

OF94-3
Supplement

**Sub-Paleozoic Structure in
Manitoba's Northern Interlake Along the
Superior Boundary Zone:
A Detailed Investigation of the Falconbridge
William Lake Study Area: Supplement**

OPEN FILE REPORT



By
R.K. Bezys



Cover:
Falconbridge core hole WL-92-51: A broad view of the contact between the Ordovician Stony Mountain Formation (upper unit) and Ordovician Red River Formation (Fort Garry member) (lower, darker unit).

GEOREF

NTS GRID: 63G/11, 14

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- | | |
|-----------------------------|--------------------------|
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| Paleozoic | Winnipeg Formation |

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Open File Report OF94-3 (Supplement)

Sub-Paleozoic Structure in Manitoba's Northern Interlake Along the Churchill Superior Boundary Zone: A Detailed Investigation of the Falconbridge William Lake Study Area: Supplement

by R.K. Bezys
Winnipeg, 1999

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INTRODUCTION

Open File Report OF94-3 (Supplement) complements previously published Open File Report OF94-3.

The original report published in 1996 provides an interpretation of the sub-Paleozoic and Paleozoic structural and isopach variations in the William Lake area (NTS 63G/11, 14). It is based on data compiled from drill core supplied by Falconbridge Limited, from sub-Phanerozoic mineral exploration along the southwestern extension of the Thompson Nickel Belt.

The supplementary report contains the data used for interpretation in the original report including ten 1:50 000 scale maps, drill logs for all drillholes, detailed descriptions of the geological units intersected in the William Lake area core (Appendix A), and twenty-six core photographs (Appendix B).

APPENDIX A
DRILLHOLE CORE LOGS

LIST OF DRILLHOLES

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BL89-02
BL90-03
BL90-04
WL90-05
MB90-06
CL91-07
CL91-08
MB91-09
MB91-11
MB91-12
WL91-13
CL91-14
MB91-15
WL91-16
WL91-17
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WL92-36
WL92-37
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WL92-40
WL92-41
MB92-42
WL92-43
MN92-44
MN92-45
WL92-46
MN92-47
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WL92-51
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WL92-53
WL92-54
WL92-55
WL92-56
WL92-57
WL92-58
WL92-59
WL92-60
WL92-61
WL93-62
WL93-63

FALCONBRIDGE BL-89-01
Bracken Lake
1-8-55-16WPM
5953997N
448440E
Ground Elevation: 274.9 m
Dip: 45°, Az: 311°
Logged by R.Bezys, Feb. 8th, 1990

TRUE DEPTH (m)	DESCRIPTION
0.0-29.6	No Core
29.6-32.9	Atikameg Fm: fine to medium crystalline, light grey, vuggy, stromatolitic dolomite; vugs very angular and irregular; abundant sulphide mineralization in vugs (pyrite); rare green sandy laminae (very fine grained sand); no yellow oxidation stain is present, therefore does not look like typical Atikameg Fm; gradational contact.
32.9-43.1	Moose Lake/Inwood Fm: massive, light brown, fine crystalline dolomite; some sandy, calcarenaceous bands (no green sandy laminae); unit is slightly laminated in places; becomes very dense towards the top (dolomite); gradational lower contact.
43.1-49.1	Fisher Branch Fm: massive, slightly porous, fossiliferous (<i>Virgiana</i>) dolomite; fine crystalline, appears calcarenaceous in places; gradational lower contact - very hard to discern.
49.1-65.6	Stonewall Fm: very massive, dense, light brown, very fine to fine crystalline dolomite (at base); @ 52.3-53.7 m: light to dark grey, argillaceous dolomite band; very dark grey at top (0.20 cm thick); mottled; very fine to fine crystalline; upper contact sharp to massive, dense, light brown, fine crystalline dolomite. @ 59.8 m: mottled, light grey to light brown dolomite; appears brecciated with angular clasts; scattered fossil fragments (corals?). @ 62.6-63.7 m: dark brown to slightly red, argillaceous dolomite band, with white chert nodules; scattered small vugs.
65.6-94.2	Stony Mountain Fm: massive, fine crystalline, slightly mottled light brown dolomite; upper contact gradational; scattered small vugs; some filled with chalky chert nodules; much missing core.
94.2-111.2	Upper Red River Fm (Fort Garry Mbr): massive to laminated, burrow mottled, chert-rich, argillaceous dolomite; fine to medium crystalline; scattered angular vugs (some may have been evaporitic?); argillaceous zones are very burrow mottled, some have dark grey <i>Chondrites</i> ; white chert (some with black mottling) increases upwards, some bands are very similar to hole #2; upper contact is gradational; some zones possess minor brecciation.
111.2-139.7	Lower Red River Fm: massive, slightly mottled, light to dark brown dolomite; fine to medium crystalline; fossiliferous (solutioned fossils of crinoids and corals); rare vugs; scattered chalky chert nodules (2-3 cm); gradational upper contact.
139.7-141.6	Winnipeg Fm: medium to coarse grained, quartzose, white sandstone, massive; upper contact sharp to dolomite; no sulphide nodules as seen in hole #2. End of hole

FALCONBRIDGE BL-89-02

Bracken Lake

2-19-55-16WPM

5957010N

445817E

Dip: 55°, Az: 110°

Ground Elevation: 274.3 m

Logged by R.Bezys, 1990

TRUE DEPTH (m) (Measured)	DESCRIPTION
0.0-5.5 (0.0-6.7)	Overburden or no core
5.5-8.0 (6.7-9.8)	East Arm Fm: massive, banded, light grey dolomite, fine crystalline; scattered fossils; scattered clayey zones and calcarenaceous bands.
8.0-15.6 (9.8-19.1)	Atikameg Fm: very rubbly, broken core; predominantly yellow stained and brecciated, medium crystalline dolomite; some distinct green-grey clay bands and yellow-brown laminae; gradational upper and lower contacts.
15.6-31.1 (19.1-38.0)	Moose Lake/Inwood Fm: massive, fine to medium crystalline dolomite; calcarenaceous with sandy, brecciated bands throughout; @ 21.7 (26.5) m: core is very rubbly and irregular; some sandy bands are very distinct with large calcarenaceous clasts in green-grey dolomite with wispy laminae.
31.1-39.7 (38.0-48.5)	Fisher Branch Fm: fine crystalline, light brown to light grey dolomite; scattered <i>Virgiana</i> fossils and coral fragments; calcarenaceous zones; stromatolitic towards the upper 1 m; gradational upper contact; appears more dense and has some very porous, sandy zones.
39.7-57.2 (48.5-69.8)	Stonewall Fm: light brown to light grey, fine crystalline, sometimes argillaceous dolomite; slightly mottled at top and bottom; upper contact gradational and very hard to pick. Two red argillaceous bands: @ 42.8 (52.2) m (0.74 m thick): laminated red-yellow argillaceous dolomite - a very distinct zone; some arenaceous laminae; upper contact very sharp; very fine to fine crystalline. @ 55.1 (67.3) m (0.59 m thick): red to slightly green, laminated dolomite, appears slightly argillaceous; very fine to fine crystalline.
57.2-87.5 (69.8-106.8)	Stony Mountain Fm: upper and lower contacts are gradational; mottled, fine crystalline, light brown dolomite; scattered dark brown chert nodules, scattered solutioned fossils.
87.5-104.1(97?) (106.8-127.1(118.4))	Upper Red River Fm (Fort Garry Mbr?): fine crystalline, dark grey to dark brown, argillaceous dolomite; distinctly mottled (burrowed); some <i>Chondrites</i> @ 104 (127) m; white chert nodules and laminae at 99.1 (121) m.
104.1 (97?)-134.7 (127.1-164.4)	Lower Red River Fm: typical mottled Red River - light to dark brown, fine crystalline dolomite; mottles indistinct; scattered fossiliferous material (crinoids and corals); rare chalky chert nodules; upper contact is gradational.
134.7-137 (164.4-165.7)	Lower Red River/Winnipeg Fm (Transitional Zone): light to dark grey, sandy dolomite; medium to coarse grained; scattered black (possibly sulphide-rich) mottles at top; sharp upper contact to mottled brown dolomite.
137-145.6 (165.7-177.8)	Winnipeg Fm: (no core)
145.6 (177.8)	Precambrian: (no core)

FALCONBRIDGE BL-90-03
(Marked as 89-3)
Bracken Lake
Location: 10-1-54-18W
5944355N
434818E
Ground Elevation: 263.0 m
Dip: 55°: Az: 132°
Map: 63G/12
Logged by R. Bezys, August 1992

