

County ..... PULASKI .....  
T 29 N ..... R 4 W .....  
Sec ..... SW SE 16 .....  
Other Survey .....

Quarry or Pit.....Core.....Dim.....Other.....  
Name ..Ward Stone, Inc., Quarry near Francesville..  
Former Names .....  
.....  
Operator .....  
Former Operators .....

COAL AND INDUSTRIAL MINERALS SECTION  
INDIANA GEOLOGICAL SURVEY  
DEPARTMENT OF NATURAL RESOURCES  
611 NORTH WALNUT GROVE  
BLOOMINGTON, INDIANA 47401

MEMORANDUM REPORTS BY:	
Name	Date
1 ..... Curtis H. Ault	July 15, 1980
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	REMARKS

Ward Stone, Inc. quarry near Francesville, Pulaski County  
 SW¼SE¼ sec. 16, T. 19 N., R. 4 W; Francesville Quad  
 September 18, 1985  
 Curtis H. Ault

Description of part of the rocks being quarried on the north face of the quarry. (see also description of rocks measured in central and eastern part of quarry).

Note: Rocks in the far northwest corner are steeply dipping eastward off the reef to the west with dips on the west end of this face dipping as much as 600. Dips decrease to only a few degrees on the east end of the face.

All measurements were made and samples gathered on the west half of the face along the base and at right angles to the bedding. The Devonian rocks and some Silurian rocks at the top of the central and eastern part of the face are inaccessible and were not measured or sampled, although some of these rocks were measured in another part of the quarry on a previous visit (Ault, 1980).

The below section, therefore, does not begin at the base of the previous section by Ault of July 15, 1980, and does not represent a full section of Liston Creek. Further, the rock units described below thin somewhat toward the reef, and their lithologies also apparently change, particularly the amount of chert in the Liston Creek, which decreases toward the reef.

Unit	Description	Thick- ness	Sample
	Below section measured and sampled at the 65' level of the quarry along base of west half of north face.		
	Silurian		
	Wabash Formation, 64.4 ft. (measured at right angles to dipping beds).		
	Liston Creek Limestone Member 59.9 ft. (measured at right angles to bedding).		
1	Dolomite, slightly calcareous in part, vuggy in part, gray to light gray, very-fine- to fine-grained crystalline, very cherty; chert is mostly porcellaneous, mottled light to dark gray, fossil fragments in part, massive bedded, rubbly; some pyrite; heavy-petroleum staining in vugs.	8.3	CA85-0132
2.1	Dolomite, as above, very cherty-some minor chalky chert that is light gray; line of large vugs at base containing euhedral dolomite crystals and oozing heavy petroleum; pyrite.	7.0	CA85-0133
2.2	Dolomite, as above, very cherty-some minor chalky chert that is light gray; line of large vugs at base containing euhedral dolomite crystals and oozing heavy petroleum; pyrite.	7.0	CA85-0134
3.1	Dolomite, as above, very vuggy and cherty, much petroleum staining; dip of bedding increasing towards reef; some pyrite.	8.0	CA85-0135
3.2	Dolomite, as above, very vuggy and cherty, much petroleum staining; dip of bedding increasing towards reef; some pyrite.	8.0	CA85-0136
4.1	Dolomite, very slightly calcareous in part (secondary coatings?), gray to light gray, mostly very-fine-grained, some fine- grained-crystalline, vuggy in part with petroleum staining, pyritic in part; less cherty than above-nearer reef with steeper dip; some vague fossil outlines in vugs; much heavy-petroleum staining.	7.0	CA85-0137
4.2	Dolomite, very slightly calcareous in part (secondary coatings?), gray to light gray, mostly very-fine-grained, some fine- grained-crystalline, vuggy in part with petroleum staining, pyritic in part; less cherty than above-nearer reef with steeper dip; some vague fossil outlines in vugs; much heavy-petroleum staining.	7.9	CA85-0138

5	Dolomite, slightly calcareous coatings in vugs and on some grains, gray, very-fine- to fine-grained-crystalline, vuggy with petroleum staining, some pyrite, much less chert than above, a few calcite crystals in vugs, vague fossil outlines in part; beds dip very steeply on east flank of reef structure.	6.7	CA85-0139
	Reef-affected Mississinewa Shale Member, 9.5 ft. (measured at right angles to bedding, which dips about 60°)		
6.1	Dolomite, gray with darker gray thin laminations and streaks, very-fine-grained, probably slightly silty and clayey, but as is reef affected and appears more durable than normal Mississinewa; very steeply dipping-60° conchoidal fracture, massive bedding.	9.5	CA85-0140
	Total thickness of above measured section as measured at right angles to bedding	69.4	

Ward Stone, Inc. quarry near Francesville, Pulaski County  
 SW¼SE¼ sec. 16, T. 29 N., R. 4 W.; Francesville Quad.  
 September 18, 1985  
 Curtis H. Ault

Description of part of the rocks being quarried in the central and east part of the quarry. (See also description of rocks measured in the northwest part of the quarry).

Note: The rocks measured below dip slightly east and southeast (less than 5°) away from the Silurian reef exposed in the Vulcan quarry immediately west of this quarry. The rock units measured below begin at about 75 feet from the bedrock surface, a little below the dipping rocks measured at the northwest corner of the quarry by Ault on the same date. The rocks measured below are thicker and might have less reef-affected lithologies than those measured nearer the reef.

Unit	Description	Thick- ness	Sample
	The below units begin at about 75 feet below bedrock surface		
	Silurian		
	Wabash Formation, 52.7 feet measured		
	Liston Creek Limestone Member, 52.7 feet measured		
1.1	Dolomite, very slightly calcareous in part gray to light gray, mottled gray chert, very-fine-grained to fine-grained crystalline, cherty-mostly porcellaneous, much crystalline pyrite, massive bedded and rubbly; chert occurs mostly as nodules.	5.0	CA85-0142
1.2	Dolomite, very slightly calcareous in part gray to light gray, mottled gray chert, very-fine-grained to fine-grained crystalline, cherty-mostly porcellaneous, much crystalline pyrite, massive bedded and rubbly; chert occurs mostly as nodules.	5.5	CA85-0143
2.1	Dolomite, gray to light gray, very similar to above, much nodular chert, rubbly; two dark gray chert bands 4.5 feet above base.	5.0	CA85-0144
2.2	Dolomite, gray to light gray, very similar to above, much nodular chert, rubbly; two dark gray chert bands 4.5 feet above base.	6.0	CA85-0145
2.3	Dolomite, gray to light gray, very similar to above, much nodular chert, rubbly; two dark gray chert bands 4.5 feet above base.	6.1	CA85-0146
3.1	Dolomite, light gray to gray, very-fine-grained to fine-grained-crystalline, very cherty-porcellaneous-mottled in part with vague fossil fragments, massive bedded, rubbly.	6.6	CA85-0147
3.2	Dolomite, light gray to gray, very-fine-grained to fine-grained-crystalline, very cherty-porcellaneous-mottled in part with vague fossil fragments, massive bedded, rubbly.	7.0	CA85-0148
4	Dolomite, gray to gray-brown with splotchy color patches, very-fine to medium-grained-crystalline, very cherty-mostly porcellaneous-mottled light gray to gray; massive bedded, rubbly.	6.5	CA85-0149
5	Talus	5.0	
	Total thickness of measured section	52.7	



