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Proposed Silurian-Devonian correlations east of the Berkshire massif in western Massachusetts and Connecticut

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by

Norman L. Hatch, Jr. and Rolfe S. Stanley

In USGS Bulletin 1380 (Hatch and Stanley, 1973), we have proposed that most of the Straits Schist and parts of other units in the belt of rocks immediately west of the Triassic basin in western Connecticut are Silurian and Devonian in age and correlative with the Goshen Formation of Massachusetts (Hatch, 1967). These correlations are based on lithic similarity and on the stratigraphic sequence in which the rocks occur. Because many workers in western Connecticut have placed the Straits Schist in the middle of a presumed Cambrian and Ordovician section, our suggested placement of the Straits unconformably above all of the other crystalline stratified units in western Connecticut requires a major revision of the structure.

Figure 1 shows the route of the trip and the stops on a geologic base which shows our interpretation simplified from plate 1 of Bulletin 1380. From figure 1 it can be seen that the Goshen Formation in Massachusetts, along with the underlying Russell Mountain Formation (Hatch, Stanley, and Clark, 1970), pass under the Triassic cover west of Westfield, Mass. The rocks therein shown as Russell Mountain and Goshen-equivalent Straits around the Granville and Granby domes are separated from presumably equivalent rocks to the north by pre-Silurian rocks. They are also separated from their presumed stratigraphic correlatives to the south in the Collinsville, Conn. area by Cambrian and Ordovician rocks. This intervening area has been mapped by R. W. Schnabel (Schnabel and Eric, 1965; Schnabel, in press, 1974, 1973) who mapped the rocks as pre-Silurian Straits Schist. Although Schnabel does not subscribe to the reinterpretation presented here, he has generously guided us through his area on many occasions.

The Straits Schist forms a continuous mappable belt south from the Collinsville and Bristol domes of the Collinsville quadrangle to Long Island Sound. Thus if our stratigraphic-structural interpretation for the Collinsville area is accepted, it would also apply south to the Sound.

Critical to the development of our interpretation of the Connecticut rocks has been the Silurian Russell Mountain Formation (Hatch, Stanley, and Clark, 1970). This thin but distinctive unit of calc-silicate rock and quartzite is presumably correlative with the Shaw Mountain Formation of Vermont (Doll and others, 1961). The Russell Mountain Formation first appears in Massachusetts at Blandford Village and is mapped discontinuously to the south. Our proposed correlation of most of the Straits with the Goshen of Massachusetts is greatly fortified, we believe, by the presence in western Connecticut of a narrow belt of calc-silicate rock and quartzite structurally and apparently stratigraphically thought to be correlative with the Silurian and Devonian Goshen Formation and rocks that we correlate with the Hawley (Hatch, 1967) and Cobble Mountain (Hatch and Stanley, 1973) Formations.

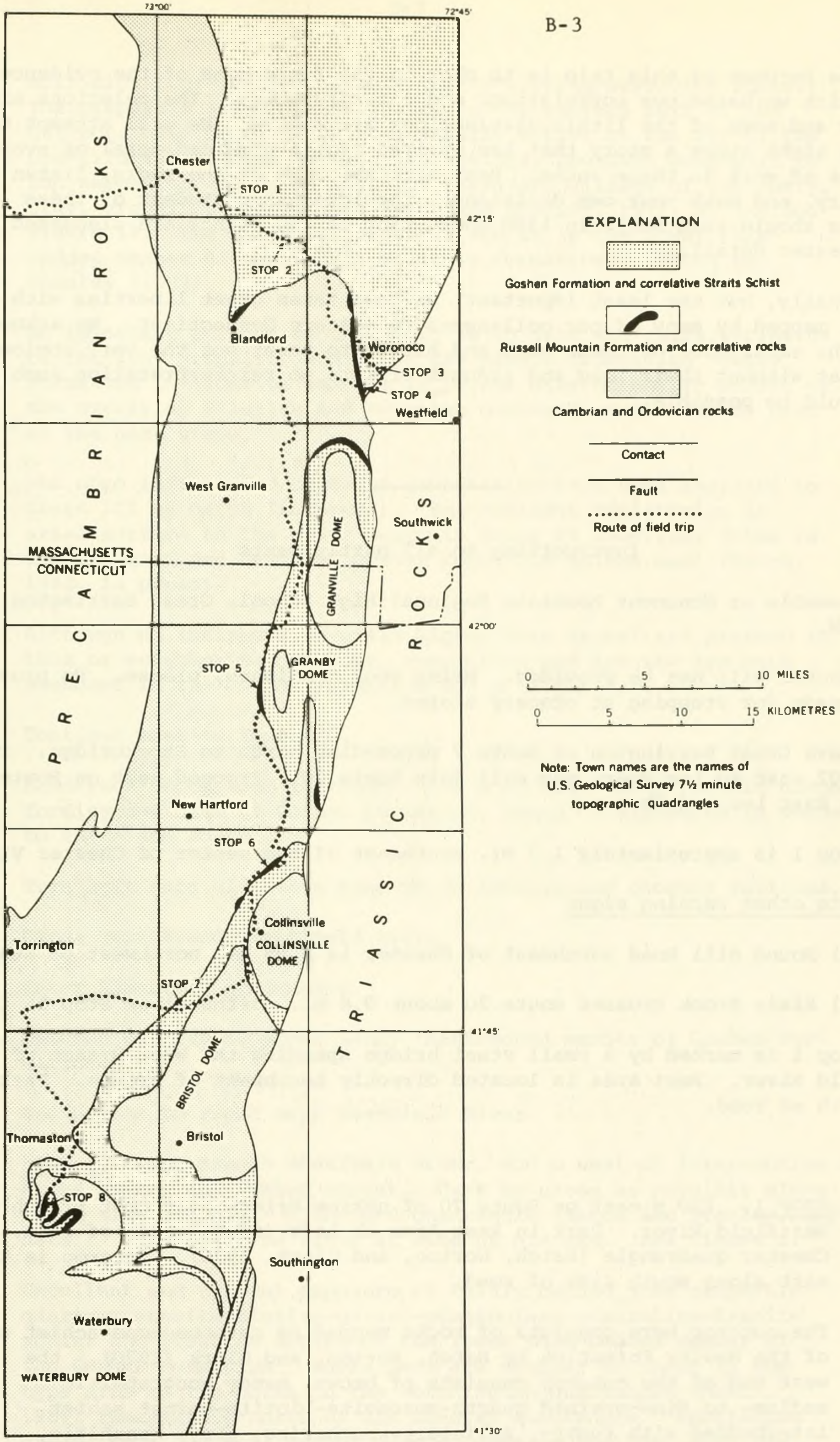

Figure 1. Sketch map of part of western Massachusetts and Connecticut showing distribution of proposed Silurian and Silurian-Devonian rocks and field trip stops. Simplified from plate 1 of Hatch and Stanley (1973).