MEASURED METRES (CONVERTED METRES)	DESCRIPTION
0.0-6.7 (0.0-5.5)	Overburden.
6.7-10.2 (5.5-8.4)	Silurian Interlake Group. Cedar Lake Fm. <i>Dolomite?</i>: slightly fossiliferous grainstone; massive.
10.2-26.3 (8.4-21.5)	East Arm Fm. Dolomitic wackestone to packstone; stromatolitic; some grainstone beds; slight breccia at top; very difficult to place upper contact; becoming argillaceous at top.
26.3-29.3 (21.5-24)	V-marker. <i>Dolomite?</i>: well laminated; green; clayey to silty mudstone.
29.3-34.5 (24-28.3)	Atikameg Fm. <i>Dolomite?</i>: orange-tan dolomite; floatstone; porous; reefal.
34.5-34.7 (28.3-28.4)	U₂-marker. <i>Dolomite?</i>: slightly argillaceous laminated mudstone.
34.7-44.8 (28.4-36.7)	Moose Lake Fm. <i>Dolomite?</i>: clean packstone to grainstone.
44.8-45.3 (36.7-37.1)	U₁-marker. <i>Dolomite?</i>: slightly argillaceous mudstone; grey; slightly laminated.
45.3-56.1 (37.1-46)	Fisher Branch Fm. Dolomite: clean wackestone to packstone; dolomitic; <i>Virgiana</i> at base - well developed; at 47-48.1 (38.5-39.4): orange-brown infill - claystone - possibly a cavern?
56.1-81.4 (46-66.7)	Stonewall Fm. <i>Dolomite?</i> : 56.1-57 (46-46.7): Upper Stonewall Marker - slightly argillaceous mudstone. 57-60.3 (46.7-49.4): clean packstone. 60.3-62.1 (49.4-50.9): T-marker: argillaceous mudstone; slight sand; distinct red colouration. 62.1-70.7 (50.9-57.9): light brown; clean packstone. 70.7-81.4 (57.9-66.7): Williams Mbr: slightly argillaceous mudstone [76.9-81.4 (63-66.7)]; at 70.7-71 (57.9-58.2) - dark grey argillaceous breccia bed.
81.4-105.4 (66.7-86.3)	Stony Mountain Fm. Gunton Mbr. <i>Dolomite?</i>: wackestone, slightly nodular.
105.4-116.4 (86.3-95.4)	Stony Mountain Fm. Penitentiary Mbr. <i>Dolomite?</i>: slightly argillaceous wackestone; slightly nodular.
116.4-129.1 (95.4-105.8)	Red River Fm. Fort Garry Mbr. <i>Dolomite?</i>: very broken rubbly core between 116.4-123.8 (95.4-101.4), possibly karstic with some infill - maybe overburden?; <i>sample 88-113-92 of infill?</i> ; marker bed at 124.8-126.0 (102.2-103.2) - dark grey, argillaceous mudstone; 2 cm clay bed at base; all mottled mudstone; sharp top and base.
129.1-180.0 (105.8-147.5)	Lower Red River. <i>Dolomite?</i>: brown wackestone, slightly mottled; 134.6-135.3 (110.3-110.8) distinct burrow mottled, argillaceous mudstone, dark brown (=kukersitic?).

180.0-194.5
(147.5-159.3)

Winnipeg Fm.

194.5 (159.3)

Precambrian?

FALCONBRIDGE BL-90-04
BRACKEN LAKE
14-1-54-18W
5944673N
434496E
GROUND ELEVATION: 262 m
DIP: 55°: AZ: 132°
Logged by R. Bezys 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-3.5	Not sure if overburden was in hole because casing was not mentioned.
3.5-10.7	Cedar Lake Fm. Dolomite: very porous; finely burrow mottled; possibly slightly bioclastic; broken core throughout.
10.7-25.6	East Arm Fm. Dolomite: very broken core; minor green grey clay cavern infill; gradational upper contact to finely laminated, stromatolitic dolomite (might be Cedar Lake Fm.); argillaceous; slight intraformational breccia; at 13.7 m becoming argillaceous, dense and sublithographic; at 14.2-14.5 m is a cross-section through the core of a stromatolite showing concentric radial growth patterns; continues to be stromatolitic with some bioclastic zones (crinoid and brachiopods <0.5 cm in diameter); at 20.8-21.7 m is an intraformational breccia zone, quite irregular, very sandy matrix and laminae, might be V-marker?; vuggy zones throughout with up to 5-8% porosity; gradational contact to Atikameg Fm.
25.6-32.3	Atikameg Fm. Dolomite: (not sure if base is really Atikameg Fm-may be part of Moose Lake Fm.); very rubbly, broken core; very bright buff yellow (probably result of oxidation); looks like a porous, reefal dolomite. -possible East Arm Fm with base having V-marker?; very green grey; argillaceous dolomite; fine crystalline to sublithographic in places; abundant floating sand grains throughout; minor red colouration.
32.3-39.0	Moose Lake Fm. Dolomite: finely laminated; stromatolitic; sublithographic; at 34.4-35.9 m is an odd fossil zone-mainly corals, quite bioclastic, very fine grained with large clasts of possible stromatolites (clasts can be up to 4-8 cm and have an indistinct lamination within them-Don't think it's diagenetic); into a finer laminated, very dense, massive, sublithographic interval; first 1.2 m is quite bioclastic-somewhat fossiliferous; tan dolomite; 2-3% porosity; slightly conglomeratic; sharp lower contact.
39.0-48.9	Fisher Branch Fm. Dolomite: irregularly nodular throughout; upper 40 cm becoming slightly argillaceous-maybe U ₁ -marker; down to a very massive, light tan, porcelaneous dolomite; very clean, rare chert nodules; 60 cm interval at base containing abundant <i>Virgiana</i> bioclastic zone; sharp lower contact.
48.9-69.4	Stonewall Fm. 48.9-52.2 m. Upper Stonewall. Dolomite: nodular to dense; buff in colour; upper 0.8 m is argillaceous and brecciated. 52.2-53.9 m. Upper T-marker. Dolomite: with distinct fine laminations; very argillaceous; with silty 4-5 cm zone towards base; slightly conglomeratic (very fine clasts); similar to what was seen before, but no red colouration; abundant pyrite mineralization along fractures. 53.4-53.9 m. Dolomite: buff in colour; indistinctly mottled; sharp upper and lower contacts. 53.9-54.9 m. Lower T-marker. Dolomite: grey in colour-no red; very distinct change; argillaceous; fine burrow mottling and fine intraformational breccia. 54.9-65.0 m. Lower Stonewall. Williams Mbr? Argillaceous dolomite: very faintly argillaceous; minor sand laminations; top is very starkly laminated with red colour-more clayey; sharp contact to nodular, less argillaceous, buff dolomite; minor cavern infill (very white kaolin? and olive yellow clay 2.5-3.5 cm). Difficult to place contact to Stony Mountain Fm.

69.4-98.7	<p>Stony Mountain Fm.</p> <p>69.4-85.7 m. Gunton Mbr. Dolomite: clean; nodular; at 74.2 m becoming more massive; very light tan in colour.</p> <p>85.7-92.0 m. Penitentiary Mbr. Dolomite: slightly argillaceous; nodular.</p> <p>92.0-98.7 m. Transition Zone. Dolomite: argillaceous; slightly nodular; numerous hardgrounds throughout; fossiliferous-mainly corals; indistinctly burrowed; very sharp lower contact.</p>
98.7-149.0	<p>Red River Fm.</p> <p>98.7-106.5 m. Fort Garry Mbr.</p> <p>98.7-101.1 m. cycle 4. Dolomite: somewhat burrow mottled; laminated to massive; argillaceous; very broken, rubbly core; lower contact not well preserved, appears gradational.</p> <p>101.1-106.5 m. cycle 3. Dolomite: argillaceous; buff; massive; in places finely laminated and brecciated; chert ~2%; 0.8 m of cave infill (brown silt) towards top; brecciated intervals are more sandy, silty and more like an intraformational breccia; lower contact not preserved due to ground core.</p> <p>Lower Red River. (106.5-149.0 m)</p> <p>106.5-107.7 m. cycle 2. Dolomite: finely burrow mottled; argillaceous; blue-grey; quite massive; fine grained; gradational lower contact.</p> <p>107.7-114.1 m. cycle 1. Dolomite: massive; argillaceous; light brown to tan to light olive grey green; 3-4% chert; finely laminated; becoming more indistinctly laminated towards top.</p> <p>114.1-149.0 m (base of last box). Lower Red River. Dolomite: burrow mottled; brown grey in colour; slightly argillaceous.</p>
149.0-?	<p>Winnipeg Fm?</p> <p>Precambrian?</p>

FALCONBRIDGE WL-90-05
WILLIAM LAKE
Location: 3-2-53-17W
5933511N
442590E
Ground elevation: 259 m
Dip 55°, Az: 125°
Map: 63G/12
Logged by Bezys, August, 1992

