Stratigraphic sequence measured from Jurassic Todilto Limestone to Cretaceous Dakota Sandstone, west side of San Juan Basin, near Crystal, San Juan County, New Mexico

By V. P. Byers

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or stratigraphic nomenclature.
Crystal Section, west side of San Juan Basin,
San Juan County, New Mexico

Measured 7-8/1980 by V. P. Byers; base of measured section, 36°01'52" N.;
108°58'04"W.

This format was designed in the U.S. Geological Survey for use on the
North Slope in Alaska, and modified by A. Curtis Huffman, Jr., and others of
the USGS for studies in the San Juan Basin. The section reads from bottom to
top in a progression similar to that of a geologist’s measurement or study of
the section in the field.

The following abbreviations and symbols are used on descriptions:

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>THICKNESS OF BEDDING</th>
<th>cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>vtk</td>
<td>Very thickly bedded; massive</td>
<td>&gt;100</td>
</tr>
<tr>
<td>tk</td>
<td>Thickly bedded; blocky</td>
<td>30-100</td>
</tr>
<tr>
<td>av</td>
<td>Average bedded; slabby</td>
<td>10-30</td>
</tr>
<tr>
<td>tn</td>
<td>Thinly bedded; flaggy</td>
<td>3-10</td>
</tr>
<tr>
<td>vtn</td>
<td>Very thinly bedded</td>
<td>1-3</td>
</tr>
<tr>
<td>l</td>
<td>Laminated; platy, shaly</td>
<td>0.3-1</td>
</tr>
<tr>
<td>tnl</td>
<td>Thinly laminated; papery, fissile</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>h</td>
<td>Homogeneous; massive</td>
<td></td>
</tr>
</tbody>
</table>

| Abbreviations | CROSSBEDDING | |
|---------------|--------------|
| tr            | Trough (festoon) | |
| cu            | Convex upward | |
| hb            | Herringbone | |
| s             | Small scale bed sets | <5 cm thick |
| m             | Medium scale | 5 cm-2 m thick |
| l             | Large scale | 2m-8 m thick |
CROSSBEDDING—continued

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>Size Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>vl</td>
<td>Very large scale</td>
<td>&gt;8 m</td>
</tr>
<tr>
<td>t</td>
<td>Tabular</td>
<td></td>
</tr>
<tr>
<td>wp</td>
<td>Wedge planar</td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>Fine</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Coarse</td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>Very</td>
<td></td>
</tr>
<tr>
<td>cgr</td>
<td>Coarse grained</td>
<td></td>
</tr>
<tr>
<td>vc</td>
<td>Very coarse</td>
<td></td>
</tr>
<tr>
<td>av</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>wr</td>
<td>Well rounded</td>
<td></td>
</tr>
<tr>
<td>ws</td>
<td>Well sorted</td>
<td></td>
</tr>
<tr>
<td>ss</td>
<td>Sandstone</td>
<td></td>
</tr>
<tr>
<td>gr</td>
<td>Grained</td>
<td></td>
</tr>
<tr>
<td>cly</td>
<td>Clay</td>
<td>&lt;1/256 mm</td>
</tr>
<tr>
<td>slt</td>
<td>Silt</td>
<td>1/256-1/16 mm</td>
</tr>
<tr>
<td>vf sd</td>
<td>Very fine sand</td>
<td>1/16-1/8 mm</td>
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<tr>
<td>f sd</td>
<td>Fine sand</td>
<td>1/8-1/4 mm</td>
</tr>
<tr>
<td>m sd</td>
<td>Medium sand</td>
<td>1/4-1/2 mm</td>
</tr>
<tr>
<td>c sd</td>
<td>Coarse sand</td>
<td>1/2- 1 mm</td>
</tr>
<tr>
<td>vc sd</td>
<td>Very coarse sand</td>
<td>1-2 mm</td>
</tr>
<tr>
<td>grnl gvl</td>
<td>Granule gravel</td>
<td>2-4 mm</td>
</tr>
<tr>
<td>f pbl gvl</td>
<td>Fine pebble gravel</td>
<td>4-8 mm</td>
</tr>
<tr>
<td>m pbl gvl</td>
<td>Medium pebble gravel</td>
<td>8-16 mm</td>
</tr>
<tr>
<td>c pbl gvl</td>
<td>Coarse pebble gravel</td>
<td>16-32 mm</td>
</tr>
</tbody>
</table>
Abbreviations--continued