The purpose of this trip is to show in the field some of the evidence upon which we based our correlations and interpretation. The relations are complex and some of the lithic distinctions are subtle. We will attempt to show in eight stops a story that has evolved from a combined total of over 20 years of work in these rocks. Bear with us, look at the rocks, listen to our story, and make your own decisions. The interested student of these problems should read Bulletin 1380 where many of the points are discussed in much greater detail.

Finally, but not least important, we have taken great liberties with the geology mapped by many of our colleagues in western Connecticut. We acknowledge the excellence of their work and hasten to point out the very obvious fact that without their long and arduous efforts no reinterpretation such as this could be possible.

Instructions to all participants

Assemble at Monument Mountain Regional High School, Great Barrington, at 7:30 A.M.

Lunches will not be provided. Bring your own lunch, please. No provision can be made for stopping at grocery stores.

Leave Great Barrington at Route 7 proceeding north to Stockbridge. Take Route 102 east to Lee where you will join Route 20. Proceed east on Route 20 through East Lee and Chester.

Stop 1 is approximately 1.7 mi. southeast of the center of Chester Village.

Note other warning signs

(a) Round Hill Road southeast of Chester is 0.95 mi. northwest of Stop 1.

(b) Blair Brook crosses Route 20 about 0.6 mi. northwest of Stop 1.

Stop 1 is marked by a small steel bridge spanning the West Branch of the Westfield River. Rest Area is located directly northwest of bridge. Park to the north of road.

Mileage

0.0 STOP 1. 150 m east on Route 20 of narrow bridge over West Branch of Westfield River. Park in Rest Area on left (north) side of road. Chester quadrangle (Hatch, Norton, and Clark, 1970). Outcrop is to east along south side of road.

The outcrop here consists of rocks mapped as carbonaceous schist units of the Hawley Formation by Hatch, Norton, and Clark (1970). the west end of the outcrop consists of brown, sandy nongraphitic medium- to fine-grained quartz-muscovite-biotite-garnet schist interbedded with rusty-, splintery-weathering, gray, graphitic,

sulfidic, fine-grained, slabby quartz-biotite-muscovite schist. The graphitic schist predominates in the eastern part of the outcrop. The brown sandy nongraphitic schist at the top of the pre-Silurian section becomes increasingly abundant southward to the essential exclusion south of Blandford Village of the rusty, gray, graphitic schist (see Hatch and Stanley, 1973, p. 7-8 and figure 1). The brown nongraphitic schist is the lower thin-bedded member of the Cobble Mountain Formation of Hatch and Stanley (1973).

An important purpose of this stop is to note the characteristics of the gray graphitic schist of the Middle Ordovician Hawley Formation in order to compare it to the gray graphitic schist of the overlying Silurian and Devonian Goshen Formation to be seen at the next stops.

The open left-handed folds in schistosity have been assigned to Stage III by Hatch (in press). The dominant schistosity is axial surface to the major mappable Stage II isoclinal folds in the Silurian and Devonian Goshen Formation to the east (Hatch, 1968, in press).

Although no indicator minerals higher than garnet are present in this or neighboring outcrops, staurolite and kyanite are both abundant in the Goshen Formation 800 m to the east.

Continue east on Route 20.

0.8 Sanderson Brook Road to right. 150 m to east cross Taconic unconformity and base of Goshen Formation, based on exposures in woods to north and south.

1.4 Turn left onto Old State Road which immediately crosses railroad.

1.6 Cross West Branch Westfield River.

2.1 Enter Blandford quadrangle.

3.9 Outcrop on left is upper sandy thickbedded member of Goshen Formation.

4.4 Footbridge to right over Westfield River.

4.5 STOP 2. West Branch Westfield River, 450 m west of intersection of Fiske Avenue and Basket Street. Park as close as possible along right side of road. Blandford quadrangle (Hatch and Stanley, unpub. data). Outcrop is in river at site of old dam. See figure 2.

Excellent and typical exposure of thinly bedded gray graphitic quartz-muscovite-biotite-garnet-plagioclase-staurolite-kyanite schist and granular schist of the lower thin-bedded member of the Goshen Formation. Rocks here are similar to those in the type area to the north in the Worthington quadrangle (Hatch, 1969) immediately north of the Chester quadrangle. Eastfacing graded beds are well preserved here despite the fact that the

rocks have been metamorphosed to kyanite grade, isoclinally folded (Stage II of Hatch, in press) (see figure 2) and then refolded (Stage III of Hatch, in press) into a major regional fold (figure 2). The northeast-striking northwest-dipping slip cleavage in the more schistose beds is parallel to the axial surface of the later (Stage III) refold.

Note the contrast between this gray graphitic schist and that of the Hawley Formation at Stop 1.

Note the undulating base of many of the graded beds. This structure could be interpreted as primary load casts or as minor folds related to the Stage III slip cleavage.

Note that individual beds here range from a few centimetres to a few tens of centimetres in thickness. Thicker beds are not unusual in this unit to the north, but are rare to the south where individual beds are more typically 1 to 4 cm thick.

Continue southeast along Old State Road toward Huntington Village.

4.7 Bear right at intersection.

4.9 Ridge of thinly bedded Goshen Formation. Graded beds strike N. 80° W., dip 52° N. and top to north.

5.0 Turn hard right by Saint Thomas Church (Huntington Village) onto bridge (Route 112) crossing Westfield River.

5.1 Turn left (east) onto Route 20.

5.5 Enter Woronoco quadrangle.

6.6 Pass through Crescent Mills.

8.7 Village of Russell.

8.8 State Police Parracks on right.

9.0 Outcrop on left opposite Craighurst Gardens is pre-Silurian rocks of the upper member of the Cobble Mountain Formation.

9.2 More upper member of Cobble Mountain on left.

9.5 Cliffs across valley to left are more of same.

9.8 Outcrop on right is more of same.

10.3 Outcrop on right is thinly bedded lower member of the Goshen Formation with boudinaged pods of calc-silicate rock.

10.4 Entrance to Strathmore Park.

10.6 to 11.0 Calc-silicate and sandy quartzose rocks of the upper member of the Goshen Formation.

