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Minnesota Valley: [specimens] 5280-5330. No. 32 1884

Hall, C. W.

[s.l.]: [s.n.], 1884

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Hall # 7.

U. S. GEOLOGICAL SURVEY

FIELD NOTE BOOK

No. 32.

Minnesota Valley.

C. W. Hall.

5280 - 3330

5280 - 3330

Survey of the Pre-Cambrian Rocks of the N. W. States.

INSTRUCTIONS.

1. Devote at least two pages of this note book to one section. On the left hand page place a map of as much of the section as has *actually been seen*. Denote rivers, lakes, marshes, etc., by the usual topographical signs. Denote the ledges of rock, when no structure is made out, by cross-hatching, making the cross-hatching cover as nearly as possible the areas occupied by the exposures. If the rock is a massive one, but still more or less plainly bedded, use the same sign with a dip arrow and figure attached, showing the amount and inclination of the dip. Denote slaty or other very plainly bedded rocks by lines running in the direction of the strike, with figures and a dip arrow attached as before. To each exposure on the face of the map attach the number of the specimen representing it. In mapping the section count each of the smaller spaces as 100 paces, each of the spaces between the red lines as 500 paces, and four of these large spaces as one mile, or 2,000 paces. Usually the southeast corner will be placed at the first red line above the bottom of the page and at the right hand side. If, however, for any reason, it is desirable to show portions of an adjoining section, the southeast corner may be shifted up or down one space, or the map may be turned around and the north placed at the left hand side of the page.

2. On the right hand page place the notes descriptive of the exposures. Begin in each case with the number of the specimen, after which give in order the position of the ledges as reckoned in paces from the southeast corner of the section, and the dip and strike when observable, for instance: 4025; 250 N., 300 W.; *Strike, N. 6° E.; Dip, 50° E.* Then follow with as full a description of the exposure as possible. Very often the notes for one section will cover more than one page in which case pass to the next right hand page, *repeating the map on each left hand page* as long as the notes, with regard to one section, continue.

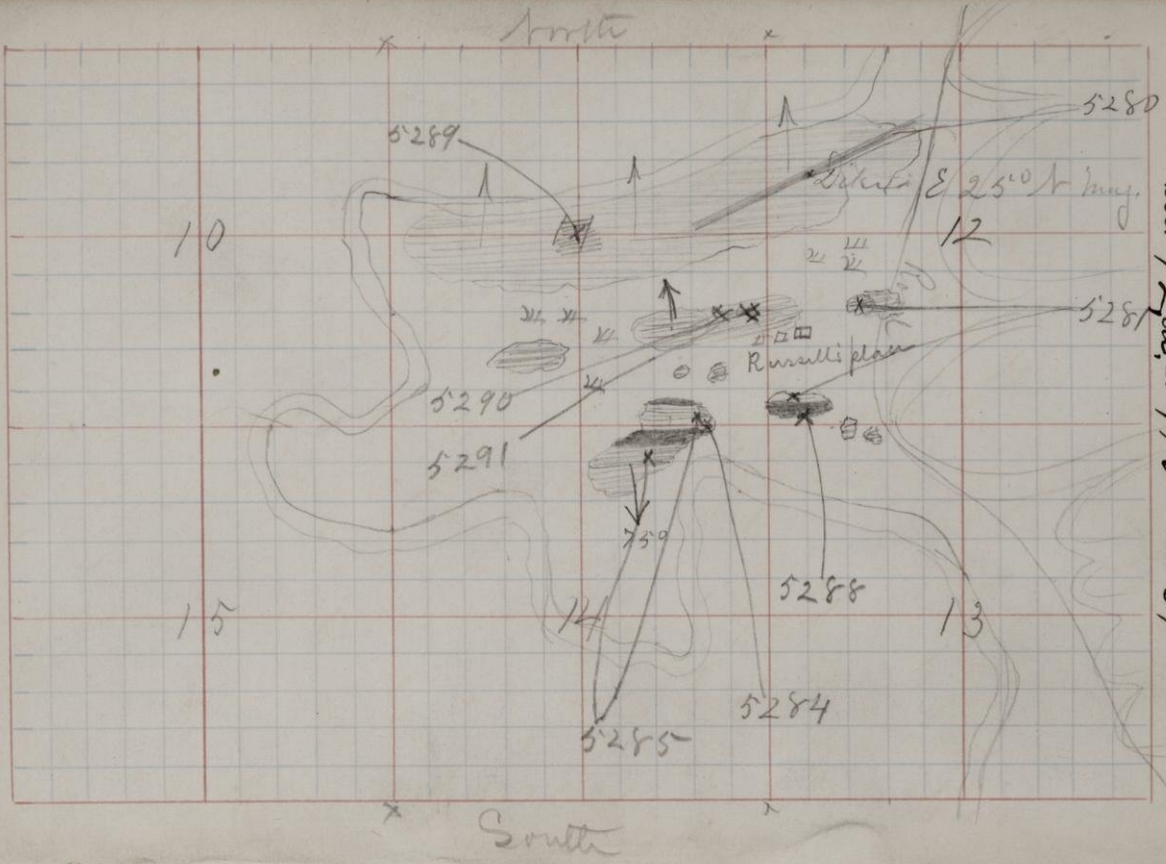
3. Collect a specimen from each separate ledge of rock, or whenever there is a change of rock on any one ledge. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be sampled, the position and extent of the ledge being marked on the map, with the note that it is of a rock identical with specimen so-and-so. Under the same conditions small sized samples will be allowed, but in all other cases *large sized trimmed specimens*, with chips for slicing, must be selected in accordance with § 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. All specimens are to have numbers painted on them, in white on a black background, in camp.

4. On the last twenty-five pages of the book give, as may seem desirable, a general account of the examination of the region mapped in the previous pages, correlation of observations, etc., etc.

5. Forward this note book, as soon as filled, as registered mail matter, to R. D. IRVING, U. S. Geologist, Madison, Wisconsin.

32

Sec. 12, T. 118, R. 39



5280

1300 N; 1800 W,

This number represents the dike, or rather a dike for others no doubt occur in the locality, on the high rocky bluff to the south of Minersville Falls.

At the place where this sample was broken which was well up towards the highest point of the bluff 50-75 feet above the water the surface had been worn by water and glacial action (evidently the latter as well as the former).

The width of the dike is about 8 paces. The texture is rather fine than coarse for a dike of this width.

The direction is N. 25° E, mag, but it can be followed only a few paces either way.

The rock is very much shattered — being far from so massive as an most of the dikes in Stearns County,

Sec. 12 T. 113ⁿ R. 39

See preceding plat.

5281

2

700 N; 1700 W.

This represents the hornblende rock at the roadside 500± paces from the stretch of rock reaching nearly east and west & through which 5280 breaks.

The rock is a schist rather coarse in texture and apparently hornblende in composition.

The locality is greatly fractured with joints nearly obliterating the bedding; the blocks vary some in size. The bed is more firm than the mass which stands up in a nearly perpendicular wall extending nearly north & south. 10 feet or so in height.

Sec.

T.

R.

See plat of 5280

5282

250 N.; 200 W.

(SE $\frac{1}{4}$ Sec. 13, 115; 39

At 100 paces from the river when it turns and flows towards the South, stands an exposure of quartz 150 paces long and 50 paces wide.

The rock is 30 feet above the level of the meadow at the highest point ~~above~~ of its rounded surface.

The direction of the rock is N 2 + S W, the strike of the same is N 40° E (mag) with a southeasterly dip of 80°.

The exposure stands on the line of boundary between the open meadow and the forest covered area.

Sec.

T.

R.

See plot for 5280

5283

250 ft; 200 W

See 13, 115, 39

This number came from the same place as the preceding

The exposure consists of alternating feldspathic (at least of light-colored) and darker or more distinctively quartzitic bands

This number represents the coarse and more feldspathic modification

The strike and dip of the two are identical

{ Based on Manchester's observations }

Sec. 14 T. 115~ R. 39

Suplat for 5280,

5284

5

2000 N; 300 W.

This sample taken 300 paces from the East side of Sec 14 between it & Sec 11 represents one of several modifications found here

The exposure is 500 - 600 paces long and 250 wide

The direction runs nearly East and West varying in some places to 10° N. of E. (Mag.)