CROSSBEDDING--continued

vc pbl gvl  Very coarse pebble gravel  32–64 mm
Cbl gvl    Cobble gravel      64–256 mm
bldr gvl   Boulder gravel     >256 mm

CPS        Counts per second
BG         Background
ND         Not determined/not determinable
NA         Not applicable
gy         Gray
pk         Pink
rd         Red/reddish
brn        Brown
Grn        Green
yl         Yellow
wht        White
or         Orange

Kd         Dakota Sandstone
Jmw        Westwater Canyon Member of Morrison Formation
Jmr        Recapture Member of Morrison Formation
Js          Summerville Formation, undivided
Jsu        Summerville Formation, upper part
Jsl        Summerville Formation, lower part
Jcs        Cow Springs Sandstone
Jt         Todilto Limestone
Je         Entrada Sandstone
EXPLANATION

Trough (festoon)

Convex upward

Herringbone

Planar crossbed, nontangential

Planar crossbed, tangential

Shale

Siltstone

Sandstone

Conglomerate

Pebbles
Reference cited

Figure 1.--Index map showing location of Crystal measured section in Crystal quadrangle, New Mexico
**Stratigraphic Section Description**

<table>
<thead>
<tr>
<th>Depth/Location</th>
<th>Fractures</th>
<th>L.C.P.</th>
<th>Visual Porosity Estimate</th>
<th>Core Description</th>
<th>Rock Type</th>
<th>Cement</th>
<th>Accessory Minerals/Fragments</th>
<th>Description</th>
<th>Inferred Environment of Deposition</th>
<th>Transport Direction</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
Unit 3a
Sample (no #) given to J. Ridgley (8/3/89). Contains algae (?) structures.

Unit 2
Sabkha, reworked eolian sandstone

Unit 1
Siltstone parting at base of unit
Jmr unit 32
Sample: 80JSJVB32B (middle part) (submitted for thin section 8/28/80)
Sample: 80JSJVB32A (near base) (submitted for thin section 8/28/80)
Sandstone, very f. m. silty, 0.2' upper smushed zone due to bedding plane slipage?, platy
fissile, pale red brown, thicknesses thins laterally, 0.2' base is highly calcareous, violet to m. silty 25
mottled 17 g.n. py & pale red brown. Environment: quiet water w mud precipitated or sandy bottom.

Jmr unit 31 0.7'
Marker zone, friable 25, vfq, 15. g.n. py, calcareous, < 1% heavy, ND feldspar
subbed gr., good porosity, good sorting.

Transition unit 26 0.5'
Transitional zone, silty ss, vf to m., mod red brown, unconsolidated,
poorly sorted, non-calcareous except along seams, poor porosity.

Jcs unit 24 (0-3)
Sandstone, vfq to q, very friable, calcite thin x-bed, good porosity
very pale orange to pale orange, weathered low, 1% heavy, mind < 1%
feldspar, very calcareous, but friable may be an old soil profile (?)
rounded grains, Sorting good.