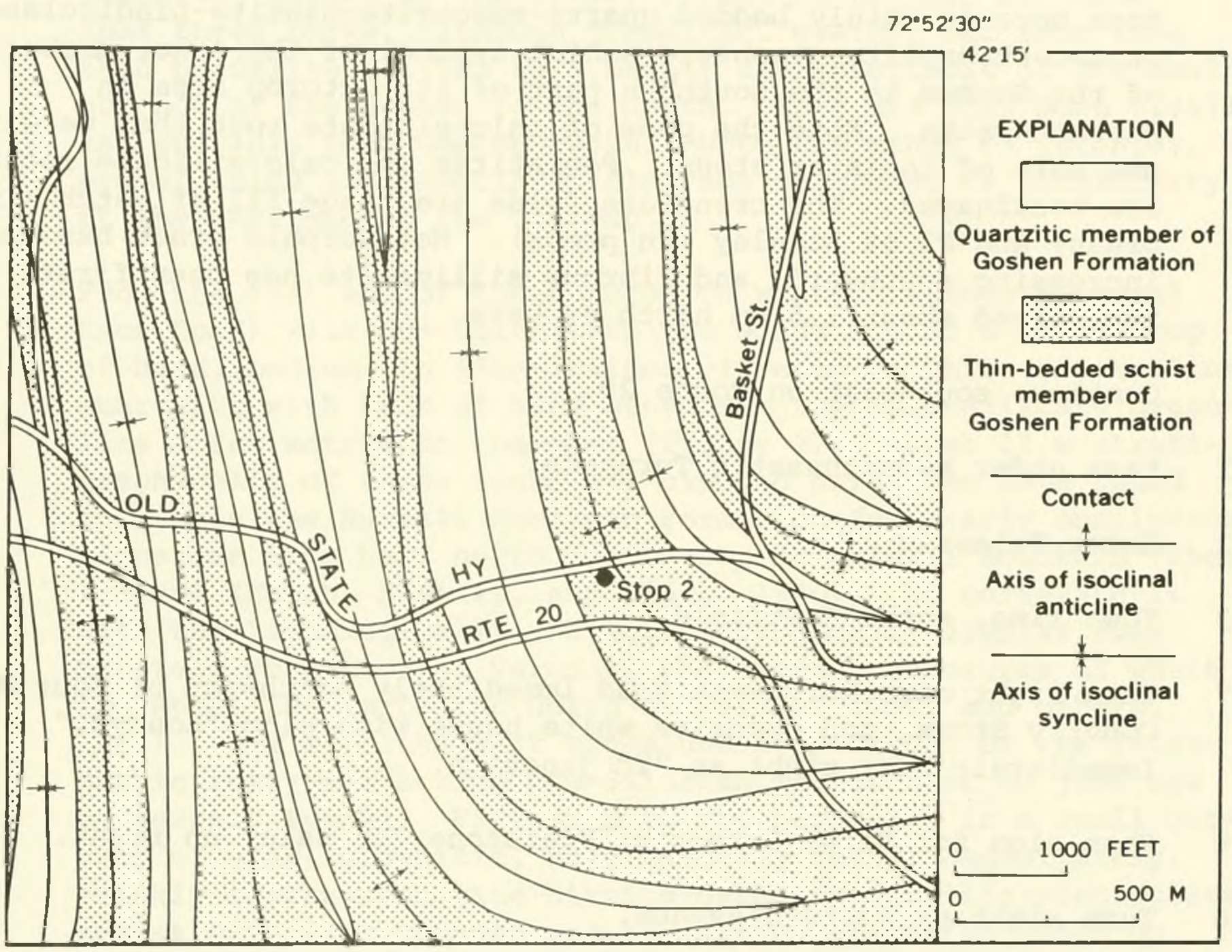

Figure 2. Sketch map of northeast corner of the Blandford, Massachusetts quadrangle showing location of geologic setting of Stop 2.

11.0 Junction of Route 20 and 23. Continue southeast on Route 20.

11.0 to 11.8 Scattered outcrops of Goshen Formation.

11.8 STOP 3. Turn left into Rest Area on north side of Route 20, Woronoco quadrangle (Stanley, S. F. Clark, Jr., and Hatch, unpub. data). Outcrop is on south side of Route 20.

Rock here is thinly bedded quartz-muscovite-biotite-plagioclase-garnet-staurolite graphitic schist typical of the lower member of the Goshen in the southern part of its outcrop area in Massachusetts. Note the pods of calc-silicate rock that we will see more of in later stops. Pegmatites and calc-silicate rocks are boudinaged. The crenulate folds are Stage III of Hatch (in press) and F3 of Stanley (in press). Metamorphic grade has been increasing southward, and fibrous sillimanite has been first recognized about 1.5 km north of here.

Continue southeast on Route 20.

12.1 Pass under Massachusetts Turnpike.

12.2 Enter Triassic.

12.3 Town line, enter Westfield.

12.7 Turn right onto Northwest Road immediately northwest of Four Mile Country Store, and opposite white house with sign "Londys." Immediately bear right at "Y" junction.

12.9 Pass sign for Ralph Lafogg's "Flatstone for sale" on right.

13.6 Turn right on Western Avenue.

A. Bicentennial Note

Two hundred years ago in December 1775, General Henry Knox, in answer to a call from General George Washington who needed artillery to drive the British from Boston, moved 43 cannons and 16 mortars in 40 days from Fort Ticonderoga, N.Y., through Great Barrington and across Massachusetts to Boston over the road now called General Knox Trail on which you are now driving.

13.9 Leave Triassic and enter crystalline rocks.

14.0 STOP 4. Park as directed. Later users of this log can park one or two cars on left opposite outcrop on right (figure 3). Woronoco quadrangle (Stanley, S. F. Clarke, Jr., and Hatch, unpub. data).

Outcrop on north side of Western Avenue (General Knox Road) is pre-Silurian rocks of the upper member of the Cobble Mountain Formation. Although some of these rocks are grossly similar to the rocks of the lower member of the Goshen Formation at Stop 3, they are distinguished from them by the criteria listed in table 1 of Hatch and Stanley (1973) and repeated here as table 1.

The east end of the outcrop consists of graphitic, splintery- and very rusty weathering schist somewhat similar to the graphitic schist of the Hawley Formation at Stop 1. Note that these rocks, although graphitic, weather out into long thin bladelike slivers in a manner characteristic of the Hawley, but not of the Goshen to the north. They are also more fissile and sulfidic than Goshen rocks. Note the minor F3 (Stanley, in press) folds and associated cleavage deforming F2 schistosity at the west end of the outcrop.

From the east end of the outcrop on Western Avenue (General Knox Road) walk due north into the woods for 85 m to outcrop of hard, medium- to fine-grained vitreous to white crystalline quartzite with beds of hard greenish-gray calc-silicate granulite a few metres to the east (figure 3). About 11 m stratigraphically of these rocks are exposed here. We have named this unit the Russell Mountain Formation for nearly continuous exposures from here north to the top of Russell Mountain (about 1.3 km) (Hatch, Stanley, and Clark, 1970). We correlate it with the lithologically and stratigraphically similar Shaw Mountain Formation of Vermont, the nearest exposures of which are about 104 km to the north in Vermont (Doll and others, 1961). Six m to the west are abundant outcrops of the feldspathic rusty-weathering pre-Silurian schist that we just saw on Western Avenue. Fifteen m to the northeast is a small outcrop of gray, graphitic, only slightly rusty, nonsplintery, crinkly quartz-muscovite-biotite-garnet-staurolite-plagioclase schist with 2 mm garnets and the satiny graphitic sheen on fine-grained muscovite surfaces that characterize the schist of the Goshen Formation. The scarcity here of the distinct thin-graded beds that we have seen at Stops 2 and 3 is typical of the basal 30 m of the Goshen and will be noted in subsequent stops. Well-bedded Goshen is abundantly exposed northeast of here.