This number seems to be a vein - there are two or three places where it was seen (from north to south) one on the north side 3 ft. across but this one, near the middle of the exposure at its Eastern end, could not be measured.

Quartz - Feldspar + hornblende can be seen - mica is not present in quantity.

Sec. 14 T. 115' R. 39

See plat for 5280

5285

6

2000 N; 300 W

This is the dark colored rock taken from the same large exposure as 5284 and in its immediate neighborhood,

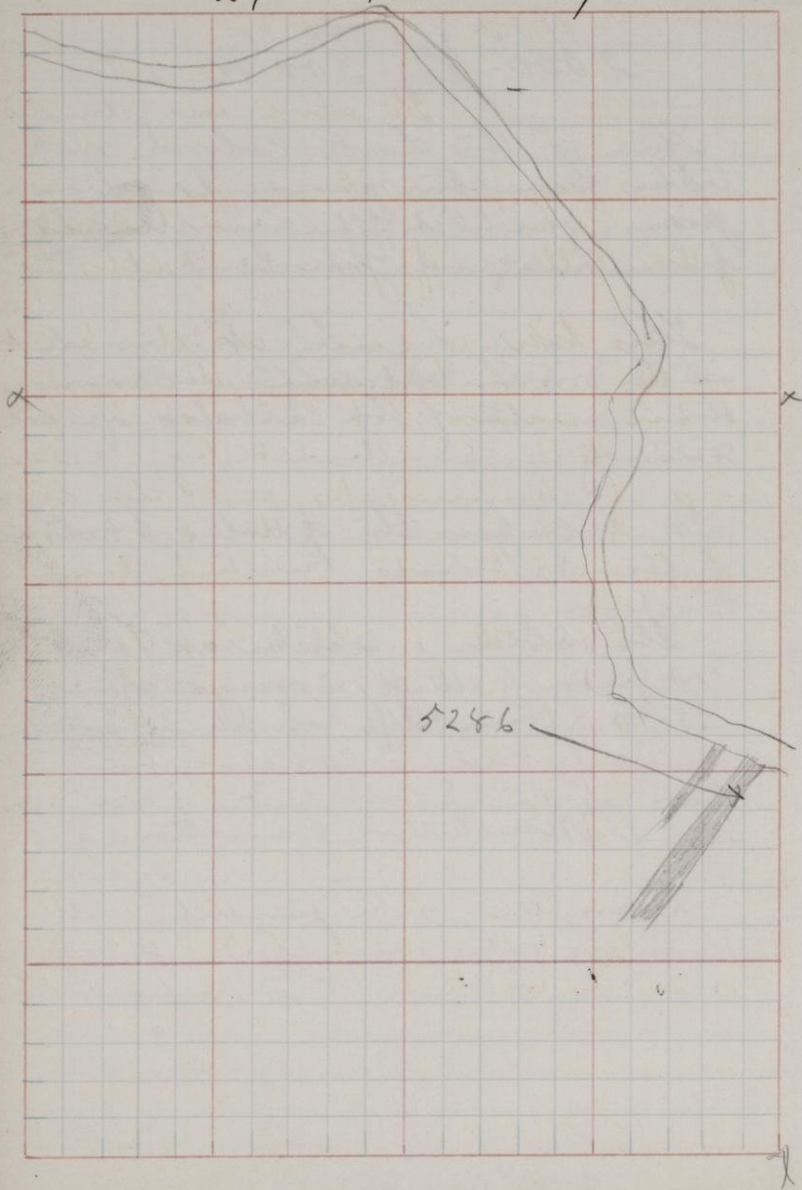
This is a hornblende rock and a schist rather coarser than most of the schist of the vicinity.

It occupies the greater portion of the exposure

The strike which is $E 10^{\circ} N$ (maybe) or nearly that is very regular so too is the dip which is southerly

(Manchester's observations)

Sec. 29 T. 176 R. 39



5286.

7

1100 N; 100 W

See 29

The above was estimated

This sample represents the dike which is seen northwest of the village of Granite Falls

This dike is seen at the bend in the river between the road & the water; it can also be followed to the southwest by a series of hummocks and the different character of the rock with different joints within the section.

Its width must be at least 40 feet and its course is N 30 E (true)

The texture is coarser than that at the South side of Miner-Sole Falls

A smaller dike parallel with this lies to the west of it 2 rods or so; its width is 5 or 6 feet.

Sec. 3

T. 115

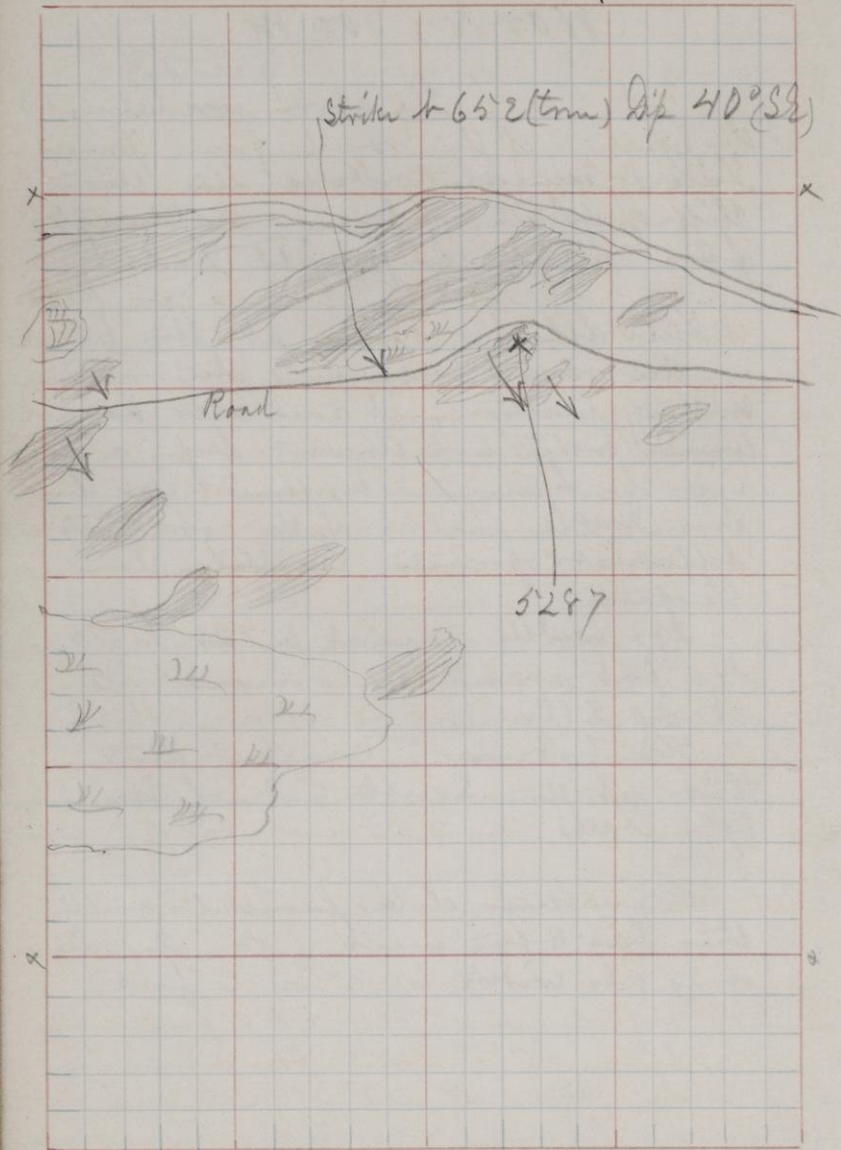
R. 39

W.

Strike $\rightarrow 65^{\circ} E$ (true) Dip $40^{\circ} SE$

Road

5287



5287

8

1600 N; 750 W.

Not very far from the river to the south of the road from Granite Falls to Minnetonka Falls lies a cliff quite steep upon the southern face and sloping off nearly with the dip of the layers upon the southern face.