Western Indiana Aggregates  
NE SW sec. 16, T. 29 N., R. 24 W.  
Approx. elevation 673 ft.

Description	Depth	
Dolomite; gray, bioclastic with micritic matrix, many corals, crinoid columnals, brachiopods (Conchidium), and gastropods. Bedding planes dip about 20. Bituminous.	10.0	20.0
As above. Few gray-green argillaceous zones. Trace of gray nodular chert.	20.0	30.0
As above except for abundance of coarse coquina.	30.0	40.0
As above. Very bituminous.	40.0	72.5
Dolomite; gray, bioclastic, some flow deposits of dolomite. No bitumen.	72.5	80.0
Dolomite; gray to white, slightly mottled, micritic matrix, slightly arenaceous, very porous.	80.0	110.0
Dolomite; gray, mottled, bioclastic, abundant cup and colonial corals, slightly arenaceous.	110.0	160.0
As above. Conspicuous number of Favosites. Small pyrite crystals. Many cup corals. Extremely vuggy at 185 ft.	160.0	190.0
Dolomite; gray, mottled, bioclastic, matrix varies from micrite to sparry dolomite.	190.0	200.0
Note: Core was taken at floor of present quarry (52 ft. deep) and was retained by the operator.		

Ward Stone, Inc. quarry near Francesville  
Pulaski County  
SW¼SE¼ sec. 16, T. 29 N., R. 4 W.; Francesville Quad.  
July 15, 1980  
Curtis H. Ault  
Description of rocks being quarried on north face of quarry.

Unit	Description	Depth		Thick- ness	Sample
	Devonian				
	Traverse Formation (?)				
1	Dolomite, slightly calcareous in part, fine- to medium-grained, crystalline, coralline with dolomite crystals lining some fossil coral molds, vuggy, much oil staining, thick bedded, trace pyrite.	0.0	2.7	2.7	CA80-0005
2.1	Dolomite, slightly calcareous in part, dark gray to dark gray-brown, fine grained, crystalline, calcite and dolomite vug filling, some solitary corals, solution vugs, stromotoporoid(?) vugs, rubbly, much petroleum staining, some pyrite.	2.7	7.9	10.5	CA80-0006
2.2	Dolomite, slightly calcareous in part, dark gray to dark gray-brown, fine grained, crystalline, calcite and dolomite vug filling, some solitary corals, solution vugs, stromotoporoid(?) vugs, rubbly, much petroleum staining, some pyrite.	7.9	13.2		CA80-0007
3	Dolomite, slightly calcareous in part, dark brown and brown-gray, fine grained, crystalline, solitary and large colonial corals - dolomitized, some vugs and calcite filling but less than in Unit 2; massive bedding, much oil staining.	13.2		5.6	CA80-0008
	Note: Less than 1-inch-thick clayey residue between above and below unit. Top beds of below unit pinch out at unconformity between the two units.				
	Silurian				
	Wabash Formation				
4	Dolomite, gray to light gray, fine- to very-fine-grained, finely interspersed clay and silt, carbonaceous flecks, dark gray clay laminations in part.	18.8		5.2	CA80-0009
	Note: Above unit shows sharp east dip in southwestern corner of quarry. It is believed to be on the extreme flank edge of the large reef exposed in the adjacent quarry to the west.				

