, biotite-chlorite-muscovite-quartz schist, minor carbonaceous muscovite-quartz schist, and interbedded muscovite schist and micaceous quartzite (metaturbidite). Locally, the unit exhibits rusty weathering, and in such places, it is extremely difficult to distinguish this unit from the Partridge Formation. The unit contains garnet and characteristic large staurolite (up to 1.5 cm wide x 10 cm long) at higher metamorphic grades. Locally, garnet is completely pseudomorphed by chlorite. Staurolite typically has retrograde muscovite (±chlorite rims) and locally exhibits complete replacement by muscovite±chlorite at lower grades and partial to complete replacement by muscovite and sillimanite (fibrolite) at higher grade in the eastern edge of the map along Brighton Road. The unit is in contact with the Clough Quartzite or the Partridge Formation along much of the Northey Hill shear zone and unconformably overlies the Clough Quartzite and Fitch Formation west of Green Mountain. The unit is in gradational contact with Dlq and is locally conformable with the Fitch Formation in the eastern part of the map. Typical exposures occur along the power line east of

Metaconglomerate member (Lower Devonian)—Gray to very light gray, white chalky weathering, fine- to coarse-grained, metamorphosed quartz-pebble conglomerate and polymict conglomerate. Conglomerate varies from clast-supported conglomeratic layers (up to 30 cm thick) to isolated, matrix-supported pebbles. The unit may contain felsic volcanic clasts or volcaniclastic rock. Southwest of Bald Mountain, the unit occurs as lenses within the DI member less than 200 m above the contact between DI and the metaconglomerate member (Scq) of the Clough Quartzite. Thickness of the unit varies from 1 to 5 m and is exaggerated on the map to show its location

SHAW MOUNTAIN FORMATION Shaw Mountain Formation (Silurian)—Heterogeneous unit consisting f interbedded rusty, slabby quartz-amphibolite, gray quartzite, feldspathic granofels, and biotite schist. The unit is exposed in Weathersfield on Pikes Peak **BRONSON HILL ANTICLINORIUM**

Sulfidic schist member (Ordovician)—Dark-gray to light-gray and grayish-black, rusty weathering, sulfidic, graphite±garnet-ilmeniteplagioclase-biotite-chlorite-quartz-muscovite phyllite or schist. Locally, the unit contains light- to dark-gray micaceous quartzite (in nly laminated layers or boudins) and dark-gray quartzite beds mapped separately as Opq; and contains rare 1- to 3-m-thick, dark-green, epidote-chlorite-hornblende-plagioclase amphibolite dikes or metavolcanic layers (amphibolite) mapped as Opa. The size of the quartzite (Opq) and amphibolite (Opa) units are exaggerated on the map to show their locations: Ona is only mapped at one location at the top of the Partridge Formation south of Bald Mountain. Contacts with the Ammonoosuc Volcanics are generally sharp, but may be gradational within a few meters. Contacts with the Clough Quartzite are very sharp and rocks are phyllonitic to

¹U.S. Geological Survey;

²University of New Hampshire;

³Naval Surface Warfare Center;

⁴Alaska Department of Natural Resources

felsic layers range from internally laminated (on a cm scale) to more massive layers that are tens of meters or more thick. Rusty weathering biotite-muscovite-quartz schist, feldspathic granofels, and layers of coticule that are present throughout the unit indicate a collection of volcaniclastic rocks and interbedded subordinate metasedimentary rocks; for this reason the unit is interpreted as a member of the Cram Hill Formation. Contact relations with underlying units are uncertain, and it may disconformably overlie both the Moretown Formation and trondhjemite gneiss (Ontd) of the North River Igneous Suite. The unit occurs below the unconformity at the base of the Connecticut Valley trough

Metasedimentary Rocks Quartzite member (Ordovician)—Steel-gray- to yellow-tan-weathering quartzite and quartz-pebble conglomerate as much as 2 m thick. At one location in Weathersfield, north of Route 131, the unit occurs along the contact with O€mb and Ochv NORTH RIVER IGNEOUS SUITE

Trondhjemite gneiss (Ordovician)—Light-gray- to chalky-whiteweathering, massive, medium-grained, biotite±garnet-quartzplagioclase trondhjemite gneiss. The unit lacks mafic layers that are present in Ochv of the Cram Hill Formation and is interpreted as intrusive into O€mhfs of the Moretown Formation along the contact with Ochv. Alternatively, this unit could be a metadacite

MORETOWN FORMATION [Age from Aleinikoff and others, 2011; Ratcliffe and others, 2011; Macdonald and others, 2014] OEmhfs Hornblende fascicle schist member (Ordovician to Cambrian)-Light-gray to gray-green, chlorite-muscovite-biotite-plagioclasequartz schist and granofels characterized by (1) conspicuous sprays of hornblende; (2) distinctive, large (5-mm- to 1-cm-diameter) porphyroblasts of cross-foliation biotite; (3) abundant irregular layers of coticule that are 1 to 2 cm thick; and (4) abundant layers of light-gray, pinstriped biotite-quartz granofels similar to the "pinstriped" granofels member (Omp) of Ratcliffe and others (2011)