The rock seems to vary considerably in texture and is very much weathered; but on the north side (or rather the northwest at the east end) the more feldspathic portions contain ~~much~~ many garnets some nearly a half inch in diameter.

The rock was nowhen so decomposed as to allow the garnets to loosen & fall out in some were secured from the imbedding rock

The ^{more} Schistose portions were ^{more} free from the garnets than the compact parts.

The rock was 40 + 50 feet high dipping 30° towards the SE
Strike was N 22° S (true) dipping slightly from two or three other points observed.

Sec. 12 T. 115 R. 39 N.

See plat app. 5'280

50 N; 1900 W.

This is coarse vein rock gathered in Sec. 12 115; 39 near the SW corner.

This rock occurs upon the South side of the exposure and at this place has every appearance of being an interstratified layer of the rock of the place. But it is more likely to be a vein which by its peculiar structure, toughness, and position directed the erosion upon this South side of the rock mass.

The sample is light colored with abundant quartz and feldspar and with little mica — altho' greenish stains are frequent indicating the decomposition of some basic mineral ingredient.

Sec. 11 T. 11 S. R. 39 N.

See plat opp. 5280

1000 ft; 1000 ft

Altho' this sample was taken from (as near as could be calculated) from the middle of Sec 11, it represents a considerable portion of the rock of this ~~particular~~ point extending westward to the south of Minnesota Falls.

It is a porphyritic hornblende quartz.

Its color is darker than the quartz of some localities and it is far from being so dark as the Schistose Slays with which it is interbedded.

The strike is E 10 ft with a northerly dip of 25° to 30°

Sec. 11 T. 115 R. 39 W.

See plat opp. 5280.

5290

600 N; 100 W

Sec. 11.

On the South side of the high cliff of rock ~~stretching~~ ^{stretching} towards the west and ~~fast~~ causing the heavy bend in the river at Minnie's Falls and not far from the main road ^{along} ~~running~~ down the bottom lives Mr. Russell

Directly behind his barn the rock stands in a steep cliff 20 or 30 feet high whose direction is nearly that of the strike of the rock - edges standing out towards the South.

This number represents a greenish layer having purple bands running irregularly thro' it.

The colors are quite bright & the rock appears very tough & fresh.

This number overlies the one following, and its dip & strike are about the same.

Sec. 11 T. 115 R. 39

See plat opp 5280

5291

12

600 N; 100 W.

See 11.

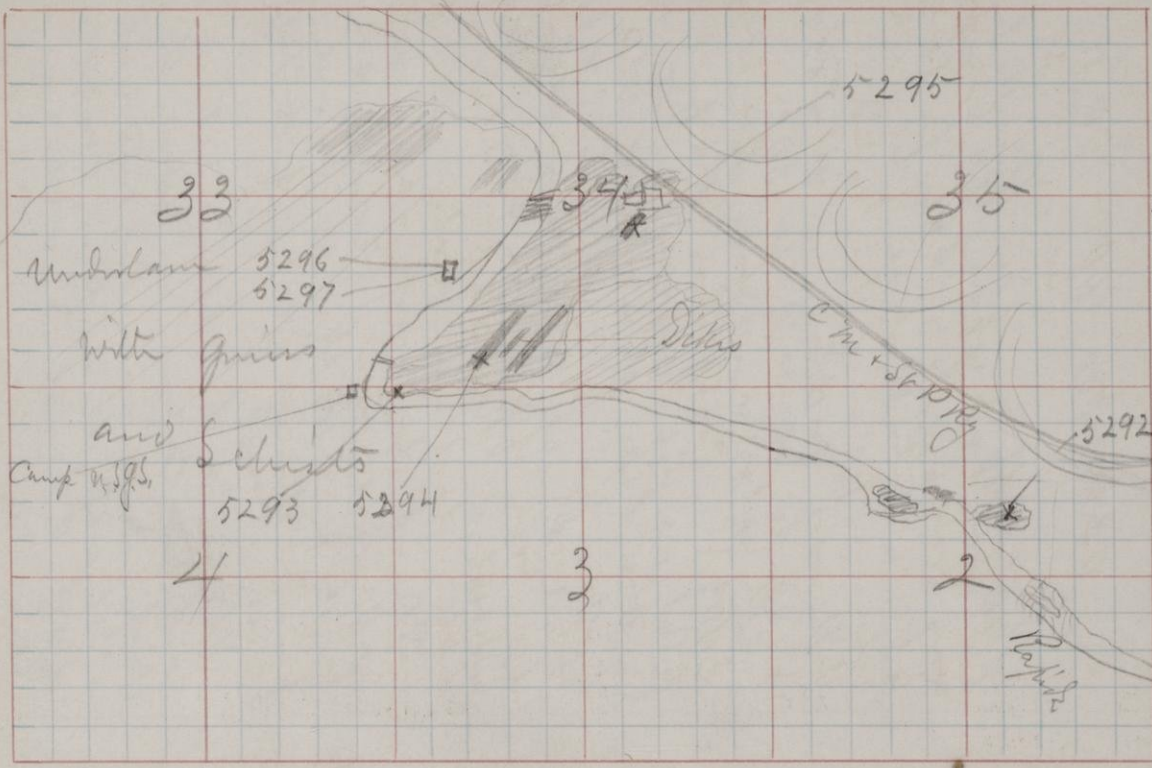
This cliff near the Russell bar has been sampled by him and a piece polished. The finish is said to be admirable.

The dip of this number 5290 is about true N at 30°

The strike could be determined only for an exposure of a few feet yet it agreed substantially in that (true E & W) with that of other points in the neighborhood, directly north but it varies from measurements taken toward the west.

This fact suggests a bend in the strata towards the south from their direction as they passed through Minnesota Falls.

This is a hornblende schist somewhat coarser in texture than the preceding number, and with a slightly decomposed condition of the hornblende at the surface.



Secs 33-34-35 T. 116 R. 39
 2-3-4⁽⁹⁻⁸⁹¹⁾ 115

5292

13

1300 N; 700-750 W.
Sec. 2, 115; 39

At the point where this sample was broken the exposure seemed to be a continuation of the rock exposure forming the rapids in the river around an island.

The strike is from E + W to $E/10^{\circ}N$ Contortion being noticed on the surface.

The dip is southerly 15°

The rock is the characteristic rock of the vicinity considerably like 5236 but a little darker in color and the banding does not appear to be so pronounced. Perhaps the latter fact is thro' the more weathered condition of the rock.

Sec. 3 T. 115 R. 39

See plat app 5292

1995 N; 1998 W.

Sec. 3, 115139

Within 6 or 8 paces of the north-west cor. Sec 3 these pieces were taken from the wall of an old + broken pot hole some 20 feet or so ~~of~~ above the present level of the river.

The rock seems somewhat massive — more so than at most of the localities — in small pieces but the rock as a whole has a southeasterly dip of near 37° while the direction of the rock is northeast and southwest.

The rock is very firm — unusually so for this part of the valley. The surface has preserved unmistakable marks of water ~~worn~~ wear in the pot holes + other worn cavities.

This must be the rock pronounced by Prof Winchell to be identical with the St Cloud Granite (Geol. & Nat. Hist. Surv. Rep. 1873, p. 169.)

Sec. 34 T. 116 R. 39

See plat app. 5292

5294

15

75 N; 1750 W.

This specimen is a sample of a dike of unknown width among the trees which with more or less denseness covers a good portion of the area comprised between the Pillsbury Elevator & the river to the West & South.

Its direction seemed to be, from the exposure of contact along the north side, $E 30^{\circ} N$ (dip)

The texture is fine as would naturally be expected from a place so near the contact with the gneissic rock thro' which it breaks.

The width I stated to be unknown the appearance of the ground in either direction from the point visited indicated a width of 20 feet or more.

Sec. 24 T. 116 R. 39

su app. 5-292

900 x 700 W See 34

This represents the igneous rock of the dike at the Pillsbury Elevator. On the north side of the track the dike appears but the rock is not distinct, Npt to the South of the Elevator upon the Knoll the rock ~~is~~ is fresh and but little decomposed.

