

AAPG Datashare XXX Supplementary Material 3:
Data For Samples with Petrography and/or SCA Porosity-Permeability
Samples for Dolostone Flow-Unit Case Studies in Text
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Core data (including RCA and SCA) are available under individual well files on the NDIC web site. SCA = Special Core Analysis. RCA = Routine Core Analysis. NDIC # = North Dakota Industrial Commission well number.

Ka = air permeability in millidarcies. Dolo. Size μm = visual estimate for average dolomite crystal size in microns.

%V Φ = percent vuggy porosity. %Anh = percent anhydrite. %Cal = percent calcite.

Fabric: M = mudstone; W = wackestone; P = packstone; St = stromatolitic boundstone.

Frobisher-Alida facies are from Petty (1988, 2010).

ND = No Data. NR = RCA core analysis "Not Representative" for petrography, possibly due to mis-match between core-analysis depth and thin-section depth, or due to fracture presence, or to questionable RCA permeability.

FROBISHER-ALIDA CASE STUDY SAMPLES WITH THIN SECTIONS OR SCA

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>Ka</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
<u>Frobisher-Alida Sherwood-B1 facies II burrowed sub-unit: northern Billings nose</u>									
142-100-17 SWNW	7563	9408	12.4	1.2 SCA	20	0	tr	20	M
142-100-17 SWNW	7563	9411	ND	ND	20	7	5	tr	St
142-100-17 SWNW	7563	9413.5	20.0	7.1 SCA					
142-100-17 SWNW	7563	9414.5	23.4	14. SCA	-	2	8	5	St
142-100-17 SWNW	7563	9416.5	9.0	0.7 SCA					
142-100-17 SWNW	7563	9416.5	12.1	2.4 SCA	15	1	1	20	W/P
142-100-17 SWNW	7563	9418.5	16.8	8.1 SCA					
142-100-19 NWNW	7486	9408.0-.3	14.2	4.6 SCA					
142-100-31 NWNW	7296	9377.4-.8	11.6	0.9 SCA					
142-100-31 NENE	8055	9347	10.6	0.7 RCA	8	3	5	3	St
142-100-31 NENE	8055	9350	9.0	0.4 RCA	30	1	4	1	M
142-101-25 SWNE	7273	9399	21.0	28. SCA	22	8	5	10	W
142-101-25 SWNE	7273	9399-00	18.0	13. SCA	32	5	5	20	W
142-101-25 NWNW	7274	9388	13.6	NR.RCA	30	1	15	10	P
142-101-25 NWNW	7274	9389	ND	ND	32	2	12	10	p
142-101-25 NWNW	7274	9389.5	17.4	NR. RCA	30	8	10	15	W
142-101-25 NWNW	7274	9389-90	20.6	22. SCA	28	6	12	10	W
142-101-25 NWNW	7274	9391	17.4	5.4 RCA	30	2	6	18	P
142-101-25 NWNW	7274	9392	20.1	7.6 RCA	8	4	20	0	St
142-101-25 NWNW	7274	9394	13.0	1.0 RCA	15	0	5	80	P
<i>Average</i>			15.6%	7.3 md	23	3	8	15	W/P/St

Frobisher-Alida Sherwood-B1 facies II stromatolite sub-unit: northern Billings nose

141-101-23 SESW	6701	9110	14.6	0.24 SCA	20	7	15	5	St
141-101-23 SESW	6701	9110.3	9.0	1.3 RCA	10	3	15	12	St
142-100-30 NENE	7544	9313-14	8.9	0.077 SCA					St
<i>Average</i>			10.8%	0.5 md	15	5	15	9	St