MEASURED METRES (TRUE METRES)	DESCRIPTION
0.0-7.3 (0.0-6.0)	Overburden
7.3-8.4 (6.0-6.9)	Silurian Interlake Group Cedar Lake Fm: clean, white grainstone; difficult to pick contact?
8.4-35.5 (6.9-29.1)	East Arm Fm: dolomite wackestone to packstone; some argillaceous intervals at top.
35.5-37 (29.1-30.3)	V-marker (?): argillaceous to sandy marker bed; finely laminated with burrowing.
37-44.2 (30.3-36.2)	Atikameg Fm: vuggy, porous dolomite; grainstone to floatstone; some minor sand; very difficult to pick; lots of mud coating.
44.2-51.2 (36.2-41.9)	Moose Lake Fm: wackestone; light grey to brown; medial marker bed at 48 (39.3).
51.2-53.2 (41.9-43.6)	U₁-marker: finely laminated argillaceous mudstone.
53.2-62 (43.6-50.8)	Fisher Branch Fm: dolomitic packstone; good <i>Virgiana</i> at base.
62-86 (50.8-70.5)	Stonewall Fm 62-63.1 (50.8-51.7): Upper Stonewall Marker: argillaceous, laminated mudstone. 63.1-66.4 (51.7-54.4): clean dolomitic packstone. 66.4-74.5 (54.4-61): T-marker: (with upper and lower beds); grey to green argillaceous, brecciated mudstone; sandy; laminated. 74.5-86 (61-70.5): Williams Mbr: (with upper and lower mudstone markers); clean wackestone to packstone interbeds; fossiliferous; some dissolution occurring of fossils.
86-124.3 (70.5-101.8)	Stony Mountain Fm: clean packstone to minor mudstone; hardgrounds at base; no distinction between Gunn and Gunton members.
124.3-149 (101.8-122.1)	Red River Fm (Fort Garry Mbr): 124.3-124.8 (101.8-102.2): grey brown, argillaceous mudstone (dolomite) marker bed; brecciated. 124.8-126.2 (102.2-103.4): brown massive dolomite; mudstone to wackestone. 126.2-129.7 (103.4-106.3): grey brown argillaceous mudstone marker bed. 129.7-134.2 (106.3-109.9): mudstone; light brown; faintly laminated with bituminous partings. 134.2-137.6 (109.9-112.7): light brown massive dolomite/mudstone. 137.6-~149 (112.7-122.1): brown mudstone; difficult to place lower contact.
149-187.2 (122.1-153.4)	Lower Red River Fm: light brown wackestone - no argillaceous zone as in BL-90-03.
187.2-187.9 (153.4-153.9)	Hecla Beds: sandy dolomite; dark grey to black; mottled.
187.9-198.2 (153.9-162.4?)	Winnipeg Fm? clean, white sandstone; very fine to fine grained.
198.2	Precambrian.

FALCONBRIDGE MB-90-06
MUDDY BAY - CEDAR LAKE
10-16-50-19WPM
5908724N
421872E

Ground elevation: 256 m
Dip: 56°, Az: 70°
Logged by R. Bezys, August, 1992

MEASURED DEPTH (TRUE DEPTH)	DESCRIPTION
0.0-4.8 (0.0-4.0)	Overburden.
4.8-24.1 (4.0-20.0)	Silurian Interlake Group Cedar Lake Fm. Dolomite? : various lithologies - wackestone to grainstone; minor argillaceous beds and porous zones; abundant orange silt infill as beds and in joints. Sample 88-114-92: (~11.8 m) ; calcite in vug with sulphides? Sample 88-115-92: (4.8-24.1 m) ; K infill material in top of hole.
24.1-48 (20.0-39.8)	East Arm Fm. Dolomite? : upper contact difficult to place; various lithologies - mudstone to packstone; argillaceous marker bed at 38.4-39 (31.8-32.3); scattered calcite lined vugs; no well developed sandy beds; slightly fossiliferous (gastropod shell); good halite mold at 29 (24).
48-51.7 (39.8-42.9)	Atikameg Fm. Dolomite? : very porous, reef-lake grainstone; pores/burrows infilled with dolomite mud +/- tripolized chert?
51.7-62.6 (42.9-51.9)	Moose Lake Fm. Dolomite? : various lithologies - wackestone to packstone beds; some medial marker beds - maybe U ₂ -marker?.
62.6-66.3 (51.9-55)	U₁-marker. Dolomite? : grey argillaceous mudstone; sandy with laminations.
66.3-75.2 (55-62.3)	Fisher Branch Fm. Dolomite? : very different Fisher Br. Fm type lithology - slightly laminated wackestone to grainstone; between 66.3-71.7 (55-59.4) very porous grainstone (20-25%); some fossil solutioning, but no discernable fossils; no <i>Virgiana</i> present.
75.2-108.3 (62.3-89.8)	Stonewall Fm 75.2-76.2 (62.3-63.2): Upper Stonewall Marker. Dolomite? : slightly argillaceous laminated mudstone. 76.2-81 (63.2-67.1): fossiliferous packstone to boundstone; large fragments of corals and stromatoporoids (2-4 cm). 81-82 (67.1-68): T-marker . grey argillaceous mudstone; slightly sandy. 82-92.7 (68-76.8): clean, white packstone to wackestone. 92.7-108.3 (76.8-89.8): Williams Mbr. argillaceous marker beds at 92.7-94.2 (76.8-78.1) and 106.8-108.3 (88.5-89.8); clean, white wackestone in between.
108.3-133.2 (89.8-110.4)	Stony Mountain Fm. Gunton Mbr. Dolomite? : wackestone to packstone.
133.2-154.7 (110.4-128.2)	Stony Mountain Fm. Gunn Mbr. Dolomite? : mudstone to wackestone with hardgrounds at base.

154.7-174.3 (128.2-144.5)	Red River Fm. Fort Garry Mbr. Dolomite: mudstone to wackestone; argillaceous marker beds at 154.7-155.4 (128.2-128.8), 156.2-158.2 (129.5-131.1), and 166.5-168.3 (138-139.5).
174.3-222.0 (144.5-184.0)	Lower Red River Fm. <i>Dolomite?</i> : brown, mottled wackestone; Hecla Beds in lower 20 cm with sulphides(?) - Sample 88-116-92 of mineralization (Falconbridge also took sample from 221.85-222 (183.9-184).
222.0-235.1 (184.0-194.9)	Winnipeg Fm. Sandstone: light brown to grey; sharp lower contact.
235.1 (194.9)	Precambrian.

FALCONBRIDGE CL-91-07
CEDAR LAKE
10-24-52-19WPM
5928666N
425106E
Ground elevation: 256.0 m
Dip: 55°, Az: 119°
Logged by R.Bezys 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-8.2	Casing.
8.2-17.9	Cedar Lake Fm. Dolomite: very fine to medium crystalline with some sublithographic intervals; very faintly laminated in places; porosity is approximately 5% (very fine pin point); associated with very fine laminations are gypsum needle casts (very abundant in some intervals). Sample 88-29-91(a & b) of evaporite crystal casts at 14.3-14.4 m.
17.9-29.2	East Arm Fm. Contact to Cedar Lake is uncertain. Change from sublithographic dense dolomite to a more porous, dolomitic grainstone. Dolomite: grey to brown; some intervals are sublithographic to medium crystalline; very grainy and sandy in places; stromatolitic; very alternating facies of very fine, sublithographic to very porous, grainy dolomite.
29.2-31.1	Atikameg Fm. Dolomite: unsure about upper contact; very stromatolitic; granular; high porosity (15%); very dark yellow to brown in colour.
31.1-48.65	Moose Lake Fm. Dolomite: finely laminated to massive; brown; very fine crystalline to sublithographic; at 37.3 m core is very rubbly; at 38.5 m core is very broken, rubbly and more of a granular yellow dolomite, very vuggy (appears to have mud-infill coating the vugs); grainstone becoming stromatolitic upwards; in sublithographic zones are numerous intervals of intraformational breccia with infilling of very fine slightly clayey sand; clasts are very angular, small breccia plugs are stratiform (i.e.. following bedding plane); becoming very vuggy in association with stromatolites (porosity up to 10%); minor brecciation at 48.6-48.65 m (flat pebble conglomerate) with green grey sand matrix and some sand occurring as clasts up to 5 cm long; could be a U ₂ -marker? or transition between Fisher Branch Fm and Moose Lake Fm?? Gradational lower contact.
48.65-59.0	Fisher Branch Fm. Dolomite: mottled brown; porosity is low (<2-3%); containing scattered brown nodules of chert; very white to brown in places, appears porcelaneous; very clean looking; at 57.9 m to 59.0 m is a very dark grey, argillaceous appearing dolomite; slightly nodular, cream dolomite, finely laminated U ₁ -marker; slight brecciation possible in some places; very fine crystalline to lithographic; cross-cutting pyrite veinlets in places; good <i>Virginia</i> in lower 0.8-1.2 m.
59.0-75.7	<p>Stonewall Fm.</p> <p>T₁-marker: 61.9-62.9 m. Dolomite: purple red to red orange-yellow with minor green; appears predominantly a diagenetic colour change; some laminations appear to be silt-rich; sharp break from green grey argillaceous dolomite into a buff, slightly mottled, brown dolomite; minor laminations and minor fossils (rugose corals).</p> <p>T₂-marker: 64.1-64.8 m. Dolomite: grey to blue grey to slightly red; mottled grey; very argillaceous; sublithographic; gradual change to very red, argillaceous dolomite with fine granules.</p> <p>At 67.0 m is a transitional change to a more massive dolomite with no distinctive red colouration, mottling or vugginess.</p>
74.0-75.7	Stonewall Fm. Williams Mbr. Dolomite: very fine crystalline to sublithographic; dark brown to green brown in colour; slightly argillaceous, faintly laminated; some red colouration associated with laminations; transitional change to overlying nodular dolomite; cleaner looking, 1-3% porosity.