The texture is much coarser than that of the preceding number. The direction of the dike is about $N 30^{\circ} S$ with a width between 30 and 40 feet.

Altho somewhat broken the blocks are quite fresh & the rock ~~clear~~

Several other dikes were observed on this tract of wooded, rocky land but as they seemed to be identical with the two numbers taken save perhaps in texture they were not sampled.

Sec. 34 T. 116 R. 39

See plat app. 5292

5296

17

At the N W corner of Prairie
and Thursday streets,

50 paces from the river,
A well was dug in July 1884 to
the depth of 15 feet.

The first four (4) feet was com-
posed of ordinary river drift
from 4 feet to 13 ft the matter
removed was a decomposed gneiss
like this sample, taken from
the dump.

The rock is quite thoroughly de-
composed, the feldspar produ-
cing kaolin which is mixed
with quartz and an unusual
proportion of ferric oxide.

5297

represents the last 2 feet of
the depth of the well.

The decomposition product is
much lighter colored than
that above it.

A fair amount of water was
found at this depth and it
was not determined how much
deeper the disintegration reaches,

Sec. 34 T. 117 R. 40. W.



1600 N; 800 W.

On the land of Mr. Carlson between the railroad and the river lies a mound of quite decomposed rock.

At one or two places especially along the lower side next the boggy meadow the rock has been examined for foundation stone until a reasonably fresh rock sample could be secured.

The color is reddish or brownish — not the distinctly red color which is sometimes seen.

The mass is a gneiss — in some places almost approaching a schist with a northwesterly strike and a southeasterly dip approaching 60° .

The exposure is over 200 paces long from east to west.

Any width the rock is bounded by a hay meadow on the south while to the north the rock disappears under the drift and the railroad.

Sec. 34 T. 117 R. #40,

See plat opp, 5298,

1600 N; 800 W.

This represents the dike rock of the exposure of which the preceding number 5298 represents the same.

Three of these dikes were observed one was very much wider than the others and the wider one was perceptibly coarser than the narrower ones.

The walls of the dike ^{are} not smooth, (the rock on account of its shattered condition was more readily quarried than the gneiss at either side) but they evidently conform to the differences in hardness and toughness of the #5298 through which it breaks.

The dikes are parallel and have a direction N 65° E (Mag)

The westerly one is 4 ft wide; the next one 50 feet away is 3 ft wide and the third 20 feet further to the east is still narrower.

Sec. 34 T. 117 R. 410 W.

See plat app. 5298

5300

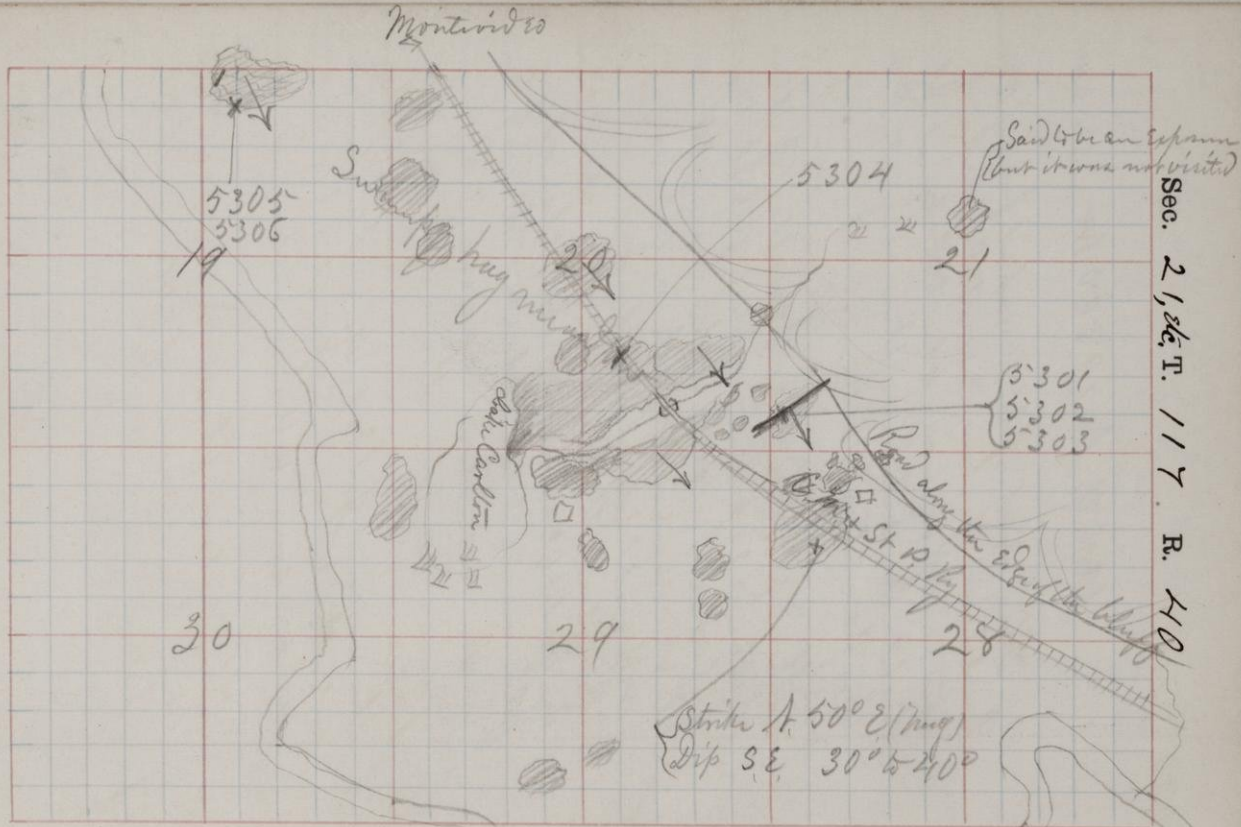
20

1600 N; 800 W sec 34

This sample came from the broadest or most westerly dike of this exposure on the line of contact between the injected + the country rock.

There is along both walls of this dike a considerable quantity of calcite; with it is mingled a dark mineral with a cleavage resembling hornblende.

In some places this material is quite coarse — the cleavage planes of the calcite being an inch or more across.



100 N; 1985' W su 21

The rock of this whole neighborhood is firm, smoothly worn and in most places quite fresh.

There is a tendency to wavy outline of the Striae as they appear upon the surface of the knobs especially upon the easterly ones e.g. those in the N W $\frac{1}{4}$ sec 28

Yet in spite of the waviness of the Striae the general direction of N 45° to 50° E (Mag) is clear and unmistakable. Dip S.E.

The ~~structure~~ ^{quartzitic} structure is generally clear. In many hand specimens the more feldspathic bands $\frac{1}{4}$ in or so thick are separated by more micaceous + thinner bands.

The color shows a redder tint than the quartz of Minnekahta Falls.

Sec. 21 T. 117 R. 40

See plat app 5301

5302

22

100 ft; 1985 W. sec. 21

This is a modification of the preceding no. 5301 and was taken only a few feet from it. It exhibits in some places a granitoid structure but this structure does not appear over sufficiently large area to throw any doubt upon the gneissic character of the rock.

It occurs frequently in bands of several feet in width, and small pieces (hand specimens) can hardly be distinguished from granite.

But there is an interbedding of these massive with the foliated layers.

The color is more reddish than the more foliated rock with which this alternates.

Sec. 21 T. 117 R. 40 Or.

See plat app 5301

150 N; 1975 W.

A dike breaks thro' the two preceding numbers taken on this Section.

Its direction is N.E. + S.W. (diag)
Its width is from 20 to 25 feet

The rock is not entirely above the surface; there are three or four places in the Section where it stands up above the other rock — representing those spots in the dike which are harder than the main mass.

The rock is very hard and brittle and the fractures are bright and clear.

It is also porphyritic with feldspar crystals $\frac{1}{2}$ to $\frac{3}{4}$ inch in length.