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>K_a</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
<u>Frobisher-Alida Sherwood-C facies IV: northern Billings nose study area</u>									
142-100-7 SWSW	7149	9394.4-.9	22.8	78. SCA					
142-100-7 SWSW	7149	9394	21.6	55. SCA	38	2	0	7	M
142-100-17 SWNW	7563	9426	11.7	1.7 SCA	44	tr	1	20	M
142-100-17 SWNW	7563	9428	19.5	19. SCA					
142-100-17 SWNW	7563	9428	13.7	3.3 SCA					
142-100-17 SWNW	7563	9428	18.1	14. SCA					
142-100-17 SWNW	7563	9429	19.4	26. SCA					
142-100-17 SWNW	7563	9429	19.8	32. SCA					
142-100-17 SWNW	7563	9429	19.5	22. SCA					
142-100-17 SWNW	7563	9430	19.2	24. SCA	40	tr	5	20	M
142-100-17 SWNW	7563	9430	19.5	25. SCA					
142-100-17 SWNW	7563	9430	18.1	18. SCA					
142-100-17 SWNW	7563	9431	14.9	7.1 SCA	34	tr	1	20	M
142-100-17 SWNW	7563	9433	17.6	15. SCA					
142-100-17 SWNW	7563	9433	15.7	7.5 SCA					
142-100-17 SWNW	7563	9433	17.6	18. SCA					
142-100-17 SWNW	7563	9435	16.7	13. SCA					
142-100-17 SWNW	7563	9435	7.2	0.09 SCA					
142-100-17 SWNW	7563	9435	15.2	8.5 SCA					
142-100-17 SWNW	7563	9437	7.4	1.0 SCA					
142-100-17 SWNW	7563	9437	9.7	1.0 SCA	40	0	0	0	W
142-100-30 NENE	7544	9632	17.2	13.3 SCA	36	4	tr	25	W
142-100-31 NWNW	7296	9394-95	13.5	10. SCA					
142-100-31 NENE	8055	9366	NR	NR. RCA	32	3	0	20	W
142-100-31 NENE	8055	9372	13.1	5.6 SCA	44	4	0	32	W
142-100-31 NENE	8055	9374	14.7	8.2 RCA	40	tr	tr	25	M
142-101-13 SESE	7452	9431	19.4	29. SCA	44	2	0	20	M
142-101-25 SWNE	7273	9410-11	19.5	30. SCA					
142-101-25 SWNE	7273	9412.5	19.9	40 SCA					
142-101-25 SWNE	7273	9413	22.3	44. SCA					
142-101-25 SWNE	7273	9413.5	21.0	17. SCA					
142-101-25 SWNE	7273	9415	22.0	71. SCA	40	2	1	2	M
142-101-25 SWNE	7273	9417-18	24.7	129. SCA					
142-101-25 SWNE	7273	9418	18.0	NR. RCA	42	3	2	25	M
142-101-25 SWNE	7273	9418-19	19.2	22. SCA					
142-101-25 SWNE	7273	9421-22	24.4	110 SCA					
142-101-25 SWNE	7273	9422	23.4	113 SCA	40	3	tr	1	M
142-101-25 SWNE	7273	9422-23	21.0	80 SCA					
142-101-25 NWNW	7274	9402	13.5	6.2 RCA	40	3	1	20	W
142-101-25 NWNW	7274	9403	19.1	54 RCA	41	1	0	0	M
142-101-25 NWNW	7274	9404	18.7	10 RCA	44	1	5	4	M
142-101-25 NWNW	7274	9405-05.5	19.6	48 SCA					
142-101-25 NWNW	7274	9414	19.5	47 RCA	40	1	4	0	M
142-101-35 SENE	7446	9346	13.1	5.6 RCA	40	tr	2	20	M

142-101-35 SENE	7446	9350	11.0	2.6 RCA	40	0	tr	25	W
143-100-30 SENE	6378	9534	12.3	NR. RCA	35	7	0	20	M
143-100-30 SENE	6378	9535	NR	NR. RCA	40	5	0	5	M
143-100-30 SENE	6378	9537	NR	NR. RCA	35	6	0	0	M
143-100-30 SENE	6378	9540	NR	NR. RCA	38	0	7	tr	M
143-100 30 SENE	9378	9543	15.6	NR. RCA	32	4	0	10	M
143-100-30 SENE	6378	9541-42	19.4	47 SCA					
143-100-30 SENE	6378	9544-45	11.1	1.7 SCA					
143-100-30 SENE	6378	9546-47	15.9	15 SCA					
Average			17.3%	29.3 md	39	2	1	13	M