75.7-106.6	<p>Stony Mountain Fm. Dolomite: nodular; light brown buff in colour; similar to what was seen before in Cedar Lake holes with some minor argillaceous partings; very nodular (typical Gunton Mbr.) with some burrow mottling; possible hardground at 92.9 m; some fine laminations in places but mainly burrow mottled and nodular; porosity is less than 2-3%; minor vugs containing probable gypsum needle molds; along bedding breaks are some very bituminous laminations associated with nodular horizons; at 82.4 m it becomes very massive, light brown buff, less nodular with minor laminations (argillaceous); pyrite occurring in strings and circular blebs.</p>
106.6-111.2	<p>Stony Mountain Fm. Transition Zone. Dolomite: slightly burrow mottled associated with breccia zones and finely laminated zones; brown to grey in colour; grades up into a brown dolomite, medium grained grainstone?; goes to 106.6 m with possible associated hardgrounds?</p>
111.2-163.7	<p>Red River Fm.</p> <p>111.2-127.1 m. Fort Garry Mbr. Dolomite: burrow mottled; grey to brown with wispy laminations of argillaceous material; chert abundance increases dramatically up to 10-15% in some intervals; highly argillaceous; in some intervals it is extremely bioturbated and brecciated; porosity is also high in some intervals (up to 10%) with large vugs; difficult to place contacts to Stony Mountain Fm and Lower Red River. (cycles not defined).</p> <p>cycle 4. 111.2-117.0 m. Dolomite: finely laminated; brown to light brown in colour; some intervals are grey to blue-grey; faintly mottled; becoming more lithographic at top; scattered chert nodules (3-4%); at 112.6 m is a sharp contact between a brown laminated interval underlain by a breccia (~1 cm thick, blue-grey, medium grained appearance, very fine fragments (2-4 mm)); some bedding plane breaks with extremely bituminous partings; top of unit is a flat pebble conglomerate with interstitial grey clay.</p> <p>cycle 3. 117.0-122.1 m. Dolomite: bioturbated zone; very dark grey to grey in colour; extremely burrow mottled, yet associated with fine laminations in places; some intervals are nodular with argillaceous partings; very distinctive blue-grey bioturbation-blebs as seen before; chert presence is practically nil; porosity is less than 5%; some bedding plane breaks associated with nodular intervals are very argillaceous.</p> <p>cycle 2. 122.1-125.4 m. Dolomite: massive, laminated interval; very rich in chert (mainly lenses up to 3-4 cm thick with very dark centres and light rims); at 122.1-122.4 m are 4 small breccia zones, 0.5-1.5 cm thick, appearing to be predominantly intraformational; fragments are quite rounded in places with no presence of anhydrite.</p> <p>cycle 1. 125.4-127.1 m. Dolomite: Lake Alma Mbr; bioturbated interval.</p> <p>127.0-163.7 m. Lower Red River. Dolomite: medium grained to crystalline; indistinctly burrow mottled throughout; appears fragmental with fossil material; brown to tan in colour; typical Yeoman sequence; porosity is less than 5% with scattered vugs up to 2 cm in diameter, some have a scalloped interior as seen in units 7 and 8 at Conawapa; chert less than 5% occurring as white, chalky nodules; minor sulphides occurring as pyrite or marcasite? in vugs; becoming darker at 131.3 m appearing a little more argillaceous and more burrow mottled, slightly bioclastic; porosity remains under 3%; very white towards the base; (slightly sandy also); lower contact not well preserved; at 162.5-163.7 m: cream-white dolomite (sharp change). Winnipeg Red River contact is sharp; some minor subrounded to argillaceous fragments of dolomite (1-3 cm) below contact (to slightly argillaceous sandstone, fine to medium grained); undulatory contact.</p>
163.7-173.6	<p>Winnipeg Fm:</p> <p>163.7-164.6 m. Sandstone: slightly argillaceous; green-grey; quartzose; rounded; fine to medium grained; slightly friable in places.</p> <p>164.6-173.6 m. Sandstone: white to off-white; fine to coarse-grained; some intervals very friable, whereas others are very indurated; gradational lower contact; base of Winnipeg to Precambrian is not sharp with lots of unconsolidated sand.</p>
173.6	<p>Weathered Precambrian.</p>

FALCONBRIDGE CL-91-08
CEDAR LAKE
12-32-51-19WPM
5923386N
417765E
Ground elevation: 256.0 m
Dip: 55°, Az: 143°
Logged by R.Bezys, 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-7.4	No core?
7.4-27.0	Cedar Lake Fm. Dolomite: 7.4-9.8 m is a very porous dolomite (maybe reefal material associated with Chemahawin Mbr.); between 17.2 m and 18.8 m unit becomes very argillaceous, dense and dark brown in colour; 24.8-27.0 m is very fossiliferous with a grainstone appearance; very finely laminated, stromatolitic, dense, sublithographic dolomite, light brown to buff, porcelaneous in appearance in places.
27.0-43.2	East Arm Fm. Mixed lithologies from brown to tan grey, very dense sublithographic dolomite to very sandy and slightly conglomeratic dolomite: faintly laminated in places developing into stromatolitic; minor sand; at ~31.5 m is a crinoidal hash; at 38.5 m it is much more stromatolitic, porosity ~20%, very broken, rubbly core, very Atikameg-type appearance to 36.0 m.
43.2-47.5	Atikameg Fm. Dolomite: very porous, porosity up to 10% in places; stromatolitic; brown to light brown buff colouration; fine to medium grained alternating with a more sublithographic interval and laminations; upper and lower contacts are gradational.
47.5-56.0	Moose Lake Fm. Dolomite: very massive grainstone; slightly argillaceous with some brecciated laminations; 50.8-56.3 m becoming stromatolitic; (medial markers) at 51.7-51.8 m - slightly sandy flat pebble conglomerate bed with a green grey colour, very well indurated;
56.0-56.3	U₁-marker: very sandy conglomeratic dolomite.
56.3-65.0	Fisher Branch Fm. Upper 3 m is a porcelaneous dolomite: grades down into a dense, clean, sublithographic to very fine crystalline dolomite; continues into a slightly argillaceous, mottled to burrow mottled dolomite; at base is a 0.5 m extremely fossiliferous <i>Virgiana</i> zone with good shell development-up to 3 cm in diameter-seems stratigraphically too low-may actually be Stonewall Fm?
65.0-84.6	<p>Stonewall Fm.</p> <p>65.0-68.1 m. Dolomite: indistinctly laminated and mottled; massive; dense; buff in colour; minor flat pebble conglomerate zone and sharp break to Fisher Branch Fm.</p> <p>68.1-68.8 m. T₁-marker. Dolomite; typically purple red in colour; finely laminated; argillaceous; with colours of yellow, grey and some green; coarser grained intervals towards the base (as seen in CL-91-7); gradational top and bottom contacts.</p> <p>69.3-69.7 m. T₂-marker. Dolomite: distinctly purple red, finely laminated; argillaceous; no distinct pattern; quite dense and sublithographic.</p> <p>79.7-84.6 m. Williams Mbr. Dolomite: dark brown; argillaceous; faintly laminated with minor intraformational breccia; minor green grey clay laminations; at ~80.3 m is a distinct purple red finely mottled zone; rest of unit is indistinctly mottled, buff dolomite; fine crystalline to sublithographic in places; 5-6% porosity, some intervals are very massive and dense with faint laminations.</p>

84.6-114.1

Stony Mountain Fm.

84.6-99.9 m. **Gunton Mbr.** Dolomite: very nodular, minor chert nodules; less argillaceous than Lower Stony Mountain; light brown buff in colour; minor fossiliferous material at 92.7 m (*Favosites*); breccia zone at 93.4-93.8 m with small, irregular fragments of dolomite in a clayey matrix; very friable, some grains are slightly rotated and rounded (most probably a depositional breccia??).