INDIANA GEOLOGICAL SURVEY  
MEMORANDUM

To: Curtis H. Ault

Date: July 20, 1993

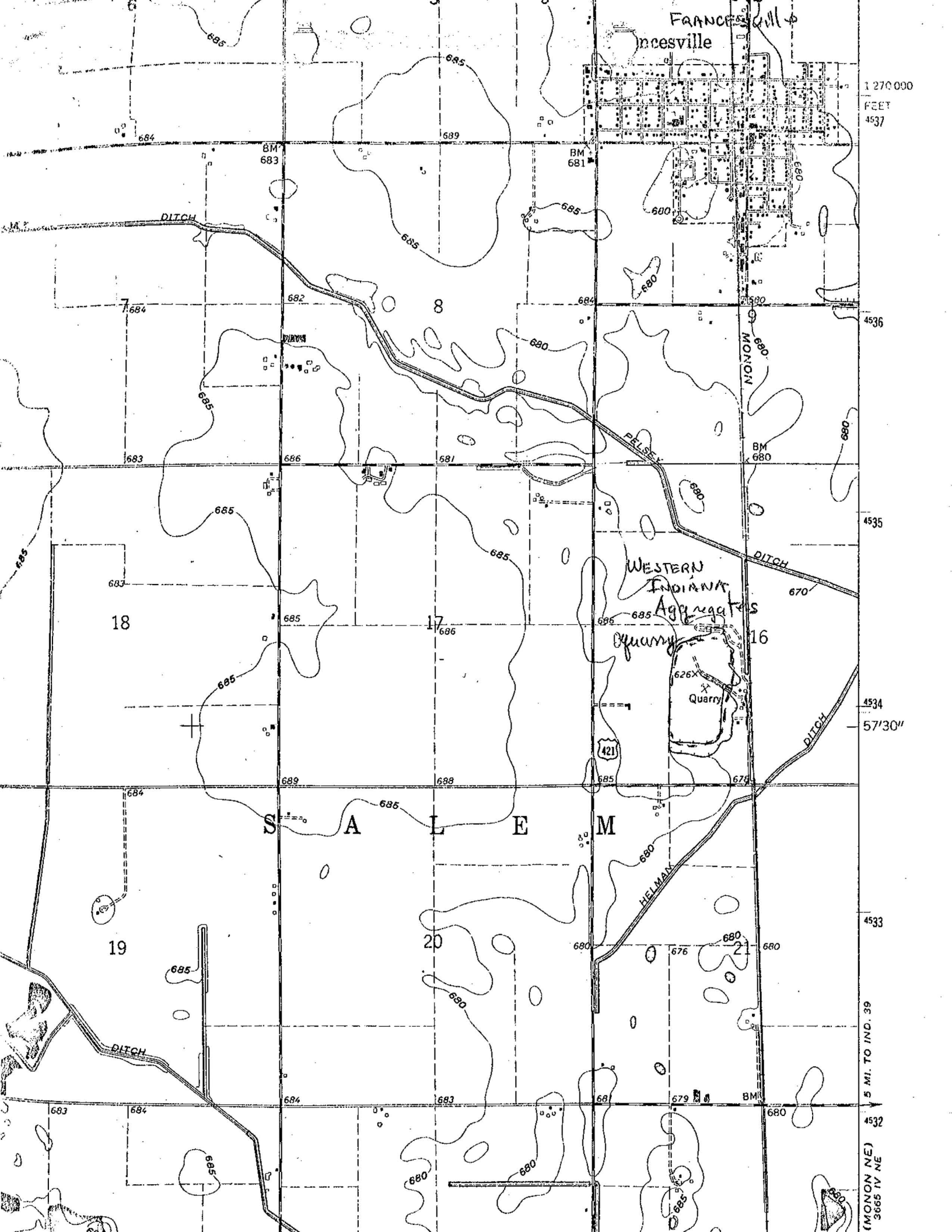
From: Carl B. Rexroad *CBR*

Subject: Age of sample Ca93-1

I processed for conodonts 1 Kg of your sample CA93-1 and recovered 14 specimens including fragments. *Icriodus latericrescens* is the only identifiable species and is characteristic of the Middle Devonian. I believe that the subspecies is *I. latericrescens latericrescens*, which is found in the Traverse Formation but not in the underlying Detroit River Formation. Subject, then, to the correctness of the subspecific identification, I suggest the sample came from the Traverse Formation.

6 2





FRANCESVILLE

1270000  
FEET  
4537

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4532

5 MI. TO IND. 39  
(MONON NE)  
3665 IV NE

18

17

16

19

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21

SALLEM

WESTERN  
INDIANA  
Aggregates  
Quarry

(421)

Quarry

DITCH

PELSEY

DITCH

DITCH

DITCH

HELMAN

**MEMORANDUM REPORT**

by  
Curtis H. Ault

**Ward Stone, Inc. quarry near Francesville, Pulaski County**

**Date:** May, 1993

**Location:** SW  $\frac{1}{4}$  SE  $\frac{1}{4}$  sec. 16, T. 29 N., R. 4 W., Francesville Quad.  
2 miles south of Francesville east of US 421 and on east side of railroad  
tracks adjacent to Vulcan Materials Quarry.

**Company:** Ward Stone, Inc.  
P.O. Box 737  
Francesville, IN 47946

**Officers:** Dale E. Ward, Pres.

**Telephone:** 219/567-9777

**Geology:** The exposed rocks are the same as detailed in the previous report. The quarry is being expanded eastward in the Devonian and Liston Creek. A sample of the Devonian carbonate was obtained from the lip of the quarry and submitted to Carl Rexroad for conodont analyses. The sample number is CA93-1.

MEMORANDUM REPORT

by  
Curtis H. Ault

Ward Stone, Inc. quarry near Francesville, Pulaski County

Date: September 17, 1985

Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 29 N., R. 4 W.; Francesville Quad. 2 miles south of Francesville east of US 421 and on east side of railroad tracks adjacent to Vulcan Materials quarry.

Company: Ward Stone, Inc.  
P.O. Box 737  
Francesville, IN 47946

Officers: Dale E. Ward, Pres.  
Fermin Cox, Quarry Mgr.

Telephone: 219-567-9777

Geology: The quarry is in the far flank of the reef exposed on the east side of Vulcan Materials quarry, which is located immediately west of the Ward quarry. Very steeply dipping rocks (60°) are now exposed in the northwest corner of this quarry on the east-southeast limb of the reef. Devonian rocks have been eroded in this part of the quarry.

Part of the rocks assigned to the Traverse Formation in the previous report may be Detroit River Formation (see Shaver-Rexroad correspondence attached). Unfortunately, Devonian rocks and the top of the Silurian rocks are inaccessible at the present time and were not resampled for conodont analysis.

A steeply dipping 9.5-foot section of reef-affected Mississinewa Shale Member is exposed in the northwest corner and a thicker section is exposed on the westface in the corner.

Now exposed:

Overburden	5 feet
Devonian	18.8 feet (only in part of quarry)
Liston Creek	121.2
Reef affected Mississinewa Shale	9.5 (exposed only in the northwest corner)

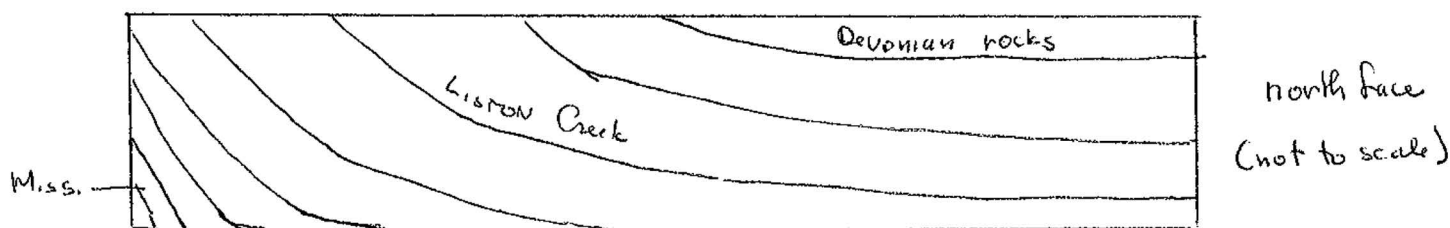
Total vertical depth of bedrock: 130 feet



Ward Stone, Inc. quarry near Francesville, Pulaski County  
SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 19 N., R. 4 W; Francesville Quad

Description of part of the rocks being quarried on the north face of the quarry.  
Description by Curtis H. Ault September 18, 1985. (see also description of  
rocks measured in central and eastern part of quarry).

Note: Rocks in the far northwest corner are steeply dipping eastward off  
the reef to the west with dips on the west end of this face dipping  
as much as 60° (see below sketch). Dips decrease to only a few degrees  
on the east end of the face.