O€mb Black schist member (Ordovician to Cambrian)—Dark-gray to silvery gray, carbonaceous garnet-biotite-muscovite schist, and associated rusty weathering muscovite-biotite-quartz schist. The unit contains layers rich in small garnet that are 1 to 2 mm in diameter; layers resemble phyllites of the Whetstone Hill Member of the Moretown Formation (Ratcliffe and others, 2011) O€mgt | Garnet schist and granofels (Ordovician to Cambrian)—Light-grayto gray-green-weathering, garnet-biotite-chlorite-muscovite-quartz

distinctive garnet. The unit occurs in depositional contact with O€mb about 1 km west of Brownsville in the northwest part of the map Quartzite member (Ordovician to Cambrian)—Light-tan-weathering, thinly layered, muscovite-biotite-plagioclase quartzite. The unit occurs in contact with O€mgt and as layers within O€mb Freen schist and granofels member (Ordovician to Cambrian)— Light-green to pale-gray-green, lustrous, chlorite-biotite-muscovite-

schist and schistose biotite-garnet-plagioclase-quartz granofels with

quartz schist and light-gray feldspathic granofels interbedded on a scale of 10 cm. Locally, the unit contains coarse-grained garnet schist and widespread thin beds (as much as 10 cm thick) of pinstriped chlorite-muscovite-plagioclase-quartz schist and granofels identical to the "pinstriped" granofels member (Omp) of Ratcliffe and others (2011). Beds of coticule that are 1 to 2 cm thick (identified on the map by a lower case "c") or layers of dark-green, well-foliated amphibolite may be abundant. Distinctive porphyroblasts of cross-foliation biotite occur throughout the unit. These porphyroblasts and the very feldspathic interbeds are regionally characteristic of the Moretown or Stowe Formations and are absent from the Pinney Hollow Formation at the type locality and are also absent regionally (Ratcliffe and others, 2011) with which these rocks have been correlated by Thompson and others (1993). The unit is in fault contact with Mesoproterozoic rocks at its base and is interbedded with and gradational upward into O€mb. The unit is well exposed northeast and southeast of Ascutney Notch where it was intruded by the Cretaceous gabbro and diorite of the Little Ascutney stock

Amphibolite (Ordovician to Cambrian)—Dark-green epidoteotite-hornblende and hornblende-plagioclase amphibolite. The rock varies from well foliated (with epidote pods) to a more granular rock consisting of approximately 70 percent hornblende and 30 percent plagioclase

Talc-carbonate schist (Ordovician and Cambrian)—Cream-colored o light-bluish-gray, brown-weathering, talc-carbonate schist and dark-green serpentinite. The unit is exposed at one location in the black schist member (OEmb) of the Moretown Formation south of Cady Hill Road in Weathersfield. The contacts with other units are not exposed in the map area

[Age from Tremblay and Pinet, 2016]

CORE ROCKS OF THE CHESTER DOME MOUNT HOLLY COMPLEX Intrusive and Migmatitic Rocks

Baileys Mills tonalitic gneiss **Fonalitic gneiss (Mesoproterozoic)**—Light-gray- to whitish-grayweathering, coarse-biotite-flecked, medium-grained, biotite-quartzplagioclase gneiss having a distinctive non-gneissic, igneousappearing texture in less sheared rocks. The unit contains numerous inclusions of coarse biotite amphibolite (mapped as Ya) that may, in part, be comagmatic dikes of metagabbro. The unit passes into lighter-gray (more leucocratic) biotite trondhjemite gneiss, and yielded a SHRIMP U-Pb zircon age of 1,383±13 Ma (Ratcliffe and others, 1991; Aleinikoff and others, 2011). The unit is well exposed along the power line southwest of Nelsons Corner

Plagioclase-phenocrystic tonalite gneiss (Mesoproterozoic)—Very well foliated, mylonitic, biotite gneiss containing porphyroclastic eyes of plagioclase (as much as 5 mm long) that are set in a mylonitic matrix that is rich in biotite. The rock gradually passes into a mylonite gneiss or schist that may be equivalent to much of the dark, biotitic, feldspathic schist in the feldspathic member of the Cavendish Formation (Ycfs) on Hawks Mountain and on Pine Hill in the adjacent Chester quadrangle (Ratcliffe, 1995b; 2000b). The unit is well exposed along the power line southeast of Nelsons Corner Metasedimentary and Metavolcanic Rocks

Cavendish Formation (Mesoproterozoic)