99.9-114.1 m. Transition Zone. Dolomite: argillaceous; slightly nodular; occasional hardground surfaces?; similar to CL-91-7 and CL-91-14; scattered indeterminate fossil material present; sharp contact to Red River Fm.

114.1-167.3

Red River Fm.

114.1-129.6 m. Fort Garry Mbr.

cycle 4. 114.1-117.8 m. Dolomite: slightly burrow mottled with interbeds of green grey, slightly mottled dolomite and massive brown sublithographic dolomite; upper 20-25 cm is a very vuggy dolomitic grainstone (most of the vugs appear to be burrows); contains numerous breccia intervals.

cycle 3. 117.8-121.9 m. Dolomite: argillaceous; dense, massive; minor burrow mottling; scattered chert nodules (<5%); minor brecciation in places; cavern infill at 118.4-118.6 m of medium to coarse grained, very well sorted quartz and kaolin (pure white in colour); gradational contacts.

cycle 2. 121.9-127.3 m. Dolomite: blue grey to brown; burrow mottled; at 123.6-124.5 m is a sharp break from a very brown, more massive, slightly lithographic dolomite to a dark grey-green grey grainstone which is a very fine fragmental conglomerate with brown argillaceous dolomite.

cycle 1. 127.3-129.6 m. Dolomite: massive; faintly laminated; slightly argillaceous; cherty; brown in colour; 2-3% porosity; 205 chert-usually as lenses up to 4 cm in thickness with burrowed brown centres (similar to unit 5A of Conawapa units); some burrow openings have been silicified; gradational contact to Lower Red River (Yeoman).

129.6-167.3 m. Lower Red River. Typical Lower Red River: burrow mottled dolomite; massive; slightly fossiliferous; tight; light brown to brown in colour; at 131.9 m becoming very finely burrow mottled with faint argillaceous laminae; cherty at top; fine crystalline; granular; sharp lower contact.

167.3-177.4

Winnipeg Fm:

167.3-175.4 m. Argillaceous Sandstone: dark green-grey; fine grained; some mottling; becomes lighter in colour by 171.2 m; very friable in places; for 25 cm to base, sandstone is very friable with black pyrite staining throughout.

175.4-177.4 m. Sandstone: argillaceous; medium to coarse grained sand; some quartzite fragments.

177.4

Weathered Precambrian.

FALCONBRIDGE MB-91-09
MUDDY BAY - CEDAR LAKE
(CORE IS LABELLED CL-91-9)
3-24-51-19WPM
5919608N
424659E
Ground elevation: 256.0 m
Dip: 50°, Az: 157°
Logged by R.Bezys, 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-25.61	Casing. Might have 1-2 m of Cedar Lake at top, lost 0.9 m of core.
25.61-31.90	East Arm Fm. Dolomite: dense; sublithographic; buff tan; stromatolitic in places; cave infill between 28.5 m and 29.5 m; at 25.2 m is a 15 cm breccia zone with green clay and sand infill, probably depositional (might be V-marker?).
31.9-34.9	Atikameg Fm. Dolomite: granular; vuggy; porosity less than 5% pin point, not as porous as seen before; Atikameg may be porous interval in Moose Lake Fm below; some green grey clay infill along bedding planes (not sure if cavern material); slightly stromatolitic; lower contact is sharp; upper contact to East Arm Fm is gradational.
34.9-51.4	Moose Lake Fm. Dolomite: dense; brown to grey in colour; sublithographic; floating sand grains at 38.5 m and at base of this unit is a 4 cm thick, very finely laminated, green grey interbed which appears to be <i>in situ</i> (might be a U-marker??); continues to a very dense interval of sublithographic dolomite (very much like East Arm type lithology??); from 39.1 m to 44.4 m the unit is very vuggy (5-10% porosity) with some faint stromatolitic lamination; 49.8 m to 51.4 m is a grainy, fossiliferous hash with some stromatolites. U₁-marker: 51.36-51.4 m.
51.4-60.1	Fisher Branch Fm. Dolomite: very dense, sublithographic; buff tan in colour with scattered fossil debris (<i>Favosites</i> and rugose corals); <i>Virgiana</i> zone at base is approximately 40 cm thick; abrupt contact to Stonewall Fm.
60.1-80.0	Stonewall Fm. Dolomite: upper 80 cm is a very dark grey, argillaceous, dense dolomite; difficult to see the two T-markers because there are actually 4 red argillaceous zones seen here. highest T-marker: 63.4-63.6 m. Dolomite: purple red, argillaceous. second highest T-marker: 63.7-64.5 m. Might be the main marker since it is the thickest. Dolomite: very purple red with a yellow arenaceous zone as seen in other holes, very distinctly mottled with breccias. second lowest T-marker: 65.3-65.6 m. Dolomite; very finely laminated; purple red; argillaceous; some burrow mottling. lowest T-marker: 72.2-72.5 m. Another red argillaceous interval. At 68.2 m is the top of a typically purple red, nodular dolomite with abundant clots/blebs of chalky chert (~2 cm in diameter); unit to 80.0m is Williams Mbr?? with very minor breccia zones; rest of Stonewall is more dense, very faintly laminated; very fine crystalline to sublithographic; gradational contact to Stony Mountain Fm.
80.0-111.1	Stony Mountain Fm. Dolomite: typical Gunton-like lithology (nodular dolomite with slightly argillaceous partings); large breccia zones with clasts 3 cm in diameter and a shaly, sandy matrix occurs 36 m from bottom; minor chert; lower part of Stony Mountain is a transition zone (106.3-111.1 m) with slightly argillaceous nodular dolomite and scattered hardgrounds?; sharp contact to Red River Fm with possible hardground as seen before.

111.1-165.2

Red River Fm.

111.1-125.6 m. Fort Garry Mbr.

cycle 4 (111.1-111.7 m). Dolomite: argillaceous; dark grey; brecciated zone; could actually be a part of cycle 3??.

cycle 3 (111.7-117.0 m). Dolomite: predominantly finely laminated; brown; argillaceous; with faint grey mottling becoming more blue grey upwards to contact; quite massive, scattered breccia intervals-small scale; some zones brecciated up to 15 cm; base has minor chert.

cycle 2 (117.0-121.3 m). Dolomite: blue grey; burrow mottled typical lithology as seen in previous holes; no chert present; quite massive core; fine crystalline; at 118.7 m becoming more nodular and browner in colour, but still distinctly burrow mottled; minor bituminous partings; medium bedding; approximate contact to cycle 1.

cycle 1 (121.3-125.6 m). Mixed lithologies: from a massive, finely laminated dolomite with abundant chert (up to 15% in places); buff to brown in colour; upwards becoming a more blue grey with abundant breccia zones, some with rounded clasts; a gradational change to overlying cycle with possible hardground surface (with bioturbation); not sure if upper 2 m of blue grey dolomite should be in this cycle; in chert are some dark centres with burrow mottling as seen in CL-91-8.

125.6-164.95 m. Lower Red River. Dolomite: brown to light brown; fine to medium crystalline; granular; very dense; slightly mottled; scattered Mn nodules towards the base (@ 164.7 m); gradational lower contact. Red River is really dark, not like 91-97 degrees; interbedded at base (with sand); Winnipeg/Red River contact not preserved; soft, unconsolidated, slightly argillaceous sand at contact.

164.95-165.2 m. Basal Red River (Hecla Beds). Interbedded dolomite and sandstone: brown grey to grey brown; irregularly laminated with pyrite nodules; sharp lower contact.

165.2-175.4

Winnipeg Fm:

165.2-173.9 m. Sandstone: very clean; off-white; fine to coarse grained; quartzose; rounded to sub-rounded grains.

173.9-175.4 m. Argillaceous Sandstone: dark grey; clayey; very friable; may have some weathered Precambrian at base?

175.4

Precambrian.