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>Ka</u>	<u>Dolo. Size μm</u>	<u>%Vϕ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
Frobisher-Alida Sherwood-E facies IV: north Billings nose study area									
141-100-5 NENW	7986	9355.5	20.8	6.4 RCA	15	4	tr	0	W
141-100-5 NENW	7986	9355.5	20.8	6.4 RCA	18	tr	5	2	W
141-100-5 NENW	7986	9355-56	19.3	10.4 SCA	17	4	0	0	W
141-100-5 NENW	7986	9360-61	14.3	2.8 SCA	17	1	0	0	M
141-100-8 NWSE	8072	9346.5	12.7	1.1 RCA	16	4	tr	1	M
141-100-8 NWSE	8072	9346-47	14.4	0.97 SCA	16	4	tr	1	M
141-100-8 NWSE	8072	9347-48	15.4	2.19 SCA	15	4	tr	0	M
141-100-22 NENE	6899	9488.8	18.8	6.27 SCA	16	4	0	tr	W
141-100-22 NENE	6899	9489.6	19.6	5.37 SCA					
141-100-22 NENE	6899	9492-93	17.8	2.87 SCA					
141-100-22 NENE	6899	9492.5	19.4	9.8 RCA	18	tr	1	1	M
141-101-1 NESW	7086	9328	10.4	0.60 SCA					
141-101-1 NESW	7086	9343	16.5	2.66 SCA	16	2	tr	2	M
141-101-23 SESW	6701	9142	14.8	2.05 SCA					
142-100-7 SWSW	7149	9420	19.4	6.49 SCA	15	4	3	3	W
142-100-7 SWSW	7149	9421.8	20.3	15 SCA					
142-100-17 SWNW	7563	9446	9.2	0.84 SCA	15	3	3	0	M
142-100-17 SWNW	7563	9446	11.0	2.1 SCA					
142-100-17 SWNW	7563	9447	11.2	1.7 SCA	14	2	4	0	M
142-100-17 SWNW	7563	9449	16.3	8.4 SCA	15	3	4	0	W
142-100-17 SWNW	7563	9449	14.7	8.2 SCA					
142-100-17 SWNW	7563	9450	18.5	6.4 SCA					
142-100-17 SWNW	7563	9450	17.4	4.1 SCA					
142-100-17 SWNW	7563	9452	12.9	1.3 SCA					
142-100-17 SWNW	7563	9453	14.8	3.2 SCA					
142-100-17 SWNW	7563	9453	14.0	3.5 SCA					
142-100-30 NENE	7544	9647	12.4	1.7 SCA					
142-100-31 NENE	8055	9386	12.9	4.4 RCA	16	3	6	0	W
142-100-31 NENE	8055	9390	16.2	2.1 RCA	16	2	4	tr	W
142-100-31 NWNW	7296	9413	18.5	2.8 SCA					
142-101-25 SWNE	7273	9436-37	18.0	NR. RCA	15	2	2	0	M
142-101-25 NWNW	7274	9425.6-26	14.5	5.8 SCA					
142-100-25 NWNW	7274	9428-29	19.0	NR. RCA	14	tr	2	0	M

142-101-25 NWNW	7274	9429	15.3	4.0 SCA	18	1	3	8	W
142-101-35 SENE	7446	9364	17.1	8.1 RCA	18	2	5	0	W
142-101-36 NWNE	7125	9371	12.9	1.29 SCA					
<i>Average</i>			15.9%	4.5md	16	2	2	1	M/W

Well location (T-R-S) NDIC # Depth Porosity (%) Ka Dolo. Size μm %V Φ %Anh %Cal Fabric

Frobisher-Alida Sherwood-E facies IV: Square Butte field area

139-103-5 NWNW	4359	9253.1	19.1	11.9 SCA	16	4	3	tr	M
139-103-5 NWNW	4359	9253.6	21.0	17.7 SCA	17	5	tr	4	M
139-103-5 NWNW	4359	9254.1	20.9	13.4 SCA	20	4	2	tr	M
139-103-5 NWNW	4359	9255	21.0	18.3 SCA	20	5	1	tr	M
139-103-10 SENW	4684	9086-87	19.8	22.5 SCA	20	8	0	4	W
139-103-10 SENW	4684	9088	21.0	10.6 SCA	20	6	0	1	M
139-103-15 SENW	4677	9181-82	20.8	25.0 SCA	18	7	1	0	M
139-103-15 SENW	4677	9182-83	20.3	10.5 SCA	20	7	1	tr	M
139-103-15 SENW	4677	9183	19.4	11. RCA	18	3	1	tr	M
139-103-16 SESE	4683	9204	16.6	1.1 SCA	16	4	tr	2	M
139-103-16 SESE	4683	9205	16.9	6.5 SCA	20	4	tr	tr	M
139-103-16 SESE	4683	9205.3	14.4	2.66 SCA	18	2	tr	tr	M
139-103-16 SESE	4683	9205.9	17.8	8.4 SCA	17	5	tr	tr	M
139-103-16 SESE	4683	9206	18.1	7.4 SCA	16	5	1	tr	M
139-103-16 SESE	4683	9206.3	17.9	8.4 SCA	18	5	tr	1	W
139-103-16 SESE	4683	9207	13.9	1.0 SCA	20	1	tr	2	M
<i>Average</i>			18.7%	11.0 md	18	5	1	1	M