[There are no exposures of the Cavendish Formation on the map, however, contacts have been extrapolated from exposures in the adjacent Cavendish quadrangle (Ratcliffe, 1995a; 2000a)] Ycfs Feldspathic schist or granofels (Mesoproterozoic)—Either (1) lightto medium-dark gray, rusty weathering, white-plagioclase-spotted, biotite-quartz granofels; or (2) biotite-rich porphyroclastic schist that has isolated augen of plagioclase (as much as 1 cm in diameter) that

are set in a phyllonitic matrix of biotite, muscovite, epidote, and quartz Marble (Mesoproterozoic)—Unit consisting of a variety of marbles closely associated with calc-silicate gneiss and (or) beds of actinolitic quartzite, including (1) whitish-gray-weathering, medium- to coarse grained, phlogopite-calcite-dolomite and quartz-knotted marble; (2) greenish actinolite-rich dolomitic marble; and (3) yellow-grayweathering, fine-grained, highly foliated phlogopite-talc(?)-tremolite-

Other layered gneiss of the Mount Holly Complex Ybg Biotite-quartz-plagioclase gneiss (Mesoproterozoic)—Heterogeneous unit consisting of an assemblage of dark- to medium-gray, non-rusty weathering, quartz-rich biotite gneisses, all characterized by abundant plagioclase and epidote and little or no microcline. Other distinctive rock types include (1) light-gray-weathering, magnetite-muscovitebiotite-plagioclase-quartz gneiss containing thin layers of hornblendespotted gneiss; (2) very dark gray, biotite-rich plagioclase-quartz gneiss commonly associated with epidote quartzite; and (3) mediumto dark-gray, white-albite-spotted, biotite-quartz gneiss. Muscovite is a common accessory mineral in most rocks and small garnet may be present as well. The biotite-quartz-plagioclase gneiss contains numerous layers of other distinctive rocks interlayered throughout; where these interlayered rocks are thick enough, they are mapped

separately as Ya and Y²rs Amphibolite (Mesoproterozoic)—Dark-green- to dull-gray-weathering, fine- to coarse-grained, biotite-hornblende-plagioclase and garnethornblende-plagioclase amphibolite that is commonly associated with

Y²rs Quartz schist and gneiss (Mesoproterozoic)—Dark-brown to gray, rusty weathering, gneiss and schist containing abundant layers of schistose quartzite, biotite-garnet quartzite, and rusty sulfidic amphibolite. Locally, the rock passes into more muscovitic, lustrous, chlorite-garnet-muscovite schist mapped in the adjacent Chester and Cavendish quadrangles as unit Yrs (Ratcliffe, 1995a; 1995b; 2000a; 2000b), but here they are not distinguished separately

EXPLANATION OF MAP SYMBOLS [Taconic, Acadian, Neo-Acadian, and Alleghanian, refer to orogenic events and not to divisions of geologic time] Contact—Approximately located; dotted where concealed by water; dashed where inferred in Corbin Park. In cross section, dotted where projected above the ground surface; projections are based on

Outcrops—Areas of exposed bedrock or closely spaced contiguous bedrock exposures examined in this study; some areas are enlarged to

[Approximately located; dotted where concealed by water. In cross section, dotted where projected above the ground surface] Pre-peak metamorphic thrust fault—Parallel to the Acadian S₁

structural measurements of surface exposures

foliation in the Connecticut Valley trough. The Keyes Mountain thrust fault may be Taconic. Sawteeth on upper plate Post-peak metamorphic strike-slip fault or shear zone (Alleghanian)—Steeply dipping, parallel to the S₂ or younger foliation; arrows indicate relative motion where known; U, upthrown side; D, downthrown side. Faults and shear zones are characterized by lower-greenschist facies metamorphic assemblages that overprint earlier higher-grade assemblages. Includes the Sumner Falls, Northey Hill, and Bald Mountain shear zones; location of Bald Mountain shear zone is inferred in Corbin Park Brittle fault (Mesozoic)—Steeply dipping; arrows indicate relative motion where known; U, upthrown side; D, downthrown side where

Axial trace of F₂ fold (Acadian or Alleghanian, early dome-stage)

[Location is known or inferred; dotted where concealed by water. Symbols show trace of axial surface and direction of dip of limbs] Axial trace of F₁ fold (Acadian, nappe-stage)

Overturned antiform

Overturned synform

Axial trace of F₃ or younger fold (Alleghanian?) Antiform

Folds in the pre-Silurian rocks above and within the Chester dome Strike and dip of inclined axial surface of minor isoclinal fold of schistosity or gneissosity that is parallel to the composite first and second generation schistosity (S₁-S₂); probably Taconic; arrow shows bearing and plunge of hinge line of fold. Minor folds are concentrated near and parallel to the fault between the core gneisses and pre-Silurian cover rocks of the Chester dome

Strike and dip of axial surface of minor fold that is parallel to nonpenetrative cleavage; arrow shows bearing and plunge of hinge line of fold. May correlate with F₂ and F₃ folds in the Silurian and Strike and dip of folded axial surface of F₁ fold that is parallel to S₁ **foliation**—Isoclinal, rootless folds; Acadian nappe-stage