All measurements were made and samples gathered on the west half of the  
face along the base and at right angles to the bedding. The Devonian rocks  
and some Silurian rocks at the top of the central and eastern part of the face  
are inaccessible and were not measured or sampled, although some of these rocks  
were measured in another part of the quarry on a previous visit (Ault, 1980).

The below section, therefore, does not begin at the base of the previous  
section by Ault of July 15, 1980, and does not represent a full section of  
Liston Creek. Further, the rock units described below thin somewhat toward  
the reef, and their lithologies also apparently change, particularly the amount  
of chert in the Liston Creek, which decreases toward the reef.

<u>Unit</u>	<u>Description</u>	<u>Thickness</u>	<u>Samples No.</u>
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Below section measured and sampled at the 65' level of the quarry  
along base of west half of north face (see above sketch).

#### SILURIAN

Wabash Formation, 69.4 ft. (measured at right angles to dipping beds).

Liston Creek Limestone Member 59.9 ft. (measured at right angles to  
bedding ).

- |    |   |      |          |
|----|---|------|----------|
| 1. | Dolomite, slightly calcareous in part, vuggy<br>in part, gray to light gray, very-fine- to<br>fine-grained crystalline, very cherty; chert<br>is mostly porcellaneous, mottled light to dark<br>gray, fossil fragments in part, massive bedded,<br>rubby; some pyrite; heavy-petroleum staining<br>in vugs. | 8.3' | CA85-132 |
|----|---|------|----------|

- |    |  |       |                                     |
|----|--|-------|-------------------------------------|
| 2. | Dolomite, as above, very cherty-some minor chalky chert that is light gray; line of large vugs at base containing euhedral dolomite crystals and oozing heavy petroleum; pyrite.   | 14.0' | CA85-133<br>7.0'<br>CA85-134<br>7.0 |
| 3. | Dolomite, as above, very vuggy and cherty, much petroleum staining; dip of bedding increasing towards reef; some pyrite.   | 16.0  | CA85-135<br>8.0<br>CA85-136<br>8.0  |
| 4. | Dolomite, very slightly calcareous in part (secondary coatings?), gray to light gray, mostly very-fine-grained, some fine-grained-crystalline, vuggy in part with petroleum staining, pyritic in part; less cherty than above-nearer reef with steeper dip; some vague fossil outlines in vugs; much heavy-petroleum staining. | 14.9  | CA85-137<br>7.0<br>CA85-138<br>7.9  |
| 5. | Dolomite, slightly calcareous coatings in vugs and on some grains, gray, very-fine- to fine-grained-crystalline, vuggy with petroleum staining, some pyrite, much less chert than above, a few calcite crystals in vugs, vague fossil outlines in part; beds dip very steeply on east flank of reef structure.                 | 6.7   | CA85-139                            |

Reef-affected Mississinewa Shale Member, 9.5 ft. (measured at right angles to bedding, which dips about 60°)

- |    |   |     |                                    |
|----|---|-----|------------------------------------|
| 6. | Dolomite, gray with darker gray thin laminations and streaks, very-fine-grained, probably slightly silty and clayey, but as is reef affected and appears more durable than normal Mississinewa; very steeply dipping-60°; conchoidal fracture, massive bedding. | 9.5 | CA85-140<br>5.0<br>CA85-141<br>4.5 |
|----|---|-----|------------------------------------|

Note: Sample CA-141 is missing-needs re-sampling.

Total thickness of above measured section as measured at right angles to bedding is 69.4 feet.

Ward Stone, Inc. quarry near Francesville, Pulaski County  
SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 29 N., R. 4 W.; Francesville Quad.

Description of part of the rocks being quarried in the central and east part of the quarry. Description by Curtis H. Ault September 18, 1985. (See also description of rocks measured in the northwest part of the quarry).

Note: The rocks measured below dip slightly east and southeast (less than 5°) away from the Silurian reef exposed in the Vulcan quarry immediately west of this quarry. The rock units measured below begin at about 75 feet from the bedrock surface, a little below the dipping rocks measured at the northwest corner of the quarry by Ault on the same date. The rocks measured below are thicker and might have less reef-affected lithologies than those measured nearer the reef.

<u>Unit</u>	<u>Description</u>	<u>Thickness</u>	<u>Samples No.</u>
	The below units begin at about 75 feet below bedrock surface		
	SILURIAN		
	<u>Wabash Formation, 52.7 feet measured</u>		
	<u>Liston Creek Limestone Member, 52.7 feet measured</u>		
1.	Dolomite, very slightly calcareous in part gray to light gray, mottled gray chert, very-fine-grained to fine-grained crystalline, cherty-mostly porcellaneous, much crystalline pyrite, massive bedded and rubbly; chert occurs mostly as nodules.	10.5	CA85-142 5.0 CA85-143 5.5
2.	Dolomite, gray to light gray, very similar to above, much nodular chert, rubbly; two dark gray chert bands 4.5 feet above base.	17.1	CA85-144 5.0 CA85-145 6.0 CA85-146 6.1
3.	Dolomite, light gray to gray, very-fine-grained to fine-grained-crystalline, very cherty-porcellaneous-mottled in part with vague fossil fragments, massive bedded, rubbly.	13.6	CA85-147 6.6 CA85-148 7.0
4.	Dolomite, gray to gray-brown with splotchy color patches, very-fine to medium-grained-crystalline, very cherty-mostly porcellaneous-mottled light gray to gray; massive bedded, rubbly.	6.5	CA85-149
5.	Talus	5.0	

Total thickness of measured section 52.7 feet

Indiana Geological Survey  
Spectrochemical Analysis  
Ward Stone Inc.  
sec.16, T. 19N., R. 4W.  
Pulaski Co.