The open fields to the east are underlain by Triassic sedimentary rocks (fig. 3). Both the Goshen and the Russell Mountain Formations pass under the Triassic rocks immediately south of these exposures and their reappearance or nonreappearance to the south is the controversial subject of the rest of this field trip.

Return to cars and continue northwestward along General Knox Road (continuation of Western Avenue).

Table 1.--Characteristic features of upper Cobble Mountain rocks and basal Goshen rocks useful in distinguishing the two units.

Upper part of the Cobble Mountain Formation	Basal part of the Goshen Formation
1. Brown- to orange-brown- to red-rusty-weathering feldspathic and micaceous schist with subordinate beds of nonrusty-weathering feldspathic schist. Commonly nongraphitic except in yellow-rusty-weathering sulfidic zones.	Rusty- to red-rusty-weathering carbonaceous schist generally interlayered with thin (1-10 cm) beds of micaceous quartzite. Where bedded, schist beds are 5-30 cm thick.
2. Muscovite-biotite ratio commonly 1 in schists; ratio locally greater or less than 1.	Muscovite-biotite ratio commonly greater than 1 in schists.
3. Muscovite and biotite grains generally same size, producing a coarse "salt and pepper" pattern on some foliation surfaces.	Muscovite grains tend to be larger than biotite.
4. Garnets in schist 5-15 mm in size. Commonly sparse and cloudy. Where garnets large and numerous, schistosity of rock is bumpy.	Garnets in schist 2-4 mm in size. Commonly more abundant and clearer than in Cobble Mountain rocks.
5. Graphite, where present, is clotted or forms dark streaks in carbonaceous schists. Graphite commonly absent.	Graphite forms distinctive sheen on schistosity surfaces. Graphite nearly ubiquitous in schists.
6. Quartz-plagioclase ratio commonly 1 or less.	Quartz-plagioclase ratio greater than 1.
7. Calc-silicate rocks commonly zoned with quartz, feldspar, garnet, diopside, and epidote abundant in light-colored centers and hornblende concentrated in 2-4 mm zones toward outside of each bed. Calcite absent.	Calc-silicate rocks commonly zoned with thin light-colored centers of quartz, feldspar, garnet, diopside, and epidote and thick rims of hornblende. Calcite commonly present. Calc-silicate rocks generally more hornblende-rich than those in Cobble Mountain Formation.
8. Plagioclase-quartz-mica gneiss common.	Plagioclase-quartz-mica gneiss rare.
9. Graded beds very subtle or absent.	Graded beds common and obvious.
10. Thin (2-6 mm) vitreous quartzites that may be dark colored on fresh surfaces.	Thin, dark-colored, vitreous quartzites absent.

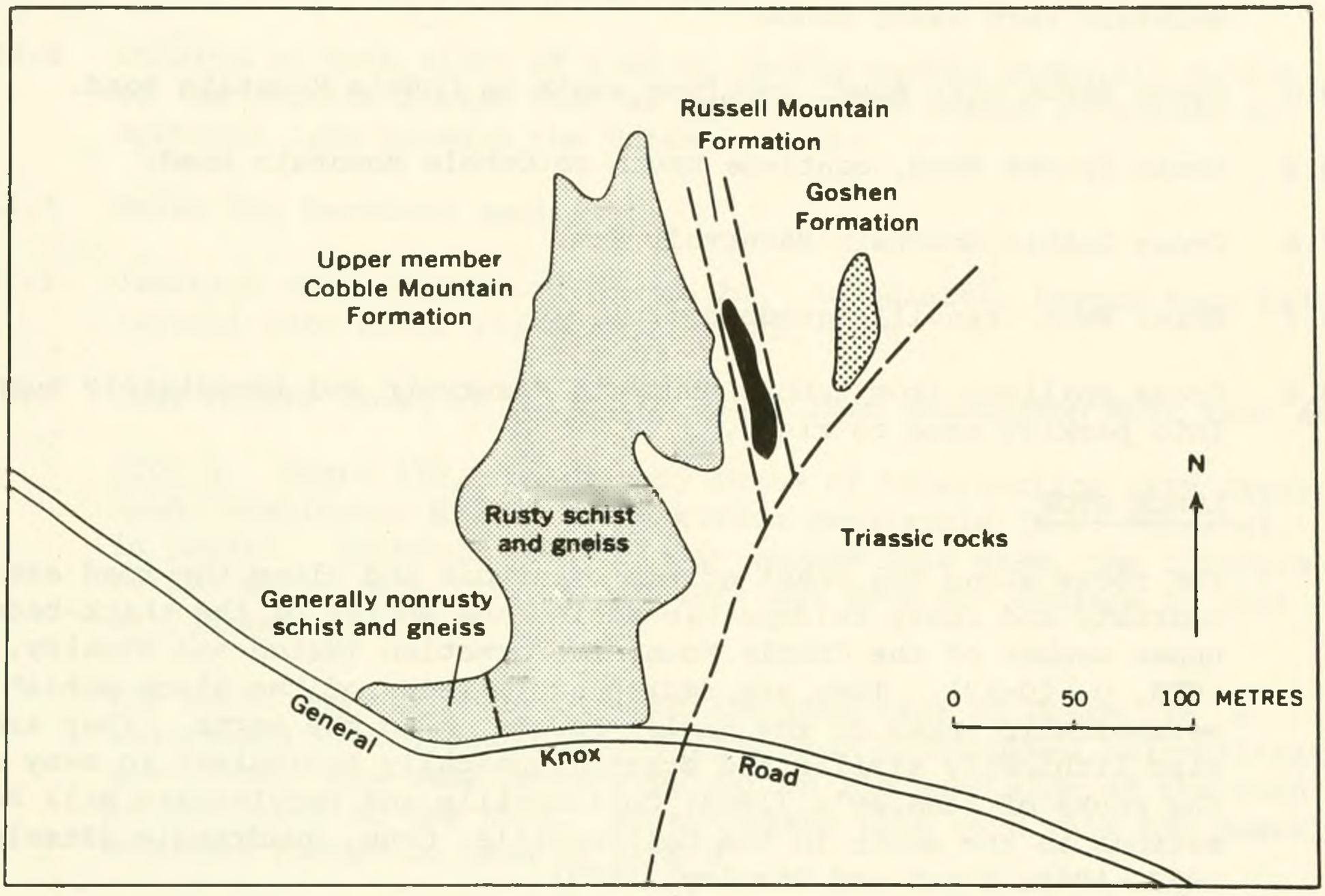

Figure 3. Sketch map of area of Stop 4, southern part of the Woronoco, Massachusetts quadrangle, showing outcrops to be examined at stop.