Inclined \leftarrow Inclined, with horizontal fold axes

of undetermined age (possibly F₄ fold) Strike and dip of kink bands (S₄)—Mesozoic

PLANAR FEATURES

> Strike and dip of bedding Inclined, showing tops from graded beds or pillows Inclined, overturned showing tops

 ── Vertical ♦ Location only, no orientation measured Strike and dip of mafic dike (Kd)

Strike and dip of spherulitic felsic dike (Kfd) Strike and dip of biotite-granite dike (Kg) Strike and dip of aplite dike (Ka) Vertical

Strike and dip of syenite dike (Ks) ── Vertical Strike and dip of granite dike (Dg)

♦ Location of pegmatite dike or sill (Dp)

Planar features in the pre-Silurian rocks above and within the Strike and dip of inclined gneissic layering (gneissosity) of Proterozoic age; symbol inside the Ascutney Mountain Intrusive Complex indicates the location of small-scale Mesoproterozoic xenoliths in the Little Ascutney stock at Ascutney Notch

Generalized strike and dip of highly-plicated inclined schistosity of undetermined age Strike and dip of inclined penetrative schistosity Strike and dip of nonpenetrative spaced cleavage or crenulation cleavage; may correlate with S₂ or S₃ in Silurian and Devonian

Planar features in rocks that are east of the Keyes Mountain thrust

or compositional layering; Acadian Inclined, deformed

Inclined, mylonitic or phyllonitic S₂ or S₃ foliation in local shear Strike and dip of dominant foliation (S_n)—Not age specific, but either S_1 or a composite S_1 - S_2 foliation expressed as a schistosity where S_2 is penetrative Inclined

with open folds and a crenulation lineation, which post-date the dominant schistosity; most apparent in fine-grained metapelites; Neo-Acadian, Alleghanian or younger Inclined

₩₩ Vertical LINEAR FEATURES \longrightarrow 5 Bearing and plunge of F_1 minor fold axis

→ 52 Bearing and plunge of L₂ intersection lineation—Intersection $\rightarrow 12$ Bearing and plunge of F_2 minor fold axis—Fold axis of tight, isoclinal, or rootless fold associated with S₂ Bearing and plunge of L, mineral lineation—Aggregate lineation or

throughout New England and Québec] Mafic dikes (Cretaceous)—Dark-gray to black, locally rusty veathering, very fine grained, locally porphyritic lamprophyre, camptonite, or diabase dikes. Forty-six dikes are shown by point symbols, and range from centimeters (cm) up to 2.0 meters (m) thick. The dikes may contain phenocrysts of biotite, amphibole, pyroxene, and olivine and may also contain amygdules filled with dolomite or calcite. Generally, the dikes intrude parallel to steeply dipping joint sets and show variable orientations with a calculated principal trend of 63 degrees (°) ± 5 °. The dikes are unfoliated but may exhibit blocky jointing. One 3-m-thick dike was traced discontinuously for over 8 kilometers (km) from just north of Whitewater Reservoir near South Cornish to near the west side of Green Mountain; the dike parallels or intrudes a brittle fault. Thickness of the dikes is exaggerated on the map to show location. Many dikes cut the syenite (Ks) at Mount Ascutney, so these undated dikes are younger than

Trachyte dikes (Cretaceous)—Gray to light-gray, tan-weathering, very fine grained trachytic dikes. The dikes range in thickness from 0.7 to 1.5 m, are unfoliated, and may exhibit blocky jointing. Three dikes occur on the west side of Mount Ascutney and intrude the syenite (Ks), the hornfels (Kch), and the metamorphosed mafic Spherulitic felsic dikes (Cretaceous)—Tan to light-gray, dark-gray to rusty weathering, very fine grained, discontinuously laminated, spherulitic felsic dikes. Flow laminations are 1 to 2 millimeters (mm) thick and are parallel to the walls of the dikes. Spherulites are 1 to 2 mm in diameter and are composed of radial, microlitic feldspathic material. The rock consists of 80 to 90 percent spherulites, 10 to 15 percent quartz, and accessory carbonate and sulfides. The rock crops out in an approximately 10-m-wide zone of en échelon dikes (20 to 40 cm thick) at an exposure in Mill Brook that is 1.1 km west of the junction of Interstate 91 and Route 131. The dikes are parallel to an east-west-striking and steeply north dipping joint set (strike 257°, dip 70°) and are shown on the map by a single brown strike-and-dip symbol. Balk and Krieger (1936) describe other felsic dikes with

grained, undifferentiated syenite to granite aplite dikes. Thirty outcrop-scale dikes are shown by strike-and-dip symbols, and dikes range from several centimeters up to 5.0 m thick. The dikes occur on Mount Ascutney and intrude the syenite (Ks), the granite (Kg), the Biotite granite (Early Cretaceous)—Coarse-grained, locally mediumgrained, predominantly homogeneous, biotite-quartz-microperthite-