Sample	CaCO3	MgCO3	SiO2	Al2O3	Fe2O3	TiO2	MnO	Na2O	K2O	P2O5	SrO	S	Co2	C	Total C	H	N
CAB5-132	48.368	39.948	8.580	0.510	0.340	0.048	0.026	0.007	0.130	0.008	0.015		42.240	11.940	0.413	0.630	0.180
CAB5-133	44.300	35.600	17.600	0.697	0.368	0.068	0.022	0.022	0.150	0.247	0.014		37.870	10.390	0.056	0.620	0.110
CAB5-134	45.000	35.600	17.000	0.471	0.259	0.022	0.019	0.012	0.145	0.108	0.006		38.990	10.870	0.230	0.550	0.120
CAB5-135	45.000	35.000	17.100	0.659	0.312	0.076	0.022	0.012	0.146	0.013	0.016		37.720	10.310	0.017	0.590	0.090
CAB5-136	52.423	41.412	4.510	0.297	0.327	0.038	0.043	0.011	0.106	0.010	0.019		44.670	12.140	ND	0.710	0.140
CAB5-137	49.800	41.800	4.530	0.709	0.389	0.083	0.026	0.008	0.189	0.009	0.015		42.660	12.300	0.659	0.660	0.160
CAB5-138	52.000	43.000	2.350	0.300	0.224	0.036	0.034	0.015	0.122	0.013	0.017		45.950	12.930	0.391	0.690	0.170
CAB5-139	52.100	42.248	2.630	0.359	0.572	0.045	0.035	0.006	0.106	0.008	0.016		42.250	12.500	0.970	0.710	0.160
CAB5-140	34.	29.	24.	4.	1	.4	.03	.02	1.	.09	.01		8.330			0.460	0.060

Indiana Geological Survey  
Spectrochemical Analysis  
Ward Stone Inc.  
sec.16, T. 29N., R. 4W.  
Pulaski Co.

Sample	CaCO3	MgCO3	SiO2	Al2O3	Fe2O3	TiO2	MnO	Na2O	K2O	P2O5	SrO	S	Co2	Total C	Org C	H	N
CAB5-142	45.300	35.800	15.800	0.741	0.351	0.034	0.019	0.021	0.230	0.126	0.006		38.800	11.390	0.802	0.510	0.170
CAB5-143	47.000	36.200	13.400	0.959	0.416	0.072	0.021	0.010	0.290	0.078	0.011		40.070	11.600	0.665	0.530	0.160
CAB5-144	46.200	34.700	15.000	0.865	0.397	0.039	0.021	0.025	0.258	0.168	0.006		39.210	11.360	0.660	0.530	0.160
CAB5-145	45.600	35.800	15.600	0.564	0.333	0.027	0.019	0.009	0.170	0.159	0.006		39.380	10.880	0.134	0.590	0.120
CAB5-146	42.500	34.300	19.900	0.401	0.303	0.048	0.013	0.025	0.347	0.159	0.005		36.030	10.040	0.208	0.610	0.100
CAB5-147	38.200	31.000	27.200	1.030	0.303	0.049	0.015	0.027	0.347	0.159	0.005		31.610	9.420	0.794	0.500	0.120
CAB5-148	45.067	36.400	15.000	0.741	0.310	0.050	0.020	0.013	0.227	0.193	0.011		37.810	11.620	1.302	0.540	ND
CAB5-149	52.500	41.800	3.080	0.388	0.329	0.045	0.019	0.030	0.126	0.011	0.019		47.340	12.820	ND	0.690	0.210

R. LAIN ATTN D. SCHELLING  
SOURCE  
FIELD OFFICE (3)✓

INDIANA STATE HIGHWAY COMMISSION  
DIVISION OF MATERIALS AND TESTS  
SUMMARY OF QUALITY RESULTS

AUGUST 25, 1980

SOURCE WARD STONE, INC. 2440  
BOX 737 FRANCESVILLE, IN. 47946

ELEVATION TOP OF LEDGE 1 678 FEET ABOVE MSL

LEDGE QUALITY

LAB NUMBER	DATE SAMPLED	LEDGE NUMBER	GEOLOGICAL FORMATION	BULK SP.G. PCT	ABS. PCT	BRI.	L.A. WEAR PCT	S.S. LOSS PCT	F.T. QUAL LOSS RATING PCT	APPROX DATA THICK FT VALID UNTIL
80-28122	12-11-79	1	TRAVERSE	2.646	.90	.23	33.26	4.20	A1	6 03-11-82
80-28123	12-11-79	2	DETROIT RIVER	2.694	1.62	.10	30.78	4.19	A1	13 03-11-82
80-28124	12-11-79	3	DETROIT RIVER	2.504	4.28	.38	34.70	29.66	C1	8 03-11-82
80-28228	06-10-80	3	DETROIT RIVER	2.443	5.14		35.52	10.48	D1	8 09-10-82

NOTES: THIS IS A CATEGORY I SOURCE.

FOR PRODUCTION SAMPLE QUALITY RESULTS SEE SUMMARY LETTER DATED AUGUST 26, 1980.

THE SAMPLES REPRESENTED BY LABORATORY NUMBERS 80-28122 THRU 80-28124 WERE TAKEN 425 FEET FROM THE SOUTH LINE AND 3000 FEET FROM THE WEST LINE OF SECTION 16, TOWNSHIP 29N, RANGE 4W.