Well location (T-R-S) NDIC # Depth Porosity (%) Ka Dolo. Size μm %V Φ %Anh %Cal Fabric

Frobisher-Alida Sherwood-E facies IV: Snow-Bullsnake field area

142-98-16 SWSE	7586	9736.5	17.0	7.8 SCA	27	2	0	12	M
142-98-16 SWSE	7586	9737.0	18.7	9.2 SCA	22	2	0	3	M
142-98-16 SWSE	7586	9737.5	20.1	17.5 SCA	30	3	0	tr	M
142-98-26 NESE	9410	9665	21.9	77 SCA	30	10	2	0	W
142-98-26 NESE	9410	9665.7	23.2	51 SCA	25	4	0	0	M
142-98-26 NESE	9410	9666.7	29.0	151 SCA	24	5	tr	0	M
142-98-26 NESE	9410	9668	29.8	257 SCA	22	8	tr	0	W
142-98-26 NESE	9410	9668.8	31.3	222 SCA	28	3	1	tr	M
142-98-26 NESE	9410	9670	18.0	17.4 SCA	20	5	10	0	W
142-98-26 NESE	9410	9670	18.0	17.4 SCA	26	9	0	0	W
142-98-26 NESE	9410	9670.8	28.2	318 SCA	25	1	0	tr	M
142-98-26 NESE	9410	9671.7	18.7	16.2 SCA	23	6	0	tr	M/W
142-98-31 SWSE	9200	9616	24.3	58 SCA	25	6	tr	tr	M
142-98-31 SWSE	9200	9617.0	26.5	74 SCA	23	5	tr	tr	M
142-98-31 SWSE	9200	9617.4	25.1	58 SCA	22	4	0	0	M
142-98-31 SWSE	9200	9618.3	17.4	6.2 SCA	20	2	0	tr	M
142-98-31 SWSE	9200	9619.0	21.1	31 SCA	22	3	tr	5	W
<i>Average</i>			22.9%	82.0 md	24	5	1	1	M

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>K_a</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
<u>Frobisher-Alida Sherwood-E facies V: Elkhorn Ranch field</u>									
144-101-16 SESW	9578	9544.2	13.9	1.6 SCA					
144-101-16 SESW	9578	9544.8	12.6	1.0 SCA					
144-101-29 NWSE	9182	9320	17.8	8.3 SCA	15	3	15	tr	W
144-101-29 NWSE	9182	9321	15.0	2.3 SCA					
<i>Average</i>			<i>14.8%</i>	<i>3.3 md</i>	<i>15</i>	<i>3</i>	<i>15</i>	<i>tr</i>	<i>W</i>

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>K_a</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
<u>Frobisher-Alida Glenburn-A facies V: southwest North Dakota</u>									
139-103-5 NWNW	4359	9286.5	19.7	10.0 SCA	22	8	2	2	W
139-103-5 NWNW	4359	9287.5	20.3	10.0 SCA	20	10	2	5	W
139-103-5 NWNW	4359	9288.7	20.1	6.8 SCA	16	9	1	4	W
139-103-35 NENE	1907	8988	23.1	15.9 SCA	15	10	1	2	W
139-103-35 NENE	1907	8988.5	20.2	8.1 SCA	12	7	tr	4	W
139-103-35 NENE	1907	8989.5	22.6	11.0 SCA	16	7	tr	tr	W
139-104-23 SENW	4308	9153.5	22.2	22.6 SCA	15	8	1	1	W
139-104-23 SENW	4308	9154	21.4	13.4 SCA	12	8	3	10	W
139-104-23 SENW	4308	9155	21.9	11 SCA	12	6	3	8	W
139-104-23 SENW	4308	9155.2	21.7	16 SCA	14	6	8	7	W
141-101-1 NENW	7121	9224	12.3	0.97 SCA					
141-101-23 SESW	6701	9178	18.7	5.96 SCA	16	2	1	4	W
141-101-23 SESW	6701	9181	15.6	3.3 SCA	18	tr	tr	65	P
141-101-23 SESW	6701	9182	15.2	4.49 SCA					
142-98-26 NESE	9410	9716.2	17.3	3.1 SCA					
<i>Average</i>			<i>19.5%</i>	<i>9.5 md</i>	<i>16</i>	<i>7</i>	<i>2</i>	<i>9</i>	<i>W</i>