Sec. 20 T. 117 R. 40 W

Suplat opp 5301

5304

24

250 N; 400 W see 20.

This is the rock of the
railroad cut

The color is reddish - often
there are narrow granitic
veins which are coarser and
redder than the mass; it is in
short a bright red.

The gneissic character is
clear to see

The strike is near to that
on see 21 i.e. #5301 but the
dip is greater - here it is a-
bout 50° to the S.E.

This rock fades out or pales
on weathering. This can be seen
in the upper part of the cut when
the rock is near to the old
surface of the rock and indeed
all over this knob of several
hundred paces in length from NE
towards SW the color nowhere
is so red as in the cut where
the surfaces are comparatively
fresh.

Some granitic veins were
observed, but not sampled.

In the vicinity of the last 4 numbers there are many exposures of gneiss. They were not all sampled because they appeared to present characters identical with those carried by the specimens taken. The rock is very fine + fresh as a rule - seen so in the six sections of page #5301 than upon section 34 of this same township.

The gneiss is partly gray and partly red; the red seems to become gray at the surface as was noticed at the railroad cut and near Lake Carlton from which latter place no samples were taken however.

In the railroad cut are one or two narrow dikes pushed up along the bedding planes of the rock + breaking across them. These dikes are of a fine texture somewhat weathered and considerably shattered from ~~to~~^{out} four inches exposure their width.

Sec. 19 T. 117 R. 40

Su plat app 0'301

1900 ft; 800 W. Sec. 19

This sample was taken from a high cliff nearly vertical towards the west standing south of the road from Monticello depot & elevators to the iron bridge across the Minnesota. It is in a heavily timbered part of the bottom but still in plain sight of the road. 40 to 50 feet high.

The rock is a gneiss with considerable foliation as disclosed on the weathered surfaces.

The strike is nearly N.E. + S.W. (mag.) with a southeasterly dip of from 30° to 50° — Somewhat contorted.

The feldspathic bands resist weathering much longer than the darker portions thus giving a grooved ~~appearance~~ ^{structure} to the surface. These grooves follow the laminae and thus the contouring makes some very interesting figures with a generally quarried appearance to the surface upon the weathered parts.

Sec.

T.

R.

See plat app. 5301

1900 N; 800 W.

In several spots upon the west end and south side of the exposure at which 5305 is the main rock there are veins and nests filled largely with quartz.

This mineral is exposed in two or three quite striking nests on the front which have been laid bare by quarrying and the removal of the outer, decomposed rock.

But several planes, one or two goodie appear upon the top of the cliff.

The color of this quartz is not that ^{which} we have usually seen - it is a smoky bluish tinted sample. The color is perhaps owing to the presence of other minerals as inclusions.

No veins were very wide.

Sec. 31 T. 118 R. 40

5308

5307

Slightly elevated

5309

Bridge

N¹/₂ Sec 6 117:40

Clipperton riv.

500 ft; 1400 ft.

See 31

Nearly on a level with a flat prairie stretch below the range of bluffs skirting the east side of the Chippewa river is the exposure of which this number is a sample.

Some waviness can be seen upon the surface but not enough to call it a contortion of the laminae.

The exposure is 60 paces long and 30 do. wide.

The mass of the rock is a guise of considerable richness in black mica. The surface is weathered and the mica grains sparkle and appear to be the chief part of the rock but a little below the surface the feldspar asserts itself more strongly.

In several places bands were seen with hornblende occurring in large grains with clear cleavage planes.

Perhaps the finer an grains of hornblende rather than mica scales;

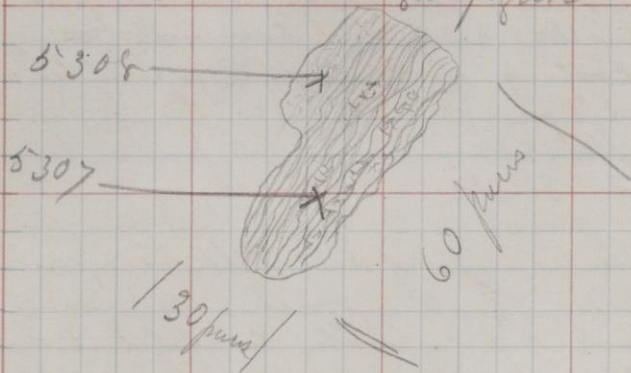
Sec.

T.

R.

See plot opp. 5307

Enlarged figure



500 N; 1400 W.

Then lies along the N.W. side of 5307 a bed of quite different rock, parallel with it and running under it in the bedding of the exposure.

The rock is a light colored feldspathic one with laminae of alternating proportions of the two constituent minerals feldspar & quartz.

It gives one, by its texture and general appearance, the impression that it is a vein or one of those peculiarly constituted layers which are hard to distinguish from veins.

The strike of the exposure — both numbers is N. 30° E. dip with a southeasterly dip of 55° ±

Sec. 6

T. 117

R. 40 W.

See plat opp. 5307

1990 N; 1980 W, Sec. 6,

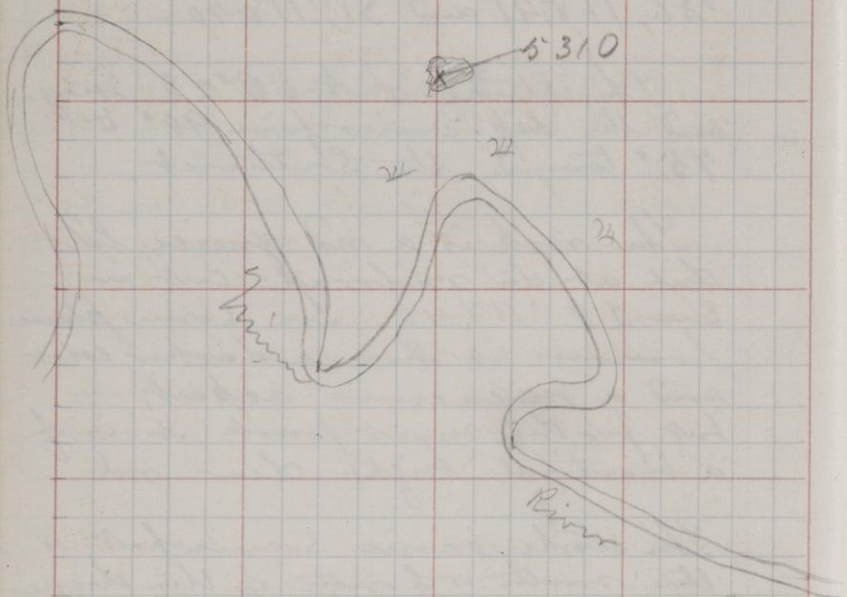
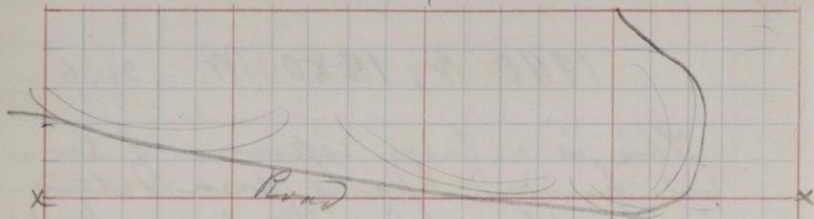
This is a large exposure of several hundred acres area standing directly under the corner post of Sections 6, 117:40; 1, 117:41; 36, 118:41 and 31, 118:40.

The strike is $N 55^{\circ} \pm E$ mag. and the dip varies from 90° to 75° towards the Southeast.

The rock is a red quartz like that at the railroad cut in Sec 20 117:40. In some places however it has a darker color and a micaceous aspect, — but for the most part it is of a beautiful bright clear red.

The strike varies somewhat to the north or south of the degree named as the laminae in places are quite wavy. This gives the variation in dip very likely.

Sec. 13 T. 117 R. 41



1600 ft; 1000 ft.