orthoclase-albite granite. At one time, it was correlated with the

Conway Granite (Chapman and Chapman, 1940; Cox, 1987), but the

Kv Trachyte to rhyolite and volcanic breccia (Early Cretaceous)—Gray to purple, fine-grained, undifferentiated trachyte to rhyolite tuff and volcanic breccia containing fragments of volcanic rocks having trachytic flow structure and layering. The unit is interpreted as volcanic rocks of the edifice. Three samples from Kv (fig. 2) are chemically similar to the syenite (Ks) and biotite-granite plutons (Kg). Two analyses of "basic segregation" xenoliths from within the biotite granite (Kg) plot as trachyandesite on the total-alkali versus silica (TAS) diagram (fig. 2A) from data in Daly (1903, p. 84). Foland and others (1985) described the xenoliths as basaltic. The more mafic rocks are mapped separately within the Kspb unit, but their chemistry was not independently confirmed in this study. The Kv unit is well-exposed south and west of the Mount Ascutney summit on the hiking trails (Weathersfield Trail and Hang Glider Trail, names not on map) and upstream of Crystal Cascade Falls (labelled "water fall" on the map). Schneiderman (1989) and Chapman and Chapman (1940) describe the volcanic units at Mount

d Gabbro and diorite (Early Cretaceous)—Undifferentiated, coarsegrained, dark-green hornblende-biotite gabbro and lighter colored, crosscutting, medium- to coarse-grained, biotite-hornblende diorite. In places, the biotite-hornblende diorite may be porphyritic. The unit is intruded by bodies of mapped syenite (Ks) and dikes of aplite (Ka). Foland and Faul (1977) and Foland and others (1985) dated the gabbro-diorite complex at 125.5 to 122.2 Ma by biotite K-Ar ages

Contact metamorphic rocks around The Ascutney Mountain Stock

epidote to pyroxene hornfels. The hornfels is subdivided into outer (Kh) and inner (Kch) contact metamorphic zones based on a textural change from black to dark-gray, foliated, flinty hornfels (±biotite) (Kh) to a more indurated, variably light- and dark-colored, layered bluish-green, and (4) light-pink. The outer contact between the transitional; the contact shown on the map is where the phyllitic and schistose character of the country rock loses its fissility and becomes flinty, but where the protolith is still recognizable. The hornfels becomes progressively indurated towards the intrusion. On the and DSwa) in the Waits River Formation are locally mapped to the contact with the syenite (Ks) due to their coarse texture and recognizable older metamorphic minerals including coarse

ROCKS OF THE CONNECTICUT VALLEY TROUGH

primary volcanic rocks

DSwf Felsic gneiss and quartzose granofels member (Lower Devonian and Silurian)—Light-gray, tan-weathering, biotite-quartz-plagioclase gneiss and medium-gray, feldspathic, biotite quartzite and granofels interpreted as volcaniclastic rock interbedded with DSwhg. The unit is present in the northwest part of the map near Sheddsville DSwg Large-garnet and hornblende garbenschiefer schist member (Lower Devonian and Silurian)—Silvery gray to light-gray, in places rusty weathering, epidote-biotite-chlorite-muscovite-garnethornblende-quartz-plagioclase schist with distinctive 1- to 5-cm-long sprays of hornblende and 1- to 5-cm-diameter garnet porphyroblasts. The unit is interpreted as metamorphosed pelitic sedimentary rock with a volcaniclastic component of intermediate to mafic

composition, and is interlayered with multiple units in the formation Hornblende-plagioclase gneiss member (Lower Devonian and Silurian)—Dark-green, medium- to coarse-grained, ±garnet-epidotechlorite-hornblende-plagioclase gneiss with roughly equal percentages of hornblende and plagioclase. The unit varies from a massive, weakly foliated, very coarse grained gneiss to a well-layered gneiss. Where massive, intergrowths of hornblende with matrix plagioclase are ubiquitous, forming a possible replacement of relict ophitic texture. Unit exposures north of Hunt Road in Windsor are the well-layered variety; the massive variety may, in part, be intrusive. Contacts with surrounding units are sharp va Amphibolite and greenstone member (Lower Devonian and Silurian)—Dark-green to green, fine-grained, massive epidotechlorite-hornblende-plagioclase amphibolite with 1- to 3-mmdiameter, white, sausseritized plagioclase porphyroclasts and laminated to massive, epidote-carbonate-actinolite-chlorite-plagioclase greenstone. Generally, the laminated greenstone is intercalated with DSwv, and the massive greenstone and amphibolite have sharp contacts with adjacent units. In the northcentral part of the map, the greenstone is interlayered with DSwv on a 1- to 3-cm-scale over a distance of several meters along the contact. The amphibolite crops out in the west, where the rocks are at higher metamorphic grade and contain layers of greenstone similar to those found to the east

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[Colors do not correspond to map unit colors]