DUPEROW CASE-STUDY FLOW UNITS: SAMPLES WITH THIN SECTIONS OR SCA

Well location (T-R-S)	NDIC #	Depth	Porosity (%)	Ka	Dolo. Size μm	%V Φ	%Anh	%Cal	Fabric
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Duperow upper-IIIa flow unit ($\Phi > 6\%$): northern Billings nose study area: peloidal mudstone; dolostone

142-100-21 SENE	7351	11290.5	13.2	4.0 RCA	60	tr	5	0	M
142-101-36 SWNE	7125	10975.5	12.8	1.4 RCA	40	0	5	0	M
<i>Average</i>			<i>13.0%</i>	<i>2.7 md</i>	<i>50</i>	<i>0</i>	<i>5</i>	<i>0</i>	<i>M</i>

Duperow middle-IIIa flow unit ($\Phi > 6\%$): northern Billings nose study area

Stromatoporoid floatstone, packstone and wackestone with a sucrosic-dolomite matrix

141-100-6 SWNW	7091	10971.5	8.6	0.3 RCA	65	0	tr	60	P
141-100-6 SWNW	7091	10974	6.3	0.9 RCA	50	0	1	60	P
141-101-11 SENE	6919	10945.5	9.3	0.3 RCA	55	0	0	65	P
141-101-11 SENE	6919	10951	14.5	2.9 RCA	70	tr	tr	60	P
142-100-15 SESE	7097	11328	10.0	0.2 RCA	60	0	0	60	P
142-100-15 SESE	7097	11332	10.6	13 RCA	80	tr	0	30	W
142-100-15 SESE	7097	11332	10.6	13 RCA	75	0	0	25	M
142-100-22 SWSE	7349	11251.5	9.2	1.1 RCA	60	tr	2	30	W
142-100-22 SWSE	7349	11254.5	15.8	1 RCA	75	1	tr	10	M
142-100-22 SWSE	7349	11258	15.2	6.6 RCA	70	tr	50	15	W
142-100-22 SWSE	7349	11259.5	10.2	19 RCA	85	1	2	1	M
142-101-36 SWNE	7125	10991.5	7.1	1.2 RCA	60	0	0	60	P
142-101-36 SWNE	7125	10995.5	17.0	0.9 RCA	70	0	0	50	M
143-100-30 SENE	6378	11220.5	17.5	23 SCA	65	10	10	4	W
<i>Average</i>			<i>11.6%</i>	<i>5.4md</i>	<i>67</i>	<i>1</i>	<i>5</i>	<i>38</i>	<i>P/W/M</i>