14.4 Scattered outcrops along road are of upper member of Middle Ordovician Cobble Mountain Formation. Continue northwest on General Knox Road to:

17.5 Turn left (west) onto Route 23.

18.1 Enter Blandford quadrangle.

18.6 Town line, enter Blandford.

19.5 Turn left (south) onto Cobble Mountain Road at red sign for Windy Mountain Farm Sugar House.

19.8 Cross Birch Hill Road, continue south on Cobble Mountain Road.

20.8 Cross Crooks Road, continue south on Cobble Mountain Road.

22.6 Cross Cobble Mountain Reservoir Dam.

22.7 Enter West Granville quadrangle.

23.0 Cross spillway from Cobble Mountain Reservoir and immediately turn into parking area to right.

LUNCH STOP

The rocks along the coast of the reservoir and along the road are the nonrusty and rusty feldspathic schist and gneiss of the thick-bedded upper member of the Cobble Mountain Formation (Hatch and Stanley, 1973, p. 10-12). They are facies equivalents of the black schist and metavolcanic rocks of the Hawley Formation to the north. They are also lithically similar and stratigraphically equivalent to many of the rocks of Stanley's (1964) Collinsville and Rattlesnake Hill Formations to the south in the Collinsville, Conn. quadrangle (Stanley, 1964, 1968; Hatch and Stanley, 1973).

These rocks along the reservoir are deformed by F3 and F4 folds (Stanley, in press).

The mineral assemblage here is quartz-plagioclase-muscovite-biotite-garnet-fibrolite-magnetite. This area and the coast of the reservoir immediately to the west were described in detail by Stanley (1967).

Although the West Granville quadrangle has been mapped by R. W. Schnabel (1973), the interpretation presented for this area is based on independent detailed mapping by Stanley.

Continue south along Cobble Mountain Road.

23.2 Bear right along coast of reservoir.

24.1 Turn left at crest of rise onto Blandford Road (red sign post without sign as of August 1974) and proceed south.

25.0 End of paving; begin dirt road.

25.2 Dirt road enters from right (west); continue south.

27.0 Turn right (west) at "T" onto Route 57 (Main Road).

27.1 Turn left (south) onto unlabelled tar road (Barnard Road on West Granville topo map).

28.3 Unlabelled blacktop road enters from left; continue south.

29.7 Turn right (south) onto East Hartland Road (Route 179).

29.9 State line; welcome to Connecticut.

30.4 Outcrop on both sides of road of thinly bedded graphitic schist of the Straits Schist that we interpret as Goshen Formation reappeared from beneath the Triassic rocks.

32.4 Enter New Hartford quadrangle.

32.9 Junction with Connecticut Route 20. Immediately beyond turn left (south) onto Route 179 toward Canton, Conn.

36.2 Just before crest of hill turn right into Washington Hill rest area.

STOP 5. Route 179, immediately south of intersection with Hayes Road, Washington Hill. New Hartford quadrangle (R.W. Schnabel, in press). Although Schnabel has mapped this area, the interpretation given here (fig. 4) is ours and does not conform to that of Schnabel.

The north end of the outcrop on the west side of Route 179 is moderately west-dipping thinly laminated light-green calc-silicate granulite. The same rocks crop out on the east side of the road at the crest of the hill. We correlate this rock with the Russell Mountain Formation seen at Stop 4.

South of the calc-silicate rock on the west side of the road is amphibolite and feldspathic schist and gneiss similar to the pre-Silurian rocks at Stop 4 with which we correlate them.

Scattered along both sides of Route 179 for 500 m north of the entrance to the rest area are outcrops of graphitic nonrusty schist of the Straits Schist. Although these rocks here are structurally below the calc-silicate rocks, we believe they are stratigraphically above them and correlative with the Goshen. We attribute the inconspicuous bedding character to the fact that these rocks are at the base of the Straits Schist (Goshen) (see discussion of Stop 4).

We bellieve that the apparent higher feldspar content of the Straits here and to the south relative to the Goshen to the north is due to coarser grain size resulting from slightly higher metamorphic grade and to higher content of intrusive pegmatite and granite.