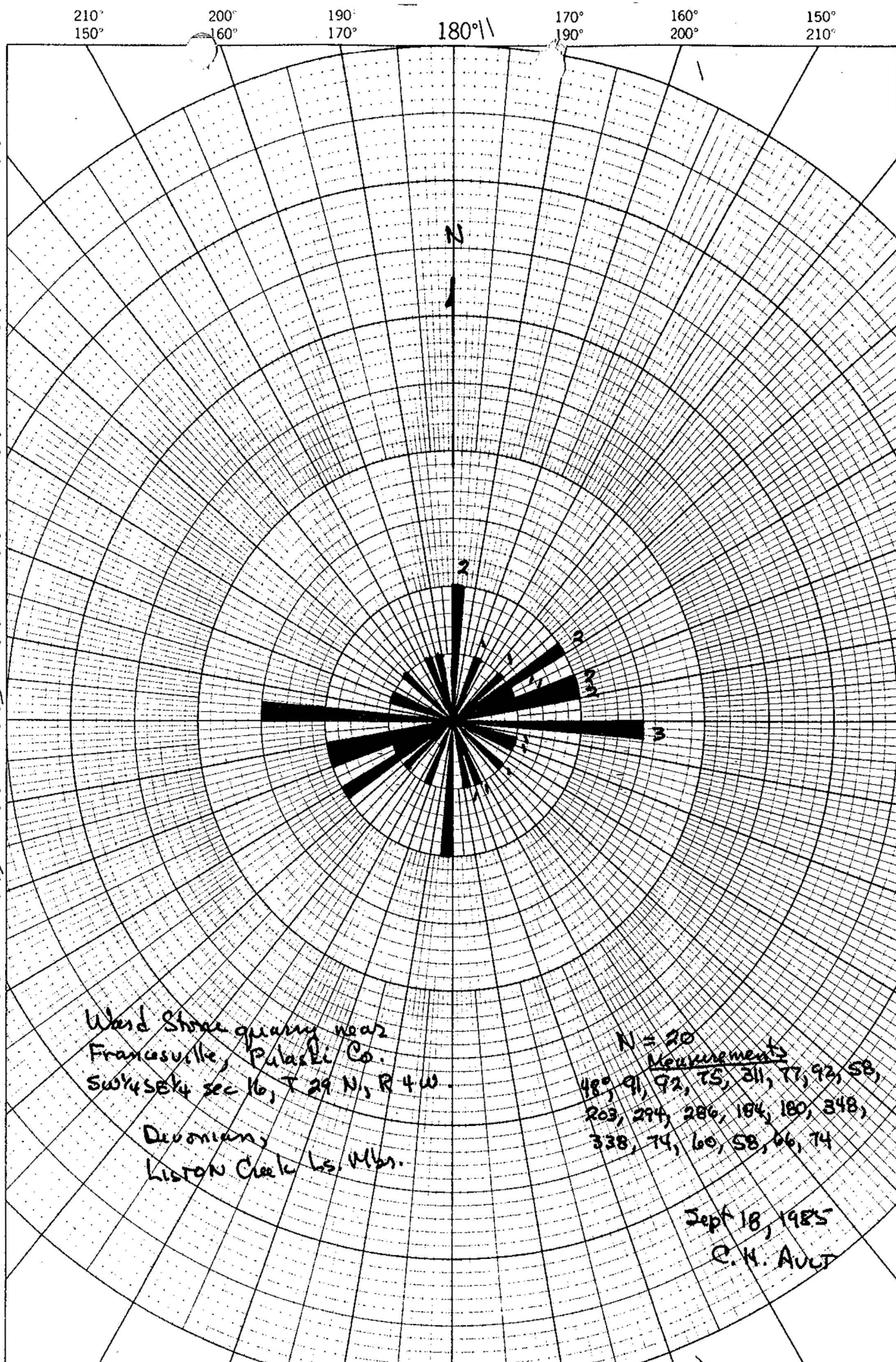
THE SAMPLE REPRESENTED BY LABORATORY NUMBER 80-28228 WAS TAKEN 725 FEET FROM THE SOUTH LINE AND 3000 FEET FROM THE WEST LINE OF SECTION 16, TOWNSHIP 29N, RANGE 4W.

THIS REPORT IS FOR INFORMATION ONLY AND  
IS NOT INTENDED TO BE USED FOR ADVERTISING.

*G. H. Lowmyer*  
CHIEF, DIVISION OF MATERIALS AND TESTS



46 4410





*Mayer  
file*DEPARTMENT OF NATURAL RESOURCES  
GEOLOGICAL SURVEY611 NORTH WALNUT GROVE  
BLOOMINGTON, INDIANA 47405AREA CODE: 812  
TELEPHONE: 335-2687

March 31, 1987

Mr. Dale E. Ward  
Ward Stone, Inc.  
P. O. Box 737  
Francesville, IN 47946

Dear Mr. Ward:

I am enclosing results of chemical analyses of samples that I obtained from your Francesville Quarry in 1985. One set of samples was collected from the upper part of the north face of the quarry, and a second set was collected from the deeper central and east part of the quarry. I am also enclosing descriptions of the samples, which can be keyed to the chemical analyses by the sample numbers.

You will note that all of the samples are dolomite; that is, they have a high proportion of magnesium carbonate ( $MgCO_3$ ). The percentage of silica ( $SiO_2$ ) varies considerably from sample to sample and is mostly in the form of chert, which varies considerably by depth and from one part of the quarry to another. The amount of silica in a particular sample should therefore not be viewed as representative for an entire bed or rock unit. One sample, taken from a steeply dipping bed in the northwestern corner of the quarry, has an uncommonly high silica content, which is mostly in the form of silt and clay. The proportionate amounts of other constituents in the samples do not vary as much as the chert and are more likely to be representative of the rock intervals that were sampled.

The calcium carbonate equivalent (CCE) can be determined from the analyses, either for a single unit or weighted by thickness for a combination of units. I have enclosed a page from Survey Bulletin 46, which shows how to compute the CCE for several units.

If you have any questions about the analyses, don't hesitate to call me.

Sincerely,

Curtis H. Ault, Head  
Coal & Industrial Minerals Sections

CHA:lw

Enclosures

GEOLOGICAL SURVEY COMMUNICATION  
INDIANA DEPARTMENT OF NATURAL RESOURCES

Give Xerox copies  
to Gary Yoder and  
Curtis Auble and  
return original to  
RHS.

TO: R. H. Shaver  
FROM: C. B. Rexroad *CBR*  
SUBJ: Conodonts from ~~Wayne~~ Stone Co. quarry  
*Wayne*

DATE: May 7, 1982

The lower tan sample from the above quarry had four fragments of Icriodus in the discrete element sense and six additional fragments that probably are the same. All were too fragmental for me to make a specific identification, although I suspect that they are I. cymbiformis, a long ranging species. Six specimens of DE Acodina are part of the Icriodus apparatus, and a single cone probably is also. Thirty-one additional fragments, including DE Hindeodella completed the sample.

Icriodus cymbiformis and DE Acodina formosa are long ranging, being present in both the Detroit River and the Traverse Formations. No zonal conodonts were recognized.

The upper gray-black sample contained six Silurian-type cones and eight unidentifiable fragments. One would suspect that these were re-worked.

Bill Orr (1972, date of imprint 1971) states that the the lower part of the Traverse in northern Indiana usually yields several dozen specimens per kilogram, and as each of the two samples processed was a two kilogram sample, the sparsity of Devonian conodonts is suggestive of Detroit River. Bill also said, however, of the Detroit River, "Only the dolomite and limestone beds that lie below the evaporites at localities 3 (unit 12), 4 (unit 11), and 5 (unit 17) have yielded significant numbers of conodonts."

My conclusion is that no definite conclusion can be made about the assignment of the samples from the Wayne Stone Co. quarry, although they may represent the Detroit River Formation. They could also be Silurian in age with leakage of Devonian material.

neither Carl Rexroad nor I (Shaver) have heard of  
Silurian conodonts reworked that far (possibly Traverse,  
up into the Devonian. All this goes to show that one  
shouldn't ever collect material not in place. We'll  
never know for sure about this unless we re-collect.

R Shaver

5/7/82

To Curtis Ault

Carl Rexroad

March 18, 1982

Bob Shaver

Identification of Devonian rocks in Ward Stone Co. quarry, Francesville

Herewith are two blocks of carbonate rocks from the upper rocks exposed in the relatively new Ward Stone Co. quarry about 3 miles south of Francesville, Pulaski County, Indiana. These rocks actually came from tailings on top of the quarry wall, collected on March 16.