NORTHFIELD FORMATION Schist member (Lower Devonian and upper Silurian)—Dark-gray o silvery gray, fine-grained, carbonaceous muscovite-biotite plagioclase-quartz schist or phyllite marked by conspicuous small garnets (1 to 2 mm in diameter) that form small bumps on the foliation surfaces. Commonly, garnets are partially to completely replaced by white plagioclase or chlorite

[Within the map area, the map units of the wider Bronson Hill anticlinorium are present in

either the smaller Orfordville anticlinorium in the Monroe thrust sheet or the area east of the

Northey Hill shear zone; some map units may be present in both areas. See the Correlation

LITTLETON FORMATION

Metaconglomerate and quartzite member (Silurian) indifferentiated unit of (1) light-gray, orange- weathering, massive, poorly bedded, weakly foliated quartzite with minor muscovite; (2) gray to orange, well-bedded, micaceous quartzite with beds from 1 cm to 1 m thick; and (3) white to gray, muscovite-bearing, quartz-pebble to cobble metaconglomerate. Extremely rare, faintly visible crossbeds are locally preserved. Clasts are typically elongated (aspect ratios commonly exceeding 10:1) and consist dominantly of vein quartz and gray to white quartzite. Rare amphibolite (found at one location on the northwest side of Green Mountain) is mapped as

> Boucot and Thompson (1963) and include tetracorals, brachiopods, pelecypods, and a possible trilobite; fossils support a Llandovery (early Silurian) age Rusty muscovite schist member (Lower Devonian and upper Silurian)—Rusty weathering, medium- to coarse-grained, chloritebiotite-muscovite-quartz schist that typically contains staurolite and garnet porphyroblasts. Contacts with Scq are not exposed in the map area. The unit is mapped as discontinuous horizons along the ridge of

Hole Road north of Green Mountain

by Rankin and others (2007)

LAKE MEMPHREMAGOG INTRUSIVE SUITE

Comerford Intrusive Complex

FITCH FORMATION

Metasedimentary Rocks

Ietadiabase dike (Silurian)—Very dark green to black and white,

medium-grained, massive, ±garnet-calcite-epidote-chlorite-biotite-

hornblende-plagioclase amphibolite. At one location, the unit was

found exposed on a jeep trail on the northwest side of Green

Mountain within the Clough Quartzite, but contacts with surrounding

quartzite are not exposed at the location. Alternatively, the

amphibolite could be a volcanic layer and not a dike. The unit is

considered an age-equivalent of the mafic dikes dated at 419±1 Ma

Gray granofels and schist member (Lower Devonian and upper

Silurian)—Gray to dark-greenish-gray, medium-grained, ±magnetite

actinolite/tremolite-epidote-muscovite-biotite-carbonate-plagioclase

quartz granofels and schist. Locally, the rock contains distinctive

irregular dissolution cracks and holes along bedding (informally

called "ant rock"). The unit contains (1) calc-silicate pods consisting

of garnet, quartz, actinolite, and diopside; (2) variably rusty to

bronze-weathering, medium-grained, carbonate-biotite-quartz schist

with carbonate pods and layers that are 2 to 10 cm thick; (3) gray to

light-gray, medium-grained, biotite-chlorite-garnet-muscovite-quartz

schist; and (4) micaceous quartzite with distinctive high-relief-

weathering quartz-rich knots, pods, layers or pebbles; pods consists

predominantly of quartz but also contain garnet, magnetite, biotite,

and muscovite. Disseminated magnetite is common in all rock types.

Locally, mm- to cm-scale magnetite layers are present near the

contact with the Littleton Formation and Clough Quartzite. The unit

is best exposed between Ram Brook and Brighton Road and just west

upper Silurian)—Green to gray-green, fine-grained, massive to

layered, ±ilmenite±apatite±calcite±actinolite±biotite-quartz-chlorite-

epidote-hornblende-plagioclase greenstone and laminated chlorite

schist. The unit exposed on the north slopes of Dingleton Hill where

it extends into the adjacent North Hartland quadrangle (Walsh, 2016)

Scd. Contacts are typically sharp. The unit may contain magnetite

and, at higher metamorphic grades, it may contain chloritoid and

garnet. Locally, the unit is mylonitic along the Northey Hill shear

zone. Fossils present are described by Boucot and others (1958) and

of the Cornish Turnpike along the Cornish-Claremont town line

Metavolcanic Rocks

Sfg Greenstone member of Fitch Formation (Lower Devonian and

CLOUGH QUARTZITE

Muscovite schist member (Lower Devonian and upper Silurian)—Silvery to light-gray, medium-grained, garnet-muscovitequartz schist with ubiquitous pink garnets. The unit occurs at the base of the Clough Quartzite at the contact with the Partridge Formation on Green Mountain, but the contact is not exposed in the map area

mylonitic along the Northey Hill shear zone

of mafic sills. At higher metamorphic grades, the rock contains appreciable amphibole, and locally it contains garbenschiefer texture; amphibolite is common south of Green Mountain. The unit is well exposed west of Cornish City and on Wellmans Hill PRE-SILURIAN COVER SEQUENCE ROCKS ON THE CHESTER DOME [Includes rocks of the Shelburne Falls arc]

tonalite. Locally, the unit contains characteristic small augen of

quartz and lesser feldspar (up to 0.5 cm across). The unit occurs as abundant foliation-parallel lit-par-lit dikes or sills in the