Duperow base-IIIa flow unit ($\Phi > 6\%$): northern Billings nose study area

Mudstone and skeletal mudstone with a sucrosic-dolomite matrix

141-100-3 SESE	7776	11121.5	15.8	NR. RCA	60	0	0	0	M
141-100-16 NENE	8456	11045.5	NR	NR. RCA	55	0	tr	1	M
142-100-10 NESE	7283	11359	NR	NR. RCA	50	tr	0	0	M
142-100-15 SESE	7097	11335	16.2	52 RCA	75	1	4	0	M
142-100-15 SESE	7097	11335	16.2	52 RCA	65	tr	tr	0	M
142-100-15 SESE	7097	11336	17.4	49 RCA	50	2	0	0	M
142-100-21 SENE	7351	11310.3	22.6	89 RCA	70	tr	20	0	M
142-100-22 SWSE	7349	11262.5	11.8	29 RCA	55	1	5	0	M
142-100-22 SWSE	7349	11263.5	21.0	NR. RCA	65	2	0	0	M
142-100-22 SWSE	7349	11264.5	15.3	74 RCA	50	3	0	0	M
142-101-36 SWNE	7125	10998.5	18.2	NR. RCA	55	5	0	0	M
142-101-36 SWNE	7125	10999.5	23.7	303 RCA	60	4	0	0	M
142-101-36 SWNE	7125	11000.5	25.3	NR. RCA	60	tr	0	0	M
143-100-30 SENE	6378	11226-27	17.8	128 SCA	85	tr	tr	0	M
143-100-30 SENE	6378	11229	15.1	116 RCA	55	2	0	tr	M
143-100-30 SENE	6378	11229-30	26.3	711 SCA	70	1	0	0	M
143-100-30 SENE	6378	11231	14.4	32 RCA	60	3	40	1	M
143-100-30 SENE	6378	11232	13.4	33 RCA	60	5	5	0	M
<i>Average</i>			<i>18.3%</i>	<i>147 md</i>	<i>61</i>	<i>2</i>	<i>4</i>	<i>0</i>	<i>M</i>

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>Ka</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
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Duperow Cycle 3; low-porosity samples: northern Billings nose study area

Upper-IIIa flow unit

142-100-22 SWSE	7349	11247.5	4.2	0.1 RCA	65	0	2	70	G
142-101-36 SWNE	7125	10980.5	5.8	0.3 RCA	50	0	0	0	M
142-101-36 SWNE	7125	10983.5	0.8	0.01 RCA	60	0	0	50	P
<i>Average</i>			3.6%	0.1 md	68	0	1	40	P

Middle-IIIa flow unit

141-100-3 SESE	7776	11118.5	5.9	0.1 RCA	55	1	4	85	P
141-100-6 SWNW	7091	10966	3.4	0.4 RCA	50	0	tr	70	P
141-100-16 NENE	8456	11041	7.5	0.1 RCA	60	0	0	80	W
141-100-16 NENE	8456	11042.5	3.4	0.1 RCA	65	0	tr	20	W
141-100-16 NENE	8456	11043.5	7.7	0.1 RCA	60	0	0	50	W
142-100-21 SENE	7351	11302	5.8	0.1 RCA	50	0	2	50	P
142-100-21 SENE	7351	11308.5	5.6	0.4 SCA	60	0	tr	50	W
143-100-32 NESW	7119	11275	3.7	0.1 RCA	55	0	0	80	P
<i>Average</i>			5.4%	0.2 md	57	0	1	61	P/W

Base-IIIa flow unit

141-100-3 SESE	7776	11122.5	7.2	0.1 RCA	50	0	tr	30	M
141-100-6 SWNW	7091	10975	5.3	0.66 RCA	60	0	tr	50	W
141-101-1 SESE	7846	10960	NR	NR. RCA	65	0	tr	50	W
143-100-32 NESW	7119	11278.5	5.1	0.02 RCA	60	0	0	20	M
143-100-32 NESW	7119	11279.5	5.9	0.1 RCA	70	0	0	30	M
<i>Average</i>			5.9%	0.2md	61	0	0	36	M/W

<i>Average all low-porosity cycle 3</i>			5.2%	0.2 md	58	0	1	49	P/W/M
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Duperow top-Cycle II marker bed: northern Billings nose study area

All samples silty and argillaceous

142-100-21 SENE	7351	11313.5	20.2	0.8 RCA	10	0	0	0	M
142-100-22 SWSE	7349	11266.5	4.8	0.3 RCA	8	0	0	0	M
141-100-3 SESE	7776	11124.2	13.6	0.04 RCA	5	0	0	0	M
143-100-32 NESW	7119	11282.5	7.9	0.02 RCA	8	0	0	tr	M
141-100-16 NENE	8456	11047.5	10.3	0.07 RCA	8	0	0	0	M
142-100-10	7283	11362.5	8.3	0.02 RCA	6	0	5	tr	M
<i>Average</i>			10.9%	0.2 md	8	0	1	0	M

RED RIVER "B" FLOW UNIT; WESTERN BOWMAN COUNTY, SOUTHWEST NORTH DAKOTA
INCLUDES CEDAR HILLS FIELD: SAMPLES WITH THIN SECTIONS OR SCA