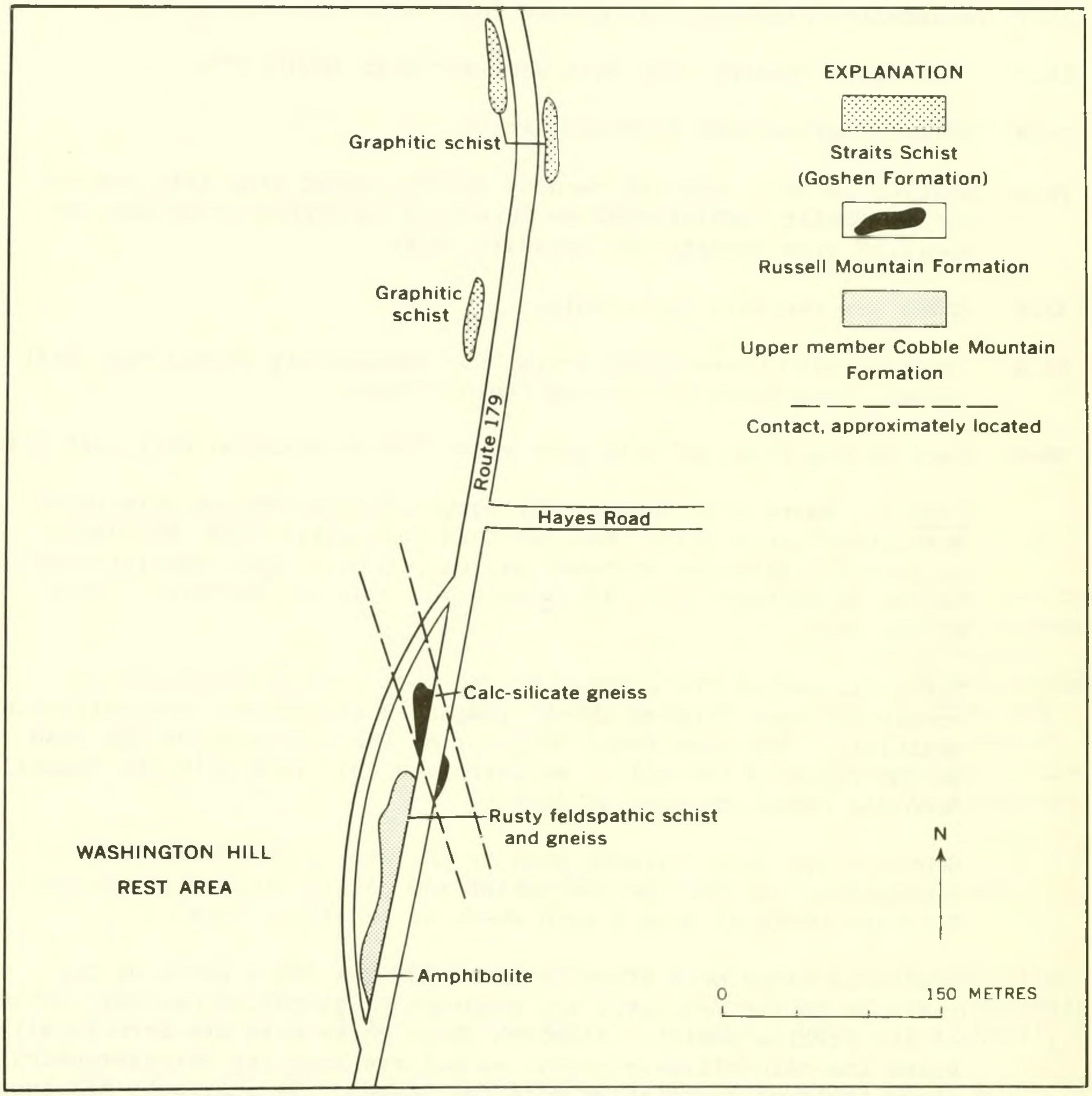

Figure 4. Sketch map of area of Stop 5, New Hartford, Connecticut quadrangle.

We point out that the pre-Silurian rocks differ from the Silurian and Devonian schist here in the following ways:

(1) More biotite and feldspar in pre-Silurian
(2) Less garnet and staurolite in pre-Silurian
(3) No graphitic sheen in pre-Silurian

We suggest comparing hand specimens of the two units.

Return to cars and continue south out south end of rest area and south on Route 179. Outcrops to south along Route 179 to intersection with Route 309 are nonrusty and minor rusty medium-grained feldspathic two-mica schist and gneiss and some volcanic amphibolite that we would correlate with the upper member of the Cobble Mountain Formation.

37.2 Bear left on Route 179 south.

38.7 Outcrop on right is rusty-weathering black sulfide, graphitic schist and black hard vitreous quartzite. Note splintery weathering of schist and fine-grained hard character of quartzite, both reminiscent of the Hawley Formation of Stop 1 and the correlative "upper member" of the Rattlesnake Hill Formation of Stanley (1964) of the Collinsville quadrangle to the south (Hatch and Stanley, 1973).

40.4 Junction with Route 309; continue south on 179.

41.9 Enter Collinsville quadrangle. Outcrops on left are Stanley's (1964) Ratlum Mountain Member of the Satans Kingdom Formation.

42.5 Turn hard left on North Mountain Road.

43.0 Outcrop on left (south) of "lower member" of Rattlesnake Hill Formation of Stanley (1964) (correlative with the upper member of the Cobble Mountain Formation).

43.1 Turn right on East Hill Road.

43.5 Bear right at intersection with Gracey Road.

43.7 Bear right at intersection with Hoffman Road.

44.0 Turn right onto East Mountain Road (Bahre-Johnson Road on Collinsville topo map).

44.7 STOP 6. Between the western part of East Mountain Road (Bahre-Johnson Road on Collinsville quadrangle map) and transmission line 1370 m north-northeast of Rattlesnake Hill. Park 550 m southwest of northern bend in road. Park on the right (west) shoulder of road and pull up as close as possible to sign marked "Slow curve ahead." Traverse is shown in figure 5, Collinsville quadrangle (Stanley, 1964).

Walk 425 m north on East Mountain Road and turn east into pasture through gap in fence. Go north along inside of fence about 15 m to first outcrop of medium- to coarse-grained nonrusty and minor rusty feldspar-biotite-muscovite-quartz-garent-kyanite schist and gneiss with about 1 m of volcanic(?) amphibolite mapped as "lower" member of the Rattlesnake Hill Formation by Stanley (1964). We correlate these rocks with the lithically similar schist and gneiss of the upper member of the Cobble Mountain Formation at the lunch stop. We also correlate these rocks with the somewhat less similar rocks just below (structurally above) the calc-silicate rocks at Stop 5. The folds deforming the schistosity here we call F3 (Stanley, in press).

In contact to the southeast here is 13 m of well-bedded quartzite, calc-silicate quartzite and greenish calc-silicate gneiss indicated by xxx and ccc symbols on Stanley's (1964) Collinsville map at the southeastern contact of his Rattlesnake Hill Formation. We believe these rocks to be the Silurian Russell Mountain Formation seen at Stop 4 (and Stop 5).

Continue walking southeast.

In contact with the calc-silicate-quartzite unit to the southeast is a graphitic rusty-weathering quartz-muscovite-biotite-feldspar-garnet schist having a graphitic sheen on the schistosity. This rock we consider to be the base of the Straits Schist and thus the base of the equivalent Goshen Formation. Once again the base of the Straits Schist is not particularly well bedded. Continue walking southeastward across brook to transmission line to outcrop on transmission line 120 m southwest of East Mountain Road (fig. 5).

Here the rock is well-bedded, thinly-bedded graphitic quartz-muscovite-biotite-garnet-kyanite schist of the Straits Schist that we consider to be Goshen. Note that the rock does not have the splintery-weathered texture, fine-grained clean quartzites, or very rusty weathering that characterize the pre-Silurian graphitic schist.

Graded beds present in outcrop top southeastward and are compatible with, but do not necessarily prove, because of the break in outcrop immediately to the west, our stratigraphic interpretation that Straits is younger than the rocks to the northwest.

Another outcrop of Goshenlike Straits Schist with thin beds similar to that at Stop 3 is 150 m to the southwest along the transmission line. Pods of mineralogically zoned calc-silicate amphibolite are very similar to those in the Goshen Formation to the north.

Note pods of quartz and blue kyanite.