Ammonoosuc Volcanics in the central part of the map (mapped in the

Cornish City belt, but not in the Claremont belt). The unit is similar

to (and probably correlative with) the Plainfied tonalite in the

adjacent North Hartland quadrangle (Walsh, 2016); there the tonalite

yielded a U-Pb SHRIMP zircon age of 475±5 Ma (Valley and Walsh,

Wellmans Hill and southwest of Cornish City

AMMONOOSUC VOLCANICS

Heterogeneous volcanic member (Ordovician)—Undifferentiated

assemblage of rock types consisting of (1) dark-greenish-gray, fine-

to medium-grained, plagioclase-biotite-chlorite-quartz schist to

phyllite; (2) layered to massive greenstone and amphibolite (locally

with garbenschiefer texture); (3) felsic quartz-plagioclase granofels

(metafelsite); (4) limonite-muscovite quartzite; and (5) sulfidic

quartz-plagioclase schist. Locally, the unit contains minor carbonate,

magnetite, and sulfides. Below garnet grade, the rocks are green,

gray-green, bluish-green, silvery gray green, and green and white

layered. At or above the garnet zone, the rocks are darker green, gray

green to black, and black and white layered. Locally, the unit also

contains pods and lenses of epidote, plagioclase, quartz phenocrysts,

deformed pillows, fiamme (eutaxitic texture), and volcanic breccia.

The unit is interpreted as a heterogeneous, metamorphosed sequence

of volcanic and volcaniclastic rocks, crystal tuffs, dacitic to andesitic

flows, and mafic volcanic and volcaniclastic rocks. Internal contacts

are variable and are either sharp or gradational by intercalation.

Contacts with the Partridge Formation are generally sharp, but locally

gradational. Along the Monroe thrust fault, the unit is in tectonic

contact with the rocks of the Connecticut Valley trough. The unit is

grayish-black, rusty weathering, sulfidic, graphite±garnet-ilmenite-

plagioclase-biotite-chlorite-quartz-muscovite phyllite or schist.

Resembles the Partridge Formation sulfidic schist member (Op) and

may be correlative with it. The unit occurs on Dingleton Hill within

±muscovite-K-feldspar-chlorite-plagioclase-quartz schist, felsic

granofels, felsic intrusive rocks, and minor quartz phenocryst-bearing

rocks. The unit is interpreted as mostly felsic metavolcanics (some

layers may represent intrusive sills) and is interlayered with other

members of the Ammonoosuc Volcanics. The unit is well exposed in

the southeast part of the Cornish City synform, on Ironwood Hill, and

white, dark-green, or black and white, distinctly banded, interlayered

greenstone and metamorphosed felsic volcanic and intrusive rocks.

Contacts are gradational with Oa and distinguished from Oa by the

distinct alternating layering of felsic and mafic rocks which resemble

Oaf and Oaa, respectively where mapped separately. The unit hosts

an abandoned zinc-sulfur-pyrite mine on Hanover Street in

Claremont, called the "Claremont Zinc Showing" (U.S. Geological

Survey Mineral Resources Data System, record identification number

Greenstone and amphibolite member (Ordovician)-Dark-green to

black, locally rusty weathering, massive to thickly layered,

±carbonate±magnetite-actinolite-epidote-plagioclase-chlorite

greenstone, schistose greenstone, or amphibolite. Epidote nodules and

layers are common, but the unit rarely contains deformed pillows that

were observed along the power line northwest of Cornish City. The

unit is interpreted to be submarine metabasalt, but may in part consist

10093852, https://mrdata.usgs.gov/mrds/)

well-exposed on an unnamed hill 2 km north of Cornish City

Bimodal metavolcanic rock member (Ordovician)—Green and

Metafelsite member (Ordovician)—Tan- to light-gray-weathering,

Sulfidic schist member (Ordovician)—Dark-gray to light-gray and

well exposed on Wellmans Hill and Barber Mountain

the Cornish City belt of the Monroe thrust sheet

2013; Valley and others, 2019). The unit is well exposed on

CRAM HILL FORMATION **Greenstone member (Ordovician)**—Medium-green to gray-green, well-foliated, hornblende-plagioclase greenstone that is marked by distinctive irregular clots, or indistinct patches of more plagioclase-

rich inclusions (as much as 3 cm in length) that are set in a more uniform amphibolite matrix. The unit is interpreted as basaltic to andesitic tuff-breccia and volcaniclastic rock and is mapped at one location in Weathersfield, north of Route 131, where it occurs below the unconformity at the base of the Connecticut Valley trough Felsic and mafic volcaniclastic rock member (Ordovician) layered, light-gray-weathering, felsic biotite-hornblende-quartzplagioclase gneiss intricately interlayered with darker mafic, gray-green hornblende-biotite-plagioclase amphibolite and hornblende-plagioclase granofels and gneiss. The proportion of felsic to mafic layers varies greatly and the thickness of the mafic layers, which are generally subordinate, ranges from one to several meters;