FALCONBRIDGE MB-91-11
Muddy Bay - Cedar Lake
14-36-50-20WPM
5912697N
417969E
Ground Elevation: 256.0 m
Dip: 50°, Az.: 122°
Logged by R.Bezys, 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-5.4	No core.
5.4-38.1	Cedar Lake Fm. Dolomite: 5.4-7.7 m is very rubbly and broken with abundant oxidized intervals; some zones are very faintly laminated; quite massive; some zones are porous and friable; some intervals with abundant porosity may be reefal (crinoid ossicles, brachiopods, corals); gradational contact to East Arm Fm.
38.1-54.0	East Arm Fm. Dolomite: mixed lithologies and characteristics; some zones are very vuggy; scattered green grey laminations and intraformational breccias; bottom 40 cm is green argillaceous interval, probably V-marker, red, dense, sublithographic to a slightly porous grainstone; V-marker (53.6-54.0).
54.0-58.9	Atikameg Fm. Dolomite: brown in colour; reefal-like; very vuggy (5-8%); appears that interval is lower than should be?; sharp contact to Moose Lake Fm.
58.9-68.1	Moose Lake Fm. Dolomite: partly bioclastic with corals; some intervals are massive; very fine crystalline to sublithographic; stromatolitic; basal 30 cm is an argillaceous interval, very sandy, possibly U₁-marker at 67.8-68.1 m.
68.1-76.5	Fisher Branch Fm. Dolomite: faintly mottled; buff to brown; fine to microcrystalline; slightly argillaceous; finely laminated; <i>Virgiana</i> zone at base (60 cm thick).
76.5-97.9	<p>Stonewall Fm. Dolomite: buff to tan in colour; massive to slightly nodular.</p> <p>upper T-marker. 80.2-81.1 m. Argillaceous dolomite: very distinctive purple-red to green colours; very argillaceous; silty; conglomeratic base; distinct oxidized pattern; gradational contacts.</p> <p>At 84.3 m Stonewall becomes more massive, finely laminated, less nodular in appearance with minor red staining.</p> <p>lower T-marker. 89.3-89.5 m. Dolomite: silty clayey texture; red to green staining; minor breccia.</p> <p>92.3-97.9 m Williams Mbr. Lower Stonewall becomes more nodular; vuggy (3-4%); with some zones coloured purple-red and yellow; 40 cm grey, argillaceous interval at base.</p>
97.9-125.8	<p>Stony Mountain Fm.</p> <p>97.9-104.9 m. Gunton Mbr. Nodular dolomite: definite Gunton type lithology; numerous breaks along bedding planes that indicate probable hardground surfaces repetitive throughout.</p> <p>104.9-122.8 m. Penitentiary Mbr. Calcitite: massive; finely laminated dolomite; less nodular in appearance; cleaner; light brown tan in colour.</p> <p>122.8-125.8 m. Transition Zone. Argillaceous to nodular dolomite: 4 hardground intervals with gradational tops; minor chert nodules; some bioclastic material.</p>

125.8-183.1

Red River Fm.

125.8-144.1 m. Fort Garry Mbr.

cycle 4 125.8-129.9 m. Mixed character of finely mottled blue grey dolomite, dense with some brown tan sublithographic, massive dolomite: quite irregular throughout; many intervals are brecciated; argillaceous to clayey; some zones are quite porous (3-4%); upper contact is sharp to typical Stony Mountain Fm.

cycle 3 129.2-134.6 m. Dolomite: brown to tan in colour; quite massive; low porosity; scattered chert nodules and lenses (<5%); quite arenaceous in places with thin breccia intervals; in upper 40 cm are numerous breccias; sharp upper and lower contacts.

cycle 2 134.6-139.2 m. Dolomite: blue green to brown in colour; burrow mottled; quite distinct as seen before; faintly bedded and laminated; some intervals maybe silty or arenaceous; gradational upper and lower contacts.

cycle 1 139.2-144.1 m. Dolomite: finely laminated; massive; cherty (up to 10%); brown to grey in colour; very broken and rubbly intervals contain chert; burrow mottling is very minor. Sharp contact to Lower Red River.

144.1-182.7 m. Lower Red River. Dolomite: quite argillaceous; burrow mottled; minor chert (<2%) (as seen before); 2 fractures at ~30° with minor white clay infill and small (<1 mm) pyrite crystals scattered on fracture face; irregularly mottled.

182.7-183.1 m. Basal Red River. Interbedded argillaceous sandstone and sandy dolomite: green-grey to brown; scattered sulphide and Mn? mottling and layering; lower contact is sharp.

183.1-192.3

Winnipeg Formation. Argillaceous Sandstone: very dirty at top; dark grey to black grey and green-grey; fine to medium grained; becoming cleaner at 185.4 m; some very Mn-rich laminations and layers alternating with cleaner sand; gradational lower contact.

192.3

Weathered Precambrian.

FALCONBRIDGE MB-91-12
MUDDY BAY - CEDAR LAKE
 (box 3 is missing)
5-12-51-19WPM
5915250N
423963E
Ground elevation: 256.0 m
Dip: 50°, Az: 157°
Logged by R.Bezys, 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-4.6	No core.
4.6-41.1	Cedar Lake Fm. Dolomite: at ~5.0-5.4 m is a very distinctive calcite crystal infill lined with sulphide in contact with dolomite (sample 88-33-91); at ~17.2 m some intervals are very porous, sponge-like-probably calcarenites subjected to intense weathering and oxidation with colours now orange to yellow-interbedded with very sublithographic, dense dolomite as seen before; some beds are very vuggy with minor brecciation; at ~22.6 m is a 20 cm thick interval of dolomite crystals lining a cavern or vug with good development of crystals (2.5-3.0 cm long) perpendicular to face; lining of vug also has a very dark sulphide-marcasite? (sample 88-32a,b,c-91); at ~23.0 m and up is very broken core; to 31.4 m is very dense, sublithographic, less vuggy dolomite with numerous cavern infills of green grey clay; at ~40.4-40.6 m are some distinctive cross-cutting veinlets perpendicular to bedding, vein is calcite (couple of mms to 0.5 cm in thickness); base is very buff tan in colour; laminated to stromatolitic, cryptocrystalline to fine crystalline dolomite.
41.1-52.3	East Arm Fm. Mixed characteristics of arenaceous, brown bioclastic dolomite to a darker grey argillaceous, finely laminated (probably stromatolitic) dolomite: some zones are quite laminated and some are vuggy; scattered throughout are brecciated intervals and lenses of green grey clay, slightly silty; at 49.8 m to 51.3 m is a quite argillaceous interval with green grey clay-possibly V-marker?; very hard to pick top of East Arm; sharp contact to Atikameg Fm.
52.3-55.8	Atikameg Fm. Dolomite: light brown to tan in colour; very vuggy; reefal; scattered green sandy clay coating vugs; somewhat nodular.
55.8-64.4	Moose Lake Fm. Dolomite: some intervals are very dense to sublithographic; minor nodular development; brown to grey in colour; slightly brecciated; could be U ₁ -marker; lower 60 cm is quite sandy, arenaceous, becoming more argillaceous towards top; gradational contact to Fisher Branch Fm.
64.4-72.5	Fisher Branch Fm. Dolomite: upper 1.0 m has very faint 0.5 cm thick floating sand interval, very irregular; sublithographic, tight; buff to tan in colour; nodular to dense; indistinctly laminated; lower 50 cm has extremely fossiliferous interval of <i>Virgiana</i> ; gradational contact to Stonewall Fm.
72.5-92.4	Stonewall Fm. Dolomite: light cream; dense to massive; upper 1 m is argillaceous, dark grey with minor brecciation; difficult to place Williams Mbr. upper T-marker 76.5-77.7 m. main T-marker, silty to clayey dolomite: very purple red to olive green in colour; very distinctive colouration; some minor brecciation at base; sharp upper contact; gradational lower contact to breccia zone; sample 88-31-91 at 77.4 m. lower T-marker 78.0-78.6 m. Dolomite: argillaceous; purple red to olive green, some yellow colouring; faintly laminated; minor brecciation at base. At 80.4 m unit is finely laminated, slightly argillaceous, very rare nodules; at 82.0 m becomes red in coloration = Williams Mbr? .

92.4-123.0	<p>Stony Mountain Fm.</p> <p>92.4-118.9 m. Dolomite: Gunton type lithology from 92.4-118.9 m; brown; nodular; some zones are indistinctly finely laminated; at 107.2 m becoming less clean (Penitentiary Mbr.??); chert abundancy is 1-2%; scattered burrows; good nodules-somewhat bioturbated.</p> <p>118.9-123.0 m. Transition Zone. Dolomite: slight argillaceous appearance; brown to dark brown; indistinctly nodular; minor brecciation; increased vugginess (5%). Sharp contact to Red River Fm.</p>
123.0-181.6	<p>Red River Fm.</p> <p>123.0-139.8 m. Fort Garry Mbr.</p> <p>cycle 4. 123.0-126.6 m. Dolomite: mixed lithologies; blue grey to tan brown; argillaceous; brecciated intervals in lower 60 cm and some intervals becoming burrow mottled and distinctly laminated.</p> <p>cycle 3. 126.6-130.9 m. Dolomite: light brown to tan; massive; quite dense in places; sublithographic; scattered bituminous partings; scattered chert lenses ~3%; gradational contact to breccia zone.</p> <p>cycle 2. 130.9-136.4 m. Dolomite: dark grey to blue grey in colour; burrow mottled to indistinctly mottled; very fine crystalline; dense to sublithographic; gradational upper contact.</p> <p>cycle 1. 136.4-139.8 m. Dolomite: similar to cycle 3; massive; slightly argillaceous; faintly laminated; chert (10%) with burrowed centres; light brown to light grey; upper 15-20 cm is slightly burrow mottled.</p> <p>139.8-181.6 m. Lower Red River. Dolomite: burrow mottled; brown; at base of Red River is a 20-25 cm transitional zone of sandy dolomite; contact to Winnipeg Fm appears to be ground.</p>
181.6-189.98	<p>Winnipeg Fm:</p> <p>181.6-182.1 m. Argillaceous Sandstone: green-grey; fine grained; quartzose; grains appear sub-rounded; burrow mottled with light sand infilling burrows (<i>Chondrites</i> and <i>Planolites</i>).</p> <p>182.1-183.1 m. Very dark grey, argillaceous sandstone.</p> <p>183.1-186.0 m. Very light grey sandstone.</p> <p>186.0-187.7 m. Dark grey sandstone; with abundant Mn? laminae; extremely dark @ 187.3 m with a high clay content; very friable.</p> <p>187.7-188.8 m. Light grey, coarse grained sandstone.</p> <p>188.8-189.98 m. Dark grey, argillaceous sandstone; very friable; gradational lower contact.</p>
189.98	<p>Weathered Precambrian.</p>