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>Ka</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
Red River upper "B" sub-unit = "B" Laminated member									
129-103-6 SESE (Bu)	11451	9282.4	17.9	20 SCA	20-25	tr	15	0	M
129-103-6 SESE (Bu)	11451	9282-83	16.5	14 SCA	18-20	2	7	0	M/St
129-103-6 SESE (Bu)	11451	9283-84	10.2	2.3 SCA	15	1	5	0	M/St
129-103-6 SESE (Bu)	11451	9284.8	15.4	8.2 SCA	18-20	2	5	0	P*/W/M
129-103-6 SESE (Bu)	11451	9284-85	16.4	8.6 SCA	20	tr	10	0	P/St
129-103-6 SESE (Bu)	11451	9285-86	14.2	7.8 SCA	22	tr	20	0	P/P*
129-104-31 NW (Bu)	10182	8944	15.5	28.0 SCA	20	3	5	0	St/W/P*
129-104-31 NW (Bu)	10182	8944.2	19.5	37.1 SCA	22	5	1	0	St/P*
129-104-31 NW (Bu)	10182	8944.5	21.4	47.9 SCA	15	3	4	0	St/P*/W
129-104-31 NW (Bu)	10182	8944.8	22.1	41.4 SCA	15	5	1	tr	P/W
129-106-9 SE (Bu)	6113	8159	10.2	1.83 SCA	18-20	3	40	0	W
129-106-9 SE (Bu)	6113	8159.4	10	1.46 SCA					
129-106-9 SE (Bu)	6113	8160.3	18.8	17.4 SCA					
129-106-9 SE (Bu)	6113	8160.5	21.2	1.15 SCA	8	12	0	0	P*
129-106-9 SE (Bu)	6113	8160.6	20.0	45.9 SCA	12	5	5	0	P*
129-106-9 SE (Bu)	6113	8161.5	21.4	10.9 SCA	15	10	2	0	P*
129-106-9 SE (Bu)	6113	8162.3	18.5	44.0 SCA	10	5	1	0	P*
129-106-9 SE (Bu)	6113	8162.7	23.8	93 SCA					
131-105-15 NW (Bu)	5070	9265	17.2	9.1 SCA	15	tr	tr	0	M
131-105-15 NW (Bu)	5070	9267	13.2	3.95 SCA	25	1	15	0	M
131-105-22 SW (Bu)	13965	9222.2	NR	NR. RCA	12	2	0	0	M
131-106-16 SW (Bu)	13928	8875.1	23.8	22. RCA	12	10	0	tr	M
131-106-24 NE (Bu)	13756	8853.7	18.7	10.9 RCA	15	0	0	0	M
<i>Average</i>			17.5%	21.7 md	17	3	7	0	P/M/St

P* = peloidal-microbial packstone/grainstone

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>Ka</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
Red River transitional "B" sub-unit = transitional between upper and lower "B"									
129-103-6 SESE (Bt)	11451	9286.9	16.5	1.9 SCA	12	0	2	0	St/P*
129-104-31 NW (Bt)	10182	8945.5	19.7	2.5 SCA	10	2	4	0	P*
129-104-31 NW (Bt)	10182	8946.2	19.3	2.1 SCA	10	tr	2	0	P
129-104-31 NW (Bt)	10182	8947.6	15.4	1.9 SCA	12	2	1	0	P
129-106-9 SE (Bt)	6113	8163	19.2	1.7 SCA	10?	0	tr	0	M
129-106-9 SE (Bt)	6113	8163.7	21.0	2.47 SCA					
131-105-22 SW (Bt)	13965	9226.0	19.5	7.6 RCA	12	4	1	15	P/St
131-106-16 SW (Bt)	13928	8877.9	24.9	11. RCA	4	5	tr	30	W
131-106-24 NE (Bt)	13756	8856.9	15.0	frac. RCA	8	6	0	10	W
<i>Average</i>			18.9%	3.9 md	10	2	1	7	P/W/St