The gray block with black pebbles and smaller grains (phosphate?) appears to have come from the upper 15± feet of dark-gray to black (as it appears on fresh quarry walls) medium-bedded limestone (or dolomite) extending up to the bedrock surface. I guess that this section makes up the Traverse Formation (=North Vernon Limestone).

The tan fine-grained argillaceous(?) laminated limestone or dolomite with what appear to be carbonate pebbles (rip-up clasts from a desiccating environment?) comes from perhaps 8 to 10 feet of section lying immediately below the black rocks without obvious unconformity (judged from a distance). I guess that this section makes up the Detroit River Formation (=Jeffersonville Limestone).

Both units dip eastward or southeastward off the large Silurian reef exposed in the large quarry that begins a few hundreds yards to the west of the Ward quarry. These units are not present in the western quarry, where reef rocks and some interreef rocks make up the entire bedrock surface that is exposed.

Below the brown rocks, there appears to be a major unconformity associated with some relief on the bottom of the brown rocks and with much greenish clay. Below the unconformity surely is Silurian nonreef (perhaps reef-affected) cherty Wabash rocks, probably most like the Liston Creek, possibly 20 feet or more now exposed.

Would you please process these two blocks to see if you can get conodont-based age determinations? I suspect that the brown rock will yield nothing, however, if indeed it is the evaporite-marginal Detroit River that we have.

We should look at the insoluble residues to see if phosphate grains and quartz sand might help to confirm the tentative identifications if conodonts do not.

Attached here is a copy of Curtis Ault's log (made before the quarry reached its present depth). Also, a copy of the State Highway Commission's sample results is attached, which appear to reveal a difference between the Highway's stratigraphic labels and Curtis Ault's.

Ault's "Wabash Formation" appears to me to resemble the brown rock here provided. Curtis, however, did describe a clay bed above his Wabash Formation,

Carl Rexroad  
March 18, 1982  
Page 2

which could represent the Silurian-Devonian unconformity. But it could also represent a lesser unconformity between Detroit River and Traverse rocks.

The information that you may provide might be used in two ways other than as filed information: (1) in the stratigraphic underpinning for a stop for one of the 1983 GSA field trips and (2) the same kind of use in Gary Yoder's thesis which is primarily to consider the reef exposed in the large western quarry. A Survey core hole has been started in that quarry.

We probably will measure a new section in the Ward quarry, but information that you might provide now would be much appreciated, and it might suggest need for in-place collecting and further conodont determinations.

RHS

RHS:ms

cc: Curtis Ault ✓  
Gary Yoder

attachments

Description of core recovered from Indiana State Geological Survey drill hole 318 in the NE1/4 NW1/4 SW1/4 (560 ft. NL, 300 ft. EL) sec 16 T29N-R4W Pulaski County, Indiana. Elev. approx. 590 ft.

Logged by Gary Yoder, August, 1982; supervised by Robert Shaver  
*Field Checked, 1982*  
*SW 1/4 1667'SL 1038'WL*  
 feet *ELEV. 579*

# Silurian System:

Wabash and upper Pleasant Mills Formations, reef facies (Salina Group), 353 ft:

1. No samples..... 0.0-20.0
2. Dolomite, light-gray to white, slightly tan-stained (in part), medium- to coarse-grained; has abundant vuggy and intercrystalline and lesser moldic porosity; is highly weathered; is highly fractured at base ..... 20-22.5
3. Dolomite, as above, becoming significantly blue gray to gray mottled; has abundant crinoid columnals, rare favositid debris, rare brachiopod fragments; is extensively fractured; contains numerous vugs with palisade-cement linings. .... 22.5-59.5
4. Dolomite, light-gray to slightly blue gray, less mottled than above, medium- to coarse-grained; very vuggy, abundant intergranular porosity; has abundant crinoid columnals and favosited debris, rare Fletcheria and possible brachiopod debris ..... 59.5-70.0
5. Dolomite, mottled light-gray, to blue-gray to slightly tan-gray, predominately medium-grained with lesser amounts of fine- and coarse-grained; has very abundant crinoid columnals, rare Fletcheria and brachiopod debris; vugs with palisade-cement linings; grades into unit below ..... 70.0-97.0
6. Dolomite, as above becoming much lighter in color; mottled (in part); has abundant Fletcheria debris, rare Arachnophyllum debris ..... 97.0-109.5

7. Dolomite, light-gray medium- to coarse-grained, alternating in bards with blue-gray fine- to medium-grained; very vuggy; has abundant crinoid and common tabulate coral debris ..... 109.5-145.0

8. Dolomite, as above with large palisade-cement lined vugs; has possible bedding plane fractures at 0 to 15 degree dips, slight amount green mud vug fill at 180 feet; unit becoming stylolitic in lower half ..... 145.0-210.0

9. Dolomite, as above, with decreasing mottling, rock becoming banded into lighter medium- to coarse-grained and darker bluish gray finer grained layers; noticeable increase in large botryoidal palisade cement lined vugs; less fractured; has fossils as above with some Halysites debris ..... 210.0-268.0

10. Dolomite, as above, with vugs grading into "stromatactis" like structures; increasing amounts of finer grained blue-gray dolomite with depth; has crinoid debris becoming prominent near base ..... 268.0-293.0

11. Dolomite, medium- to dark-gray to blue-gray, medium- to coarse-grained; rock composed primarily of crinoid columnals; stylolitic; has abundant moldic, vuggy, and intercrystalline porosity ..... 293.0-323.0

Pleasant Mills Formation, nonreef facies,  
(Salina group) 26 ft:

12. Dolomite, light-gray to medium-gray, medium-grained; has abundant green shale laminations; has slight amount vuggy porosity; retains some of the bioclastic texture of above unit; probable Waldron equivalent ..... 323.0-328.4

13. Dolomite, very light-gray to light-gray, with dark-gray mottling, medium-grained; has common intercrystalline and vuggy porosity; has slight amount shaly material on fracture surfaces ..... 328.4-329.9

14. Dolomite, light- to medium-gray, medium-grained; abundant crinoid debris; has

abundant intercrystalline; vuggy and  
moldic porosity; reef facies of  
Limberlost Dolomite Member ..... 329.9-332.1