FALCONBRIDGE WL-91-13
EAST WILLIAM LAKE
14-30-55-13WPM
5960222N
474650E

Ground Elevation: 265 m

Az.: 90°

Dips:

0.0-6.0m 45°

6.0-97.0m 48°30'

97.0-284m 47°

Map: 63G/14

Core boxes were very mixed, probably due to the presence of two holes mixed together. The picks, therefore were uncertain for WL-91-13, except for the top of the Precambrian and the Winnipeg Fm.

Logged by R.Bezys, 1992

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.0-12.0 (0.0-16.0)	First core box is missing - probably a mixture of bedrock, and overburden.
12.0-13.3 (16.0-17.8)	Fisher Branch Fm: buff to white, fine crystalline dolomite; slightly mottled; <i>Virgiana</i> present at 12.3m (16.4).
13.3-33.0 (17.8-44.0)	Stonewall Fm: 13.3-15.3 (17.8-20.4): Stonewall Marker: grey argillaceous dolomite; slightly brecciated; sharp upper contact. 15.3-16.0 (20.4-21.4): T-marker: grey to slightly yellow, argillaceous dolomite; minor sand. 16.0-16.9 (21.4-22.6): clean, mottled dolomite. 16.9-17.9 (22.6-23.9): Marker Bed?: slightly argillaceous dolomite; grey. 17.9-25.2 (23.9-33.6): clean, mottled dolomite. 25.2-25.5 (33.6-34.1): Marker Bed?: slightly argillaceous dolomite. 25.5-30.6 (34.1-40.9): clean, slightly mottled dolomite; slightly fossiliferous. 30.6-33.0 (40.9-44.0): Williams Mbr: argillaceous dolomite; massive to faintly laminated.
33.0-46.4 (44.0-62.0)	Upper Stony Mountain Fm: nodular, fine to medium crystalline dolomite, brown to tan; Gunton-like lithology.
46.4-62.8 (62.0-83.9)	Lower Stony Mountain Fm: less-nodular, massive, brown to tan, dolomite.
62.8-72.6 (83.9-97.0)	Upper Red River Fm (Fort Garry Mbr): grey argillaceous dolomite; sharp upper contact; conglomerate-breccia bed at top; another breccia bed at 63.4m (84.7).
72.6-148.5 (97.0-203.1)	Lower Red River Fm: massive to slightly nodular; fine to medium crystalline; light to dark brown; slight mottling texture; @ 145.1m containing some larger vugs, up to 3-5 cm in diameter - one with tiny pyrite crystals lining the vug (sample 88-91-2) - some containing faint needle cast impressions; at 147.9-148.5 m: very cream white dolomite; sharp lower contact? - not preserved due to bedding break and ground core.
148.5-163.8 (203.1-223.9)	Winnipeg Fm: 148.5-155.5 (203.1-212.6): Sandstone: very clean; white to off-white; quartz-rich; fine to medium grained; subrounded; slightly clayey (kaolin?); well rounded. 155.5-159.3 (212.6-217.8): Argillaceous Sandstone: fine to medium grained; grey to dark grey; numerous pyrite laminae and nodules; faint burrows @ 159.2; indistinctly to distinctly laminated, mainly due to the pyrite; pyrite blebs and specks quite abundant here also. 159.3-163.8 (217.8-223.9): Sandstone: Clean, white, quartzose sandstone; coarse grained (as above); at 157.7 m very dark olive-green shale.
163.8 (223.9)	Precambrian (approximate pick).

FALCONBRIDGE CL-91-14
CEDAR LAKE
8-24-52-19WPM
(box 39 is missing)
5928449N
425542E
Ground Elevation: 256.0 m
Dip: 50°, Az: 299°
Logged by R.Bezys, 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-7.7	No core.
7.7-9.2	Cedar Lake Fm. Very difficult to place contact. Awful core, becoming a very finely laminated, finely crystalline dolomite.
9.2-27.7	East Arm Fm. Dolomite: similar to CL-91-7; stromatolitic with brown to buff colouration; some zones are sublithographic with minor brecciation and lenses of green floating sand grains usually associated with breccia zones; at 22.2 m is very poor core-broken and rubbly.
27.7-30.2	Atikameg Fm. Dolomite: drillers report a rod drop losing 2 feet (60 cm) of core; finely laminated to very porous dolomite; yellow to buff grey in colour; minor breccia present; 10-15% porosity.
30.2-39.0	Moose Lake Fm. Dolomite: fine to medium crystalline; light brown buff in colour, some grey; extensive development of grainstone-like beds; other areas very sublithographic; variable porosity throughout, some zones up to 10-15% especially between 35.2 and 39.0 m; very minor stromatolites; throughout the formation are numerous, thin green sand and clay intervals.
39.5-39.7	U₁-marker: intraformational breccia zone;
39.7-56.9	Fisher Branch Fm. Dolomite: very fine crystalline to sublithographic; light buff in colour; porcellaneous; contact to Moose Lake is hard to place; both contacts are gradational; good <i>Virgiana</i> at base.
56.9-73.9	<p>Stonewall Fm. Dolomite: less pink in colour than CL-91-7; vuggy porosity (8%) associated with more nodular units; becoming more dense and finely laminated towards 62.8 m; small breccia zones at 63.0 m.</p> <p>T₁-marker 60.5-61.5 m: very dark brown to grey in colour; slight silt at 61.3 m; fine to medium grained, no red colouration; back into regular Stonewall-type lithology to 56.9 m; although upper 1.0 m is more argillaceous to grey brown in colour.</p> <p>T₂-marker 62.2-63.0 m: very dark brown to grey; rest of Stonewall is a nodular and clean dolomite.</p>
73.9-107.5	Stony Mountain Fm. Brown, nodular dolomite (Gunton-like): at base is a brown slightly argillaceous appearing dolomite with repetitive hardgrounds? (2-3) as seen in CL-91-7; sample 88-30-91 taken of breccia interval at 108.7-108.8 m.
107.5-162.0	<p>Red River Fm.</p> <p>107.5-124.2 m. Fort Garry Mbr.</p> <p>cycle 4 107.5-111.8 m. Dolomite: very intensely brecciated interval at top of cycle 4; blue grey, faintly mottled (possible burrows); very fine crystalline to sublithographic.</p> <p>cycle 3 111.8-116.7 m. Dolomite: small breccia zone at top; mixed lithologies of massive, faintly laminated dolomite with some nodular dolomite; chert is randomly scattered throughout in denser zones; gradational contact to cycle 2.</p> <p>cycle 2 116.7-119.7 m. Dolomite: abrupt change to blue grey mottled dolomite with distinct burrow pattern as seen before; no distinctive breccia zones; no chert.</p>

cycle 1 119.7-124.2 m. Dolomite: massive to faintly laminated; fine crystalline; abundant chert (up to 7%); gradational change to Lower Red River.

124.2-162.0 m. Lower Red River. Dolomite: upper 2 m appears argillaceous, burrow mottled and nodular as in CL-91-7, one nice *Favosites* fragment now silicified (4X5 cm) at 127.5 m; brown to light brown to cream white; fine crystalline (as seen before); sharp lower contact; slightly brecciated with fragments of dolomite (<1 cm) at base in sand.

162.0-170.7

Winnipeg Fm:

162.0-162.6 m: Interbedded sand and dolomite: very irregular; dolomite is yellow; sand is grey; grades to slightly argillaceous grey-white sand.

162.0-170.6 m: Argillaceous Sandstone: brown to grey; fine grained; scattered pyrite nodules; becoming a cleaner sandstone at 164.1 m; prominent pyrite blebs at 167.5-168.5 m; lower contact gradational.

170.7

Weathered Precambrian.