<u>Well location (T-R-S)</u>	<u>NDIC #</u>	<u>Depth</u>	<u>Porosity (%)</u>	<u>K_a</u>	<u>Dolo. Size μm</u>	<u>%VΦ</u>	<u>%Anh</u>	<u>%Cal</u>	<u>Fabric</u>
Red River lower "B" sub-unit = upper portion of "B" burrowed member									
129-103-6 SESE (BL)	11451	9286-87	20.5	1.5 SCA	8	0	tr	0	M
129-103-6 SESE (BL)	11451	9287.5	23.4	2.5 SCA	6	0	2	0	M
129-103-6 SESE (BL)	11451	9287-88	22.5	1.8 SCA	6	0	1	0	M
129-103-6 SESE (BL)	11451	9288.1	20.5	3.2 SCA	12	0	tr	0	M
129-103-6 SESE (BL)	11451	9288.4	20.4	4.7 SCA	12	0	0	0	M
129-106-9 SE (BL)	6113	8164.3	19.6	1.28 SCA					
129-106-9 SE (BL)	6113	8164.8	18.1	0.80 SCA					
129-106-9 SE (BL)	6113	8165	16.8	0.72 SCA	8	0	0	0	M
129-106-9 SE (BL)	6113	8166.0	23.0	2.49 SCA					
129-106-9 SE (BL)	6113	8171.5	6.9	0.08 SCA	6	1	5	20	W
131-105-22 SW (BL)	13965	9228.6	24.2	5. RCA	8	1	0	2	M
131-106-16 SW (BL)	13928	8879.7	24.5	3.0 RCA	5	0	0	1	M
131-106-24 NE (BL)	13756	8860.0	23.0	5.1 RCA	7	2	3	0	M
<i>Average</i>			<i>20.3%</i>	<i>2.5 md</i>	<i>8</i>	<i>0</i>	<i>1</i>	<i>2</i>	<i>M</i>
Red River basal "B" sub-unit = basal portion of "B" flow unit									
129-103-6 SESE (Bb)	11451	9289-90	21.2	6.9 SCA	15	1	10	0	M
131-105-22 SW (Bb)	13965	9229.3	16.9	7.7 RCA	18	2	1	2	M
131-106-16 SW (Bb)	13928	8883.4	15.6	frac. RCA	50	1	1	1	M
131-106-24 NE (Bb)	13756	8865.1	11.4	3.6 RCA	55	1	0	0	M
<i>Average</i>			<i>16.3%</i>	<i>6.1 md</i>	<i>35</i>	<i>1</i>	<i>3</i>	<i>1</i>	<i>M</i>

RED RIVER "B" FLOW UNIT; NORTHWEST SOUTH DAKOTA
DATA FOR CORED WELLS NEAR SOUTHERN TERMINUS OF CROSS SECTION D-D' (FIGURE 10)
SAMPLES WITH THIN SECTIONS

Well location (T-R-S) USGS # Depth Porosity (%) Ka Dolo. Size μm %VΦ %Anh %Cal Fabric

Red River "B" flow unit, northwest South Dakota

"B" laminated member

21N-19E-26 SWSW	S763	6752.5	29.6	frac. RCA	14	10	tr	0	St
21N-19E-26 SWSW	S763	6755.5	28.3	frac. RCA	10*	10	5	0*	W
21N-19E-26 SWSW	S763	6757.5	33.4	86 RCA	12*	8	0	0*	P
21N-19E-26 SWSW	S763	6758.5	38.5	67 RCA	15*	15	0	0*	St
21N-19E-26 SWSW	S763	6759.3	34.3	200 RCA	18*	18	4	0*	St

Red River "B" flow unit, northwest South Dakota

Massive dolostone near Red River "B" subcrop truncation

"B" laminated member

12N-22E-17 NENW	D846	5082.5	28.0	343 RCA	42	4	0	0	M
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"B" burrowed member

12N-22E-17 NENW	D846	5090.5	26.0	2250 RCA	275	12	0	0	M
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USGS # = USGS CRC library number = Core identification number for United States Geological Survey Core Research Center library, Lakewood, Colorado. All thin sections on-file at (or submitted to) USGS CRC library

USGS #S763 = API #40-031-20021 (well log in Cross Section E-E', Figure 13; highest core porosity in study)

USGS #D846 = API #40-041-20019 (example of well with massive dolostone in Red River "B")

*Some Red River "B" laminated samples in #S763 display a strong bimodal crystal size distribution. All crystals are assumed to be dolomite but some of the <5 μ size crystals could be calcitic micrite. Unable to differentiate without additional data.