15. Dolomite, light-gray to tan-gray to  
brown-gray, with dark-gray mottling,  
medium-grained; with irregularly spaced  
shaly laminations and horsetail  
structures; has abundant crinoid and  
trachilopod debris; occasional stylolites;  
becomes lighter, less mottled with depth;  
abundant intercrystalline and vuggy poros-  
ity; grades into unit below; nonreef  
Limberlost Dolomite Member ..... 332.1-349.0

Salamonie Dolomite, 99.8 ft:

16. Dolomite, very light-gray to light-gray  
to clear-white, generally medium-grained,  
very clean; bioclastic in texture, with  
rare clay seams and stylolites, slightly  
calcareous in part; abundant porosity;  
becomes banded in medium-gray and coarse-  
grained clear-gray layers; occasional  
crinoid debris, rare corals  
near base ..... 349.0-411.2
17. Dolomite, clear-white to light-gray  
with distinct darker gray mottling, fine-  
to medium-grained; with abundant crinoid  
columnals; has common highly weathered  
chert nodules which appear to replace  
fossil material; slightly calcareous;  
prominent saw tooth stylolites,  
occasional clay seams ..... 411.2-420.2
18. Dolomite, light-gray to clear-white,  
fine- to medium-grained; calcareous to  
very calcareous with coarse-grained  
calcite crystals; grading in part into  
generally medium grained limestone; com-  
mon crinoid fragments; prominent  
stylolites with clay concentrations;  
trace pyrite; porous to nonporous;  
slightly argillaceous  
at base ..... 420.2-438.0
19. Limestone, green-gray to green to  
brown, generally fine-grained, calcareous  
dolomite at top; very argillaceous,  
abundant shaly laminations and  
stylolites; occasional coarse-grained  
calcite crystals ..... 438.0-449.2



Sexton Creek Limestone, 82.2 ft:

20. Limestone, medium-gray to brown-gray, often darkly iron stained, sublithographic to medium-grained with thin coarse-grained layers; argillaceous, glauconitic; intermittent concentrations of fossil fragments including trilobites and clams; with basal 0.2 ft thick green shale seam ..... 449.2-454.2
21. Limestone, light brown-gray to tan to tan-gray, fine- to coarse-grained becoming generally fine-grained at depth; abundant white to gray highly weathered chert less common at depth; limestone and chert with abundant fossil debris including clams, trilobites, corals, brachiopods, gastropods, and possible crinoid and bryozoan fragments; becoming dolomitic, with decreasing glauconite at depth; with trace pyrite ..... 454.2-504.2
22. Dolomite, medium-gray to brown-gray to brown, fine- to medium-grained; with abundant interbedded dolomitic brown-gray shale increasing with depth; calcareous, fossiliferous; dolomite becoming very argillaceous and silty with depth; Schweizer Member ..... 504.3-531.4

Ordovician System

Brainard Shale (Maquoketa Group) 23.9 ft:

23. Shale, green-gray to green, silty, non-calcareous; occasional pyrite; becoming darker with depth ..... 531.4-555.3

Fort Atkinson Limestone (Maquoketa Group) 4.7 ft:

24. Limestone, dark-gray to brown to white; argillaceous, with interbedded calcareous shale; contains blue phosphatic material, pyrite; commonly iron stained; very abundant fossil material including large coral fragments and brachiopods ..... 555.3-560.0

MEMORANDUM REPORT

BY

CURTIS H. AULT

WARD STONE, INC. QUARRY NEAR FRANCESVILLE, PULASKI COUNTY

Date of field examination: July 15, 1980

Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 29 N., R. 4 W.; Francesville Quad.  
2 mi. S of Francesville E of US 421 and on E side of  
RR tracks adjacent to Western Materials Co. quarry.

Company: Ward Stone, Inc.  
Box 737  
Francesville, IN 47946

Officers: Dale E. Ward, Pres.  
Fermin Cox, Quarry Mgr.

Telephone: 219-567-9777

Products: Crushed stone and aglime, shipped by truck.

Operations: This quarry was opened in 1979.

Geology: The quarry has been opened on the flank of the large reef that is well exposed in the Western Materials Co. quarry to the west. The operator states that the strata rises north of the quarry suggesting dome-like reefal structure. No cores, if any were drilled, were available for description.

Now exposed in the quarry:

Overburden	5.0 feet
muscular Devonian (Traverse?)	18.8 feet
Wabash Formation	<del>5.2</del> feet

52.2

A distinct unconformity is present between the above two units with a clayey residue <1" thick present at the contact. On the south face of the quarry, the strata dips sharply to the east and then flattens out. The thickest Devonian was on the north face where the above section was measured.

The quarry is to be deepened shortly at a large sump pit, which is now filled with water.

*Jan '83  
deepened section  
needs  
to be sampled  
and described  
C.H.A.*

Ward Stone, Inc. quarry near Francesville, Pulaski County  
SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 16, T. 29 N., R. 4 W.; Francesville Quad.

Description of rocks being quarried on north face of quarry. Description by  
Curtis H. Ault, July 15, 1980.

<u>Unit</u>	<u>Description</u>	<u>Depth from bedrock surface</u>	<u>Thick- ness (ft)</u>	<u>Sample No.</u>
DEVONIAN				
<u>Traverse Formation (?)</u>				
1	Dolomite, slightly calcareous in part, fine- to medium-grained, crystalline, coralline with dolomite crystals lining some fossil coral molds, vuggy, much oil staining, thick bedded, trace pyrite.	0.0	2.7	CA80-5
2	Dolomite, slightly calcareous in part, dark gray to dark gray-brown, fine grained, crystalline, calcite and dolomite vug filling, some solitary corals, solution vugs, stromatoporoid(?) vugs, rubbly, much petroleum staining, some pyrite.	2.7	10.5	CA80-6 2.7-7.9 CA80-7 7.9-13.2
3	Dolomite, slightly calcareous in part, dark brown and brown-gray, fine grained, crystalline, solitary and large colonial corals - dolomitized, some vugs and calcite filling but less than in Unit 2; massive bedding, much oil staining.	13.2	5.6	CA80-8

Note: Less than 1-inch-thick clayey residue  
between above and below unit. Top beds  
of below unit pinch out at unconformity  
between the two units.

#### SILURIAN

##### Wabash Formation

4	Dolomite, gray to light gray, fine- to very-fine- grained, finely interspersed clay and silt, carbonaceous flecks, dark gray clay laminations in part.	18.8	5.2	CA80-9
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Note: Above unit shows sharp east dip in south-  
western corner of quarry. It is believed  
to be on the extreme flank edge of the  
large reef exposed in the adjacent quarry  
to the west.