FALCONBRIDGE MB-91-15
MUDDY BAY - CEDAR LAKE
 (box 5 is missing)
3-20-51-19WPM
5918585N
419049E
Ground Elevation: 256.0 m
Dip: 50°, Az: 276°
Logged by R.Bezys, 1991

TRUE DEPTH (m)	DESCRIPTION
0.0-5.4	No core.
5.4-13.0	Cedar Lake Fm. Dolomite: buff yellow tan; very broken, rubbly core; slightly argillaceous; colours are probably a diagenetic effect; 0.4 m of dark grey clay infill (probably recent material).
13.0-48.7	East Arm Fm. Dolomite: top 4 boxes of core are very rubbly and broken, some minor bioclastic and vuggy zones (maybe part of Cedar Lake Fm.); very dense and sublithographic; tan to brown with laminations of floating sand grains; stromatolitic throughout; V-marker: (47.2-48.7) argillaceous and dark grey dolomite; at extreme base is an 8 cm, slightly sandy clayey, green-grey interval; rest of 1.5 m is quite arenaceous with floating sand grains throughout (calcarenite); sharp contact to Atikameg Fm.
48.7-53.4	Atikameg Fm. Dolomite: very vuggy (15-20% porosity); reefal-like; appears breccia-like; light brown to tan in colour; sharp contact to Moose Lake Fm.
53.4-62.0	Moose Lake Fm. Dolomite: grainstone; brown; very dense to sublithographic; minor stromatolitic intervals with very fine laminations; minor bioturbation; U₂-marker: (61-62 m) argillaceous, finely laminated dolomite; very sandy with slight brecciation and gradational upper and lower contacts.
62.0-75.1	Fisher Branch Fm. Dolomite: very difficult to place contacts; possible U ₁ -marker at 70.3-71.2 m; brown; faintly nodular; clean; dense; slightly bioclastic; no <i>Virgiana</i> found.
75.1-93.2	Stonewall Fm. Upper 80 cm is a grey, argillaceous, faintly laminated dolomite; minor breccia; possibly a marker bed (not sure which one); light brown in colour; nodular; quite vuggy (5% porosity); minor bioclastic material (<i>Favosites</i> ??). upper T-marker. 83.1-83.5 m. Dolomite: argillaceous; purple-red. Between the markers is a nodular, tan to brown dolomite, very massive in places to slightly porous in places. lower T-marker. 85.9-86.2 m. Dolomite: argillaceous; laminated; purple-red staining throughout; some minor yellow colouration; lower portion is very silty and brecciated with some grains being quite rounded; very mixed lithologies and colours. Williams Mbr?: Lower part of the Stonewall is very fine grained, slightly argillaceous, light brown to tan dolomite: very massive; low porosity; faintly laminated in places becoming more grey in colour and more argillaceous at 86.9 m.
93.2-119.4	Stony Mountain Fm. Gunton-like lithology. 93.2-116.6 m. Dolomite: very nodular; some burrow mottling; minor argillaceous partings; do not see Penitentiary-like lithology. Transition Zone. 116.6-119.4 m. Dolomite: nodular; granular; possibly bioclastic; fine to medium crystalline; numerous hardgrounds (as seen in previous Cedar Lake drillholes).

119.4-174.4

Red River Fm.

119.4-135.9 m. Fort Garry Mbr.

cycle 4. 119.4-127.5 m. Dolomite: laminated; argillaceous; upper 80 cm is brown, very vuggy, possibly a grainstone; porosity is low; possible burrows (5%); minor brecciation; possible hardground surface; change in colour moving down to browns and blues into a blue-grey; slightly vuggy; laminated to brecciated dolomite; base is a massive, finely laminated, argillaceous dolomite, brown to tan in colour.

cycle 3. 127.5-129.5 m. Dolomite; argillaceous; massive; slightly burrow mottled at top; 2% porosity; indistinctly nodular with argillaceous laminations; light brown-tan in colour.

cycle 2. 129.5-133.2 m. Dolomite: bioturbated; upper 40 cm is a fine breccia as seen before with nodular dolomite; quite dense; tight; massive; very fine crystalline to sublithographic; predominantly burrow mottled with indistinct mottling in places-appears to be nodular to brecciated with rounded clasts; dark brown to blue-grey in colour.

cycle 1. 133.2-135.9 m. Dolomite: argillaceous; massive; light cream tan in colour; faintly burrow mottled; cherty (up to 15% as nodules and lenses with quite dark centres in some and some with small burrowed centres (*Chondrites?*); occasional argillaceous laminations; finely laminated in places.

135.9-174.4 m. Lower Red River. Dolomite: Slightly argillaceous; mottled, finer burrow mottles at top 0.5-1.0 m; medium crystalline; very irregular contact with stringers of dolomite and pyrite mineralization; sharp lower contact.

174.4-185.1

Winnipeg Formation. Argillaceous Sandstone: interbedded upper contact to Red River Fm of very argillaceous, dark grey to brown sandstone and sandy dolomite; sandstone is fine to medium grained; quartzose; friable.

177.4-181.4 m. Clean sandstone: fine to medium grained; (as seen before).

181.4-185.1 m. Argillaceous Siltstone to 182.8 m: light green to olive green; dense; clayey; fine grained; (odd unit - not seen before).

Rest of interval is interbedded clean sandstone and argillaceous sandstone with scattered pyrite mottling and nodules; lower contact gradational.

185.1

Weathered Precambrian.

FALCONBRIDGE WL-91-16
NORTH WILLIAMS LAKE
15-9-57-14WPM
5974182N
468997E
Ground Elevation: 267.0 m
Dip: 45°, Az: 148°
(not logged - missing core?)

WL-91-17
FALCONBRIDGE - WILLIAM LAKE
8-7-56-13W
5963402N
475344E

Ground Elevation: 265.2 m

m	Az.	Deg.
0.00	222°43'	45°30'
25.60	231°	46°30'
86.56	232°	47°
147.52		46°30'
147.52	104°	46°30'

Map 63G/14

Logged by R.Bezys, August 31, 1993

Missing box 7

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-15.35 (0.00-21.34)	Lake and overburden.
15.35-16.43 (21.34-22.74)	Stonewall Fm: light brown to tan wackestone; lower contact gradational.
16.43-19.92 (22.74-27.46)	Stonewall Fm (Williams Mbr): light brown to brown laminated mudstone; gradational lower contact.
19.92-46.37 (27.46-63.79)	Stony Mountain Fm: light brown to tan wackestone; mottled and nodular; minor fossiliferous material (corals); gradational lower contact.
46.37-53.57 (63.79-73.55)	Upper Red River Fm (Fort Garry Mbr): grey mudstone; laminated intervals; minor brecciated intervals; very broken up core; gradational lower contact.
53.57-86.78 (73.55-118.18)	Lower Red River Fm: light grey-brown to tan wackestone; nodular; scattered white tripolized chert; very broken up core; no lower contact.
86.78-91.80 (118.18-126.03)	Winnipeg Fm (off company log).
91.80 (126.03)	Precambrian.

WL-91-18
FALCONBRIDGE - WILLIAM LAKE
4-7-56-13W
5963956N
474576E

Ground Elevation: 265.18 m

m	Az.	Deg.
0.00	220°30'	47°00'
18.00	--	47°30'
18.00	220°30'	47°30'
71.00	--	49°30'
71.00	--	49°30'
71.00	223°00'	49°00'
131.00	--	49°30'
191.00	--	49°30'
191.00	220°00'	49°30'

Map 63G/14

Logged by R. Bezys, August 18, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-4.56(?) (0.00-6.23(?))	Overburden.
4.56(?) - 9.70 (6.23(?) - 13.15)	Interlake Group: Fisher Branch Fm: light brown wackestone; no distinct <i>Virgiana decussata</i> at base; minor coral debris, paleofavositids (?); core is very broken up and rubbly very close to the surface; porosity is 5-7%, small vugs; sharp lower contact.
9.70-29.31 (13.15-39.75)	Stonewall Fm: 9.70-10.54 (13.15-14.30): Upper Stonewall Marker: grey to dark grey mudstone; very minor lamination; no distinct conglomerated beds; gradational lower contact. 10.54-12.39 (14.30-16.80): unit 7: brown to light brown mudstone; irregularly laminated; massive; porosity is <1%, pinpoint and minor vugs; gradational lower contact. 12.39-12.90 (16.80-17.50): upper T-marker: red olive brown mudstone; distinctly mottled with minor burrow mottling; at 12.53-12.90m (17.00-17.50) is a shale-silt infill; porosity is <1-2%, pinpoint; sharp lower contact. 12.90-16.59 (17.50-22.50): unit 5: light brown to brown mudstone; faint lamination throughout; some portions mottled; at 14.01-14.38m (19.00-19.50) is a dark grey mudstone which may be the lower T-marker ?; porosity is 2-3%, pinpoint; gradational lower contact. 16.69-21.31 (22.50-28.90): unit 4: light brown to brown-tan wackestone; normal marine sequence with minor fossiliferous material, coral fragments (paleofavositids?); rare white tripolized chert nodules