44.7 Continue south then west down East Mountain Road.

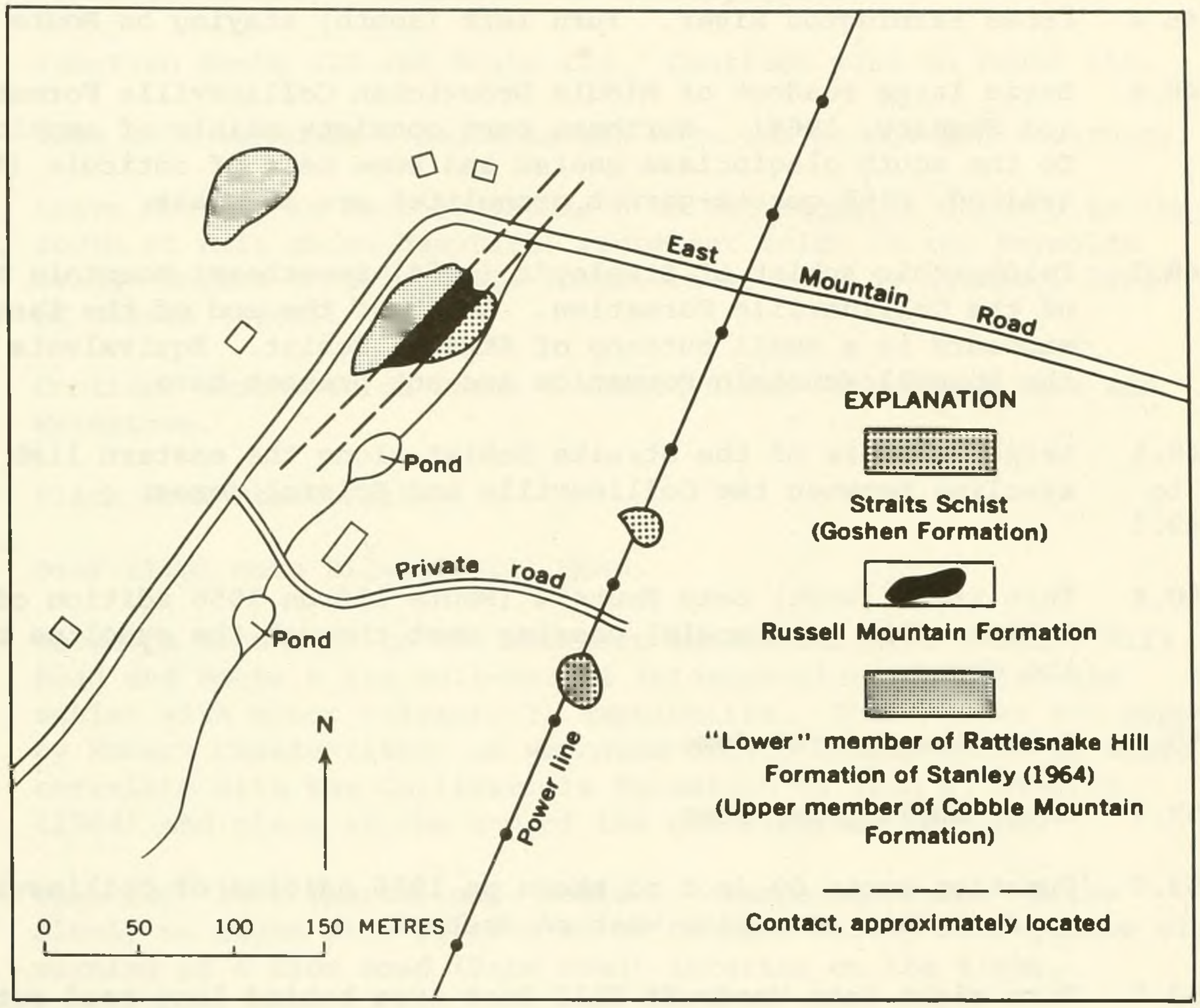

Figure 5. Sketch map of area of Stop 6, Collinsville, Connecticut quadrangle.

45.2 Turn left (south) on Route 179 at "T."

46.5 Junction Route 179 and Route 44. Go south to Collinsville on Route 179.

46.7 Junction Route 202. Continue south on Route 179.

48.0 Junction. Turn right at "Y."

48.1 Bear right along Farmington River. Stay on Route 179.

48.4 Cross Farmington River. Turn left (south) staying on Route 179.

48.6 Begin large roadcut of Middle Ordovician Collinsville Formation (of Stanley, 1964). Northern part consists mainly of amphibolite. To the south plagioclase gneiss and some beds of coticule (fine-grained, pink quartz-garnet granulite) are abundant.

48.7 Feldspathic schist of Stanley's (1964) Sweetheart Mountain Member of the Collinsville Formation. South of the end of the large exposure is a small outcrop of Straits Schist. Equivalents of the Russell Mountain Formation are not present here.

49.1 to 49.3 Large exposure of the Straits Schist along the eastern limb of the syncline between the Collinsville and Bristol domes.

50.4 Turn right (west) onto Route 4 (Route 116 on 1956 edition of the Collinsville quadrangle) passing west through the syncline between the domes.

50.6 Enter the Bristol dome.

52.7 Enter Burlington, Conn.

53.0 Junction Route 69 (not so shown on 1956 edition of Collinsville quadrangle). Continue west on Route 4.

53.1 Turn right into Woodruff Hill Rest Area behind long road cut through the Straits Schist on the western side of the Bristol dome.

STOP 7. Roadcut along Route 4, 150 m west of junction with Route 69. Park in Rest Area to north marked Woodruff Hill (Collinsville quadrangle, Stanley, 1964).

Outcrop consists of medium-grained quartz-muscovite-biotite-feldspar-garnet-kyanite schist with graphitic sheen. Beds of quartz-biotite-garnet granular schist are interlayered with schist and are typical of central part of this belt of Straits Schist. Mineralogy, bedding character, and graphitic sheen are identical to the Goshen Formation to the north. Some granular beds are graded with tops to the southeast. Several beds of calc-silicate amphibolite similar to those at Stops 3 and 6 are boudined. F3 folds deform schistosity which cuts bedding at a slight angle indicating structural tops (synclinal axis) to the southeast. Continue west on Route 4 to Harwington in the Torrington quadrangle.

56.1 Junction Route 72 and Route 4. Continue west on Route 4.

57.1 Harwington-Harmony Road to the right (north).

57.9 Center of Harwington (Harwington Green).

58.1 Junction Route 118 and Route 4. Continue west on Route 118. Outcrop to left (south) is Hartland III of Martin (1970); equivalent to Ratlum Mountain Member of Satans Kingdom Formation (Moretown Formation) and the "upper" member of Rattlesnake Hill Formation (Hawley Formation) of Stanley (1964).

59.1 Junction Route 222 and Route 118. Continue west on Route 118.

60.7 Turn left on Route 8 south toward Reynolds Bridge and Waterbury.

68.6 Leave Route 8 at Exit 38 (Route 6 to Watertown). Outcrop to the south of exit shows beautiful recumbent folds in the Reynolds Bridge Gneiss (Collinsville Formation as used by Stanley, 1964) of Cassie (1965).

Continue southwest on Route 6 toward Black Rock State Park and Watertown.

69.6 Black Rock State Park.

69.9 Bear right onto Bidwell Hill Road.

70.5 Outcrops from here to the southern intersection of Bidwell Hill Road and Route 6 are well-bedded feldspar-biotite gneiss and schist with minor volcanic(?) amphibolite. These rocks are mapped by Robert Cassie (1965) as Reynolds Bridge Gneiss which we would correlate with the Collinsville Formation as used by Stanley (1964) and place at the top of the pre-Silurian section.