Sec. 13, 117; 41

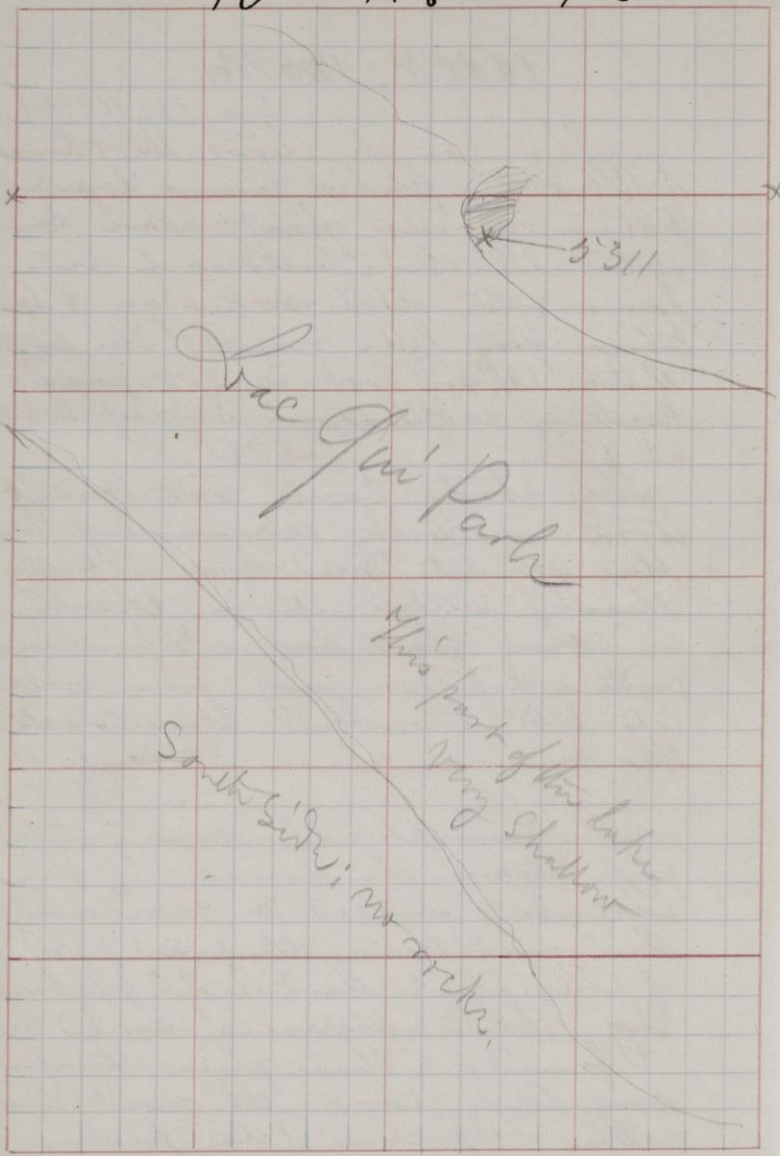
This sample is from a low exposure of no great area situated in the bottom of the Minnesota and at no great distance from the river. The length of the exposed rock is 100 paces with a width varying up to 50.

The strike could not be determined with accuracy but the general trend was pretty clearly settled upon to wit:

about northwest + southwest with a dip varying from vertical to 55° , towards the south-east.

The sample shows a fracture rock than the average of the surface; indeed it was only here and there that a spot of sufficient hardness for breaking hand specimens could be found. These pieces therefore very likely show the most durable portions of the place.

Sec. 10 T. 118 R. 42



Vac Jui Park

This part of the lake
very shallow

Sanku Sidu; no rocks

1900 N; 800 W.

This sample shows the character of the rock which forms a point jutting out into Lac qui Parle on the north side and runs to lower end. It is not very high above the lake - not more than 12 ^{or 15} feet - and it shows indications of ~~having~~ being covered at seasons of floods.

The surface is rounded but is too much weathered to show glacial strial. There are frequent veins truly granitic in character and vary from coarse to fine in texture. There are many rocky islands in the lake above & below this location which indicate the proximity to the surface of the rock over a large area.

The rock here is a gneiss like the preceding exposures.

The strike is $E 20^{\circ} N$ (Nagy) Dip to the Southeast of near 80° .

Some dip variations can be observed but the fold surface bands across the surface are continuous & clearly marked.

Estimated

700 N; 1350 W.

At a point 250 paces East of mile-post #168 C'm St P Ry where the track descends the bluff from the prairie to the river bottom about 5 miles from Odessa Station lies an out-crop of rock on either side of the road.

The area is 100 X 175 paces the longer distance being about N E + S W in direction mostly upon the southwest side of the track.

There are many joints the deeper ones showing a direction $360^{\circ}E$
 The strike is N E + S W
 Dip SE at an angle of 15°

This number represents the more gneissic modification which is the main mass of the exposure. The rock seems to be so coarse that small specimens do not show clearly what may be seen upon the rock itself.

The feldspars are often $1\frac{1}{2}$ inches across: quartz & mica as ordinarily seen

Sec.

T.

R.

See plat opp 5312

5313

Locality the same as the preceding

Through the middle part of the exposure a belt of quite granitic gneiss occupies the area. While the gneissic structure is not so pronounced as on either the northwest or the southeast side, still there are furrows indicating bands of earlier erosion there. This is the same as the more gneissic, i.e. the preceding number.

The joints and color bands are the same in direction here as in the preceding.

Some blocks of considerable size blasted out in the construction are lying near the track. They show clearly the texture and mineral constituents of the rock which are: rather coarse and granitic and quartz feldspar mica

There are ^{occasional} fragment rust stains upon the broken surfaces indicating the presence of a decomposing compound of iron probably Fe_2O_3 .

Sec.

T.

R.

See plat opp. 5312

Locality same as the two preceding numbers.

In the gneissic portions of this exposure there are frequent masses of a schistose character and a dark color.

The samples taken are somewhat weathered but they seem to be essentially like 5226 in the fresh gneiss at the railroad cut in Norton.

These nests of mica schist are drawn out in the direction of the strike as elliptical inclusions.

Frequently they end abruptly against the ordinary gneiss.

A long elevated stretch of land evidently
of glacial origin

5317

 5315
 5316

X

5315

36

300 N; 1800 W

In the bottoms between a long narrow bluff some 50 feet high from the river at low water and the bed of the stream are several exposures of considerable interest.

The knobs are high 20-40 feet above the bottom not so abrupt as the exposures in many localities as is seen by the dead & dried grass growing in the thin soil around their edges.

The rock is a gneiss of a prevailing reddish reddish color and of varying texture.

The sample represented by this number is rather fine, the feldspar & quartz prevailing, with some obscurity in the appearance and condition of the basic constituent.

The strike is NE + SW with a southeasterly dip.

Sec. 2

T. 120

R. 45

See plat opp. 5313

300 N; 1800 W

Very near the place where the preceding was taken are a number of Schistose inclusions

They are very similar to the inclusions found elsewhere down the valley tho' perhaps they resist weathering better than some

Both on these specimens the peculiar waxy appearance of the layer immediately under the surface which is similar to that observed on the gneiss elsewhere.

These inclusions seem to resist weathering better than the gneiss enclosing them

Some of these pieces are of considerable size occasionally one some piece in extent ~~to~~ and from that size down to that of more aggregations in the gneiss

Sec. 2 T. 120 R. 45

See plat opp 5315

500 N; 1900 N.

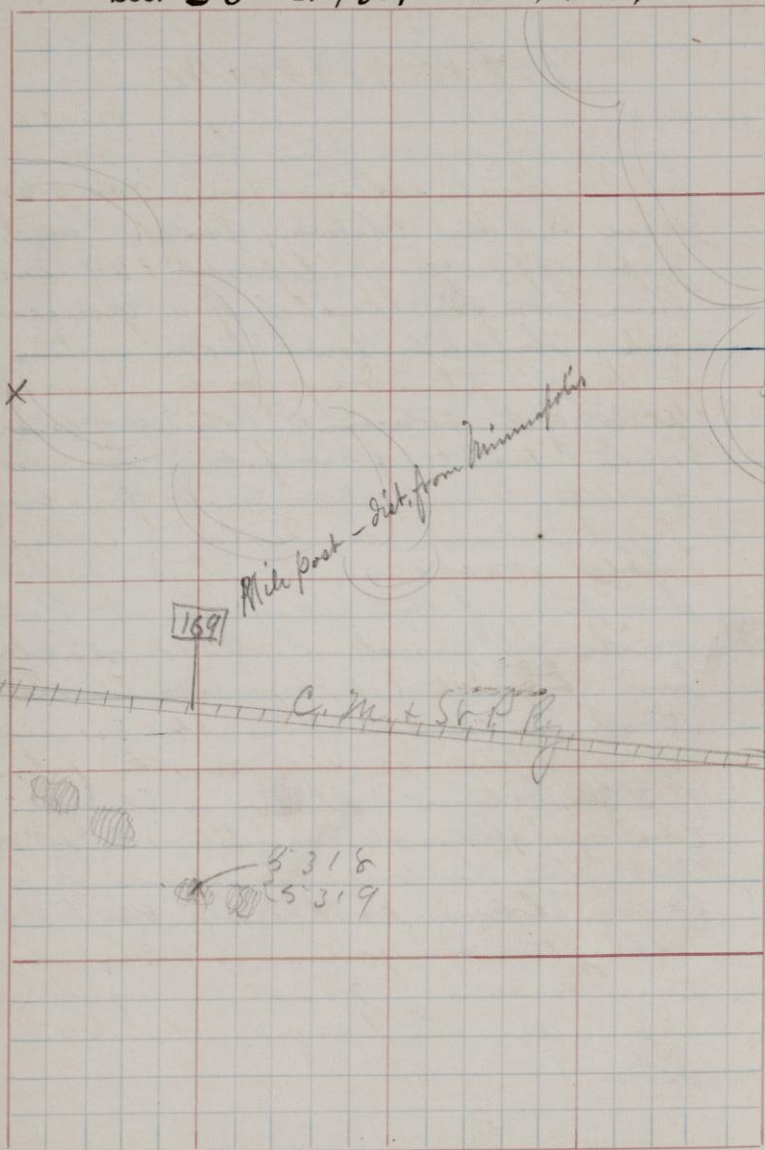
To the north of the large mass from which the two preceding nos. were broken stands quite a high + abrupt mass of rock 15' or 20' feet from the head of the Slough in which it stands.

The direction of the exposure is NE + SW which indeed is that for all the outcrops of this group.

These rocks seem to strike in the direction of the exposures at the railroad track # 5312-13 + 14 and they seem to be identical with them.

This number seems to be coarser than its neighbor 5315. Yet the differences cannot be very strong outside of the texture etc. + ~~mass~~

Sec. 36 T. 121 R. 45 N.



700 N; 1500 W.

See 36

On this section from 200 to 500 paces S. of the railway track and just opposite milepost #169 are three or four knobs of a gneissic rock. They are low one or two of them standing just above the level of the prairie. Others stand from two to four feet. The area of them all is not great but the area underlain is evidently great.

The lamination runs nearly north ~~South~~ ^{20° E} (Mag) at least it shows a considerable swinging around towards the north from the direction ~~shown~~ noted on the exposures near the river.

The dip is pretty abrupt. A distinct gneissic structure can be seen nearly everywhere especially on large blocks.

Sec. 36 T. 121 R. 45 N.

See plat opp. 5318

700 N. 1500 N.

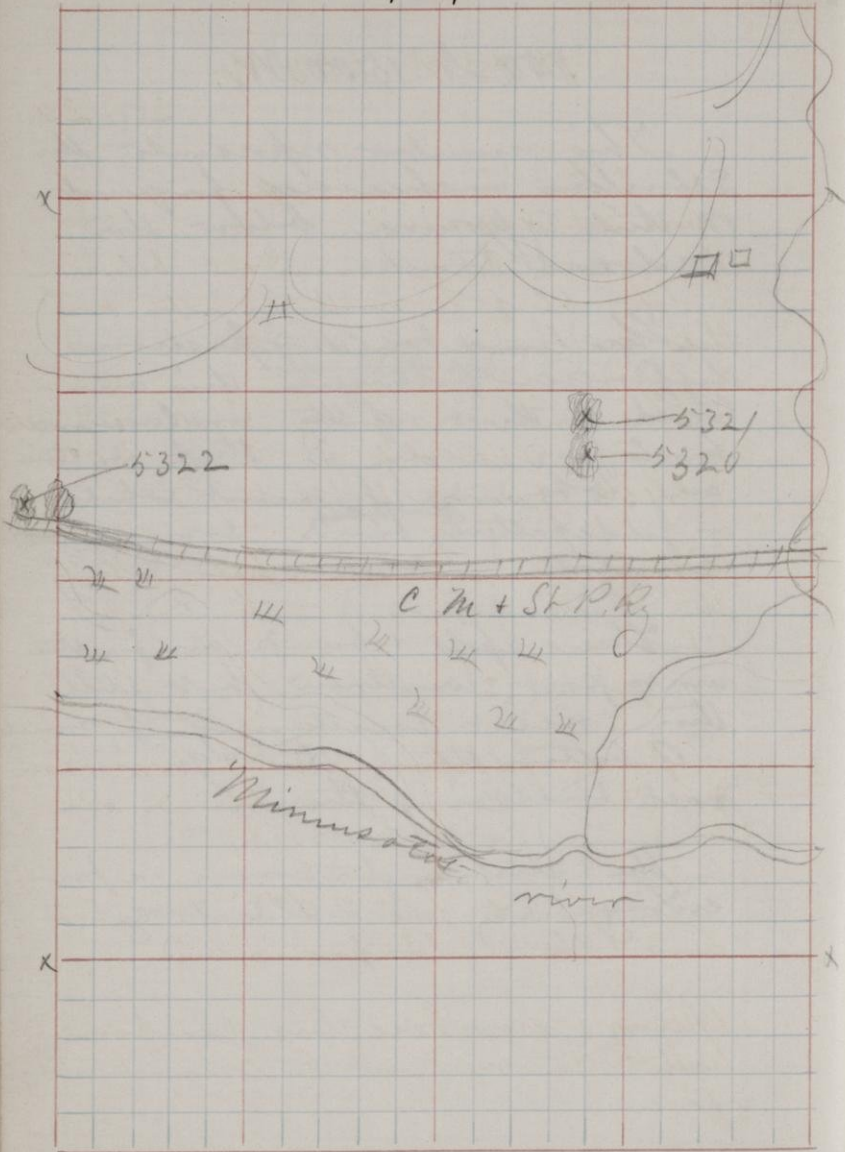
This number represents the
Scheridon inclusions frequent
on this exposure below the
railroad track.

The most conspicuous
difference between this ma-
terial & that of the inclusions
heretofore seen is that in this
are to be seen frequent white
or feldspathic ^{quartzitic} bands somewhat
concentrated

These spots & bands are for the
most part weathered but still
they resist weathering of much
better than the gneissic
rock enclosing them.

The strike is the same as pre-
ceding is $N 20^{\circ} E$ mag.

Sec. 30 T. 121 R. 45'



5220

41

1400 N; 600 W.

See 30

This is an exposure of granitoid gneiss in the middle of quite a large meadow between the bluffs on the north and the railroad on the south.

The strike is nearly north-south (mag.) and the dip is near 40° to 45° towards the east.

There are several spots where the rock comes to the surface, but only one or two where it is from 3 to 5 ft high.

Quartz-feldspar and mica with possibly some hornblende can be seen in this rock.

The quartz has a bluish color and the feldspar is red.

Query: how dare this compare with the rock at La Trambaie's place below St. Ridgely?