Strike and dip of axial surface of F₂, fold that is parallel to S₂ foliation—Tight to isoclinal, locally rootless folds; Acadian early

Strike and dip of axial surface of F₃ or younger minor fold—Open folds; Alleghanian late dome-stage or undifferentiated younger fold

[Symbols may be combined; point of intersection shows location of measurement]

Strike and dip of quartz vein (KDq)

Vertical ♦ Location only, no orientation measured **Strike and dip of trachyte dike (Kt)**

Igneous flow foliation in the Ascutney Mountain Intrusive Complex → Vertical

Strike and dip of layer-parallel schistosity (S₁)—Parallel to bedding

Strike and dip of spaced foliation (S₂)—Variable across the map, less penetrative to the west, zonal in the east; Acadian to Alleghanian

Strike and dip of late crenulation cleavage (S₂ or S₄)—Associated

[Symbols may be combined; point of intersection shows location of measurement]

 $\rightarrow \rightarrow 46$ Approximate bearing and plunge of folded F_1 minor fold axis

grain lineation associated with the S₂ foliation; consists of quartz plagioclase, biotite, muscovite, chlorite, or amphibole Bearing and plunge of L₂ rod or object lineation—Lineation composed of elongate objects such as pebbles and quartz or plagioclase phenocrysts; generally associated with the S₂ foliation but may represent an older L₁ lineation. The same symbol is used for the pre-Silurian rocks west of the Keyes Mountain thrust fault

---> 25 Bearing and plunge of F₃ minor fold axis—Fold axis of late, open fold or crenulation lineation ---->18 Bearing and plunge of F₄ minor fold axis—Fold axis of late, open fold or crenulation lineation or kink band folds OTHER FEATURES

Isograd or tectonic metamorphic boundary—Approximate boundary between rocks with biotite and (or) actinolite or locally chloritoid (in Scq) in the biotite zone; garnet and (or) hornblende in the garnet zone; staurolite in the staurolite zone; staurolite or kyanite in the Chester dome; and sillimanite-muscovite assemblages in the sillimanite zone of regional metamorphism; boundary is queried in Corbin Park where no data are available. Cordierite and biotite contact hornfels zones (Kch and Kh) are shown around the Ascutney Mountain stock; boundaries are uncertain in the Little Ascutney stock (Kgd) where the hornfels is difficult to recognize. The regional metamorphic boundaries locally coincide with (1) the Northey Hill or Bald Mountain shear zones, and (2) a splay of the Ammonoosuc fault that is east of Saint Gaudens National Historic Site **Abandoned quarry or mine**—Four quarries (three named) are shown

in the Ascutney Mountain stock and one zinc (Zn) resource mine is shown at the "Claremont Zinc Showing" that is labelled as "Zn" on the map in Claremont (source: Mineral Resources Data System, U.S. Geological Survey, 2018; identification number 10093852). The three named mines shown in the Mount Ascutney stock are (1) Norcross quarry, located in syenite (Ks) (Dale, 1909, 1923); (2) Mower quarry, located in syenite (Ks) (Dale, 1909, 1923); and (3) Enwrighte quarry located in syenite (Ks) (Morrill and Chaffee, 1964; also spelled "Enright" by Perkins, 1908). Three closely spaced unnamed quarries shown as one location on the map, on the south side of Mount Ascutney are also shown, located in granite (Kg) (Daly, 1903)

Geochronology sample location—Showing sample number and CN-3803 460±3 Ma uranium-lead (U-Pb) zircon age in millions of years before present (Ma, mega annum) by sensitive high-resolution ion microprobe (SHRIMP), from Valley and others (2019; sample number CN-3803). Walsh and others (2014; sample number CN–3762), and McWilliams and others (2010; Sample 2, 418±7 Ma maximum depositional age (MDA) from detrital zircon) Geochemical sample location—Showing sample number of

whole-rock geochemistry analysis; results are given in table 1 — Corbin Park boundary—Geology in Corbin Park on the geologic map and cross sections A-A' and B-B' is poorly constrained because access was denied for geologic mapping. Geology within the boundaries of Corbin Park is based on unpub. data from J.B. Thompson Jr., Harvard University (1988); all unit contacts ar inferred. The boundary of the park is approximately mapped based or the ATV/snowmobile trails that follow the boundary along the outside of the perimeter fence

Any use of firm, trade, or product names is for descriptive purposes only and does not imply