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Usu unit 21
Sample: 80JSJVB21CY submitted for thin section 8/28/80

Usu unit 20 0.5'
Useful marker bed. Silty ss, vfq & mud gr., calcareous, heavy < 1%
feldspar ND, Sorting poor, porosity poor, pale red with minor
mod. brown lacustrine.
Jnr Unit 48  Sample: 80SJBV948CY (submitted for thin section, 8/28/80); occasionally medium grained, thin ferruginous sandstone zone at base

Jnr Unit 46  Sample: 80SJBV944CY (submitted for thin section, 8/28/80); mottled color

Jnr Unit 45  Sample: 80SJBV845CY (submitted for thin section, 8/28/80)
Unit 56, 0.6' sandy mudstone, dk mud. brn (5YR 3/4), pinches out within 10 m to SE.
15° claystone pebbles at base. Unit includes silt & clay. Envir. is very quiet water.
Poor sort, subrounded.
Unit 83  Jmm  Pebbles in one count: Pink rhyolite, 1; "Bull" quartz, 1; quartzite, 1; (K-feldspar, chert, silicified rhyolitic volcanics, 1; chert, 1; K-feldspar, 1) quartzite, and silicified volcanics comprise most 8 granules.

Unit 82  Jmw  Sandstone, pebbly, ledge former, fine, mg to vc, H. brun. 5 YR6/4, weathers gray; av. bed, poorly sorted, CaCO₃ common granules and sm. pebbles and rare angular 1" pebb, 30 pebbles and granules largely feldspar. Matrix of rock 10% feldspar. 1% as. min. High energy fluvial.

Unit 80  Jmw  Samples: 80SJVB80ACX & 80SJVB80BCY (Submitted for thin sec. 8/28/80)
Calcereous sandstone, tv to md. 93 94, or. moitch w v pale or, good sorting, subrounded grains.

Unit 78  Jmr  Sample: 80SJVBV77CY (Submitted for thin sec. 8/28/80)
Detrital pebble, pink rhyolite (under microscope) is probably ash flow tuff from widespread ash flow sheet, probably with a volume of 500 cubic miles, large outcrop area, eroded from the western continental margin, Great Basin of Utah or Nevada (pre-Jcm in age) could be to, as some feldspars altered) during uplift of Great Basin, precursor to Nevadan orogeny. Also lake/pond/splay
Unit 94 Jmd  Sandstone, silty, f3 to rf9, & mg, & sandy mudstone, somewhat clayey, Suba to r, few.
   Color: white to pink, gy 5YR8.1, & along strike it grn gray (bentoniti).
   Mottled with dusky yl grn in upper 2', Sparse rounded sand grains.

Unit 93 Jmd  (Desc. cont) lithologic change from ss to sandy mudstone. Has to be dug out. Weathers to gentle slope.
   Color: mudstone, dk rd brn; sandy mudstone, dk rd brn; ss, wht to dusky yl grn along strike.

Unit 92 Jmw  Along strike, weathers to pale brn grading up to white or lt. grey in slope.
| DEPTH/LOCATION | FORMATION | C.R.A. | BOREHOLE NUMBER | SCARPE | PLUG NUMBERS | CORE TYPE | ROCK TYPE | COLOR | CRYSTALS | BIOLUMINESCENT | SIZE GRADE | SHAPE | BIOLOGICAL | COMPLEX | REIONS | REATIONS | PRESENCE | ACCESSORY MINERALS | DESCRIPTION |
|----------------|-----------|-------|-----------------|--------|--------------|-----------|-----------|-------|----------|---------------|------------|------|-----------|---------|--------|----------|----------|----------|-----------------|-------------|
|                |           |       |                 |        |              |           |           |       |          |               |            |      |           |         |        |               |          |

**THICKNESS SUMMARY**

- Jmb = 70 ft
- Jmw (upper part) = 95.5 ft
  - (includes 1.5 ft of parting breccia)
  - (lower part) = 113.6 ft
- Total Jmw = 209.1 ft
- Jmr (above discord) = 561.6 ft
  - (below discord) = 72.7 ft
- Total Jmr = 634.3 ft
- Transition zone = 0.9 ft
- Js = 2.9 ft
- Jes = 25.1 ft
- Js1 = 158.8 ft
- Jt = 16.2 ft

**TOTAL THICKNESS: 1177.3 ft**

**Dakota Sandstone (unmeasured)**

Mudstone Sandstone, very little thickness, lenses usually less than 1 foot thick.