70.9 Turn 180° left (north) onto Route 6. Dangerous turn. Drive slowly on right side of road so as to park safely near yellow sign warning of a side road (Park Road) entering on the right.

STOP 8. Route 6 just east of Bidwell Hill Road at the junction of Route 6 and Park Road (fig. 6). Thomaston quadrangle, Cassie (1965).

Walk 110 m south from sign along east side of road to first outcrop. Here the rock is a medium- to coarse-grained feldspar-biotite-quartz gneiss typical of Cassie's (1965) Reynolds Bridge Gneiss and Stanley's (1964) Collinsville Formation. Although amphibolite is not visible in this outcrop, it is present on Bidwell Hill Road to the west as well as in an outcrop just north of the junction of Route 6 and Park Road (fig. 6).

Walk north 130 m from yellow sign to the junction of Park Road and Route 6. On the north corner is a small outcrop of hornblende-plagioclase amphibolite of the Cassie's Reynolds Bridge Gneiss. This can be traced northwesterly across Route 6 to the outcrop just east of the gray house (fig. 6). In contact with the amphib-

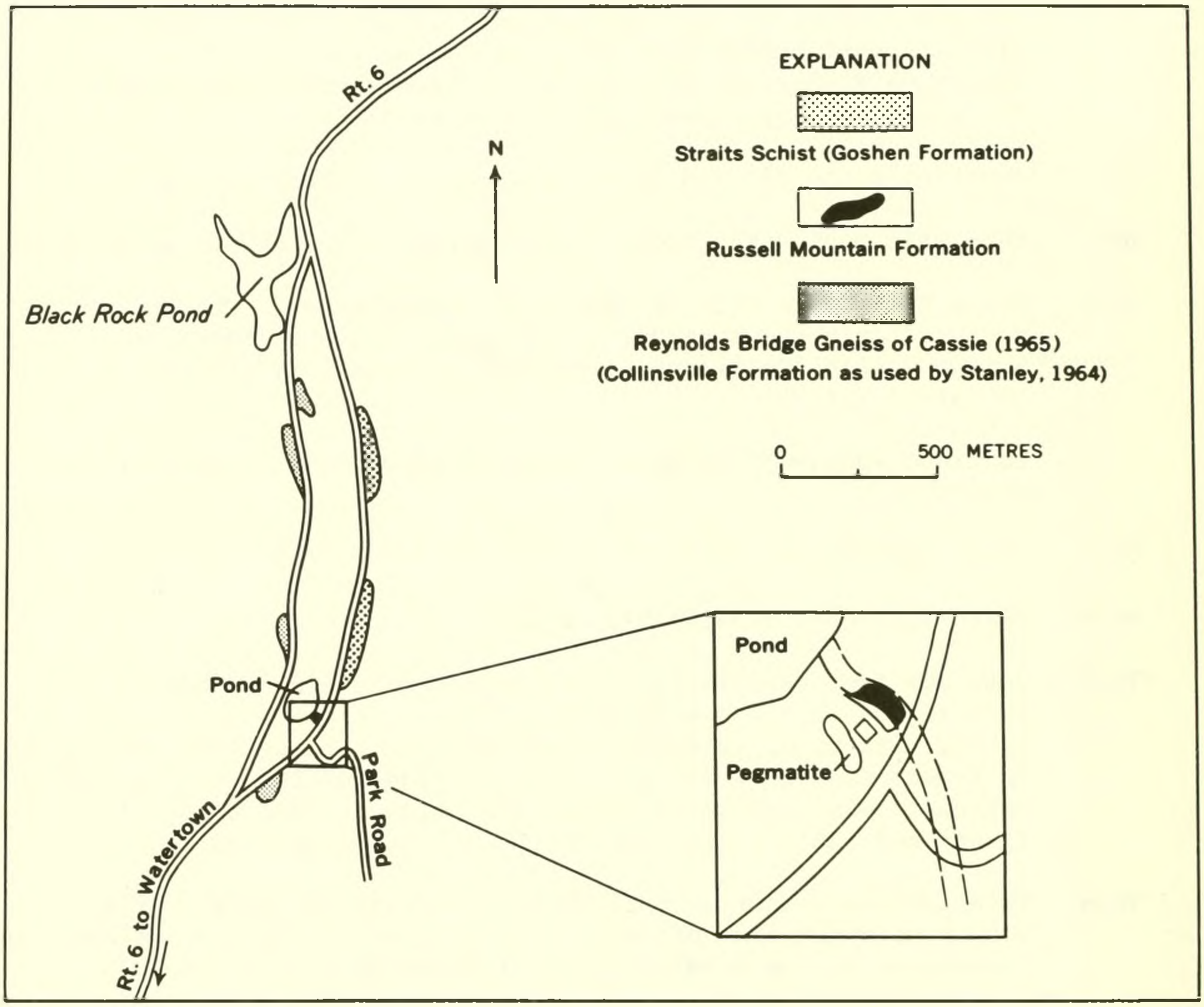

Figure 6. Sketch map of area of Stop 8, Thomaston, Connecticut quadrangle.

olite to the northeast is approximately 3 m of well-bedded marble and calc-silicate quartzite. We believe this calc-silicate unit is the Russell Mountain Formation and, therefore, stratigraphically above, though here structurally below, the amphibolite and feldspar gneiss of Cassie's Reynolds Bridge Gneiss.

Continue walking north along Route 6 about 130 m to a long outcrop of quartz-muscovite-biotite-garnet-feldspar-kyanite schist with satiny sheen of fine-grained muscovite and graphite. This is the Straits Schist of Cassie (1965). We concur and correlate this with the Goshen Formation of western Massachusetts.

Thus we have walked over the same section from pre-Silurian rocks, through the Silurian calc-silicate-quartzite of the Russell Mountain Formation, to the bedded graphitic quartz-muscovite schist and granular schist of the Goshen Formation or correlative Straits Schist that we saw at Stop 4, Stop 5, and Stop 6.

As seen on the earlier stops, the basal part of the Goshen and correlative Straits Schist is only indistinctly bedded, but it grades upward into well-bedded rock like that at Stop 7.

Note that the grain size of the Straits is coarser here than at Stop 7. This southward increase in grain size continues into the Naugatuck quadrangle where the Straits is conspicuously coarser than here.

END OF TRIP. We thank you for bearing with us and hearing our story.

71.2 Continue north on Route 6 past Black Rock State Park.

72.8 Bear right, follow Route 6 east to Route 8.

73.3 Turn onto Route 8 north. Take Route 8 to Winsted, then Route 44 northwest to Route 7 and then Route 7 to Great Barrington.

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