Sec. 30 T. 121 R. 45

See plat opp. 5320

5321

42

1450 N. 600 W

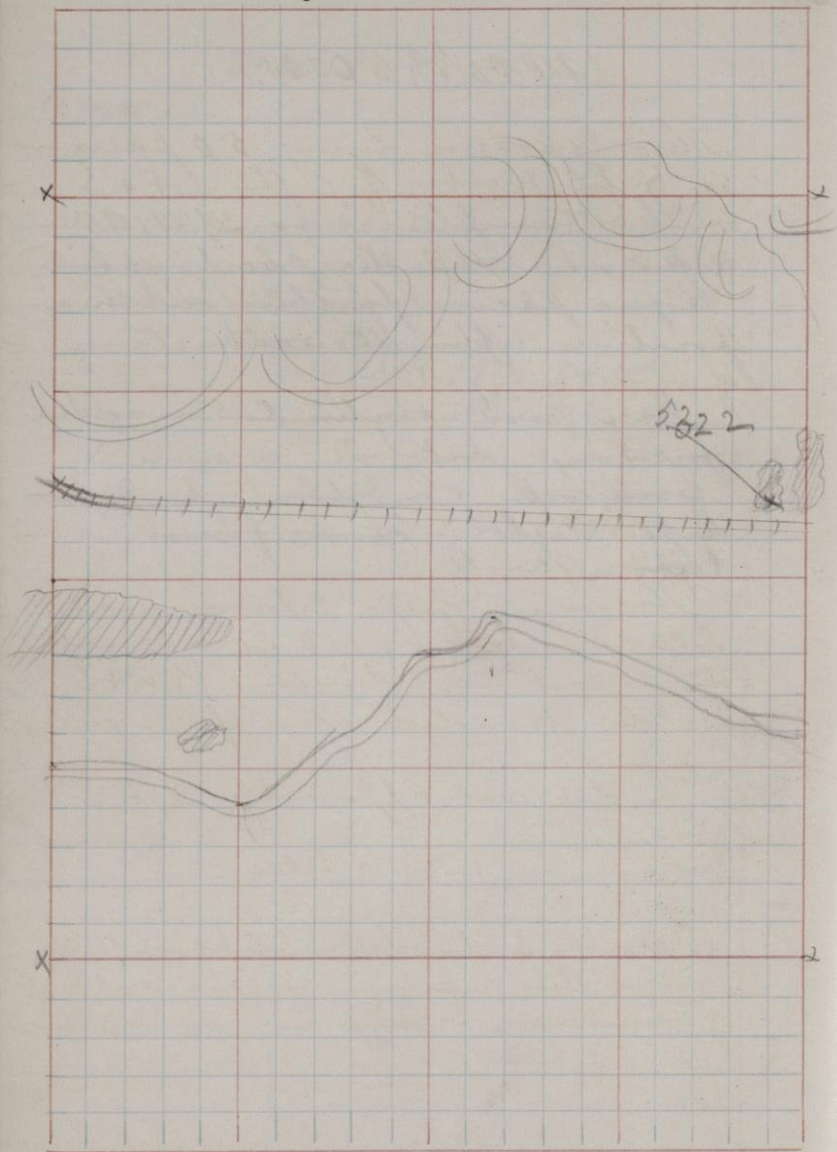
See 30

This sample is from the same exposure as the preceding but a few paces further north in position upon the rock

It is evidently the same as the preceding only in a more weathered condition, and perhaps slightly more firm in texture.

(9-891.)

Sec. 25 T. 121 R. 46



1200 N; 50 W.

Sec. 25

This exposure lying 50 paces or so to the west of the N+S line between sections 30/21; 45 + 25, 122; 45 has been quarried to some extent for culvert material in the construction of the railroad.

Fine fresh material samples could be secured.

The rock is a granitoid gneiss of reddish color and with abundant quartz.

The area of this exposure was 200 paces long by 100 or more wide with the longest direction N.W. + S.E. i.e. the general direction of the valley.

The dip was apparently E. + S.

Strike was hard to determine.

On the section line 50 paces to the east of this exposure is an outcrop of considerable extent but as it showed no different aspects was not sampled.

Sec 16.

North



Secs 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
 (21, 22, 23¹⁰-891.)
 21 R.
 46
 19

South

5323

15° 25' N; 650 W

Sec 22

This sample was taken near the road + railroad leading from Odessa to Ortonville

The rock is gneissic in the mass with rather faint lamination — often no lamination can be seen in ordinary hand specimens.

The strike is $E 25^{\circ} N$ (mag)
The dip is apparently SE while some places seem to indicate a nearly perpendicular position of the strata.

The rock does not rise above the ground along the side of the bluff

The sample shows some weathering and the different laminae show varying degrees of coarseness.

Sec. 26 T. 121 R. 46 N.

See app 5-3-23

900 ft; 1100 ft.

Sec. 26

Upon a high glaciated surface
the rock is lichen covered and
tolerably fresh

The glacial striae are N 35° W
and are distinctly visible.
There are occasionally deep
grooves worn in the direction
of the striae or lighter markings
given above which is nearly
the direction of the river
valley.

The joints are mostly NW + SE
and of great depth.

A slight dip was that evident
(from a vertical) towards the
northwest.

The granitic character is quite
prominent. The rock is of a
reddish to brownish tint very
fine and fresh and not
coarse in texture.
Quartz feldspar & mica are observed

Sec. 26 T. 121 R. 46 N.

See app 6323

850 N; 1050 N

See 26

This is a sample of the blue opalescent quartz found very generally in the coarse veinlike streaks so occasionally met with over these immense exposures.

For some distance on either side of this streak or vein are masses which show this peculiar color in the quartz.

A closer observation leads to the suggestion whether all the quartz of this locality is not of this same opalescent modification could one see clearly the color of the fine granules distributed thro' the finer textured masses of the rock.

There are numerous joints in the rock on this section; often the joints, nearly vertical, are not more than 6 inches apart - varying from that to 3 or 4 feet.

Sec. 28 T. 121 R. 46

See opp 5823

100 N; 1700 W.

Dec. 23.

This shows a fine + rather fine-grained tolerably massive rock from the railroad cut in this section. The cut is not deep and the rock is not all of this clear + rather dark appearance much is lighter colored more decomposed + of coarser texture.

For instance to the northwest is a coarser, lower grained redder modification. The texture perhaps

The laminae dip southeasterly. The strike cannot well be determined but it is no doubt very nearly that in other localities already visited.

Sec. 22 T. 121 R. 46

See app 5323

5327

48

300 N; 800 W.

Sec. 22

This sample was taken from the high glaciated ledge between the East line of sec 22 & the Center Stake of the Section

This rock is of the average shade of rd and quartz feldspar + mica

The quartz seems to be excessive in proportion and the mica forms but a very small part of the whole.

Sec. 22 T. 121 R. 46 N

See app, 5323

2000 N; 1700 N

Sec 22

This sample came from under the north line of the section (22) at a point where some little quarrying has been done.

The laminae run E 20°-25° N (may) with a southerly dip approaching 70°

The rock is coarser than the preceding, quite granitoid in texture and very fine and fresh. The color is deep and rich and arises from the colored condition of the feldspar.

The rock is highly silicious through the presence of a large percentage of quartz.

The entire surface of this section must be underlain by the granitoid gneiss represented by the sample — and the rock can be at no great depth ~~even~~ when hidden.

Sec. 22 T. 121 R. 46 N.

See app. 5323

2000 ft; 700 ft.

See, 22

This sample taken from
 near the same spot as the pre-
 ceding shows the appearance
 of frequent veinlike streaks seen
 running through the rocks
 not only here but of numer-
 ous occurrence over several
 sections.

The quartz has a peculiar opal
 escent luster and color.

The direction is quite irregular
 The texture is coarse; often the
 feldspar crystals reach a size
 of 2 inches or more

Sec. 16 T. 121 R. 46 N.

See app 5323

5330

51

25 ft; 50 ft

Sec. 16

This comes from the Southeast corner of Sec 16.

It is the most northerly exposure of rock known on the northeast side of the river. The rock is a granitoid gneiss like that in the more southerly and easterly sections of this township.

The lamination which however appears to be very distinct in some places seems to be an alternation of "mica rich" and "mica poor" bands.

The laminae have a NE + SW course over the rock.

The rocks seem to stand nearly vertical.

This exposure is 300 paces long E + W and ^{extends} 100 paces north of the South line of the section and disappears under ground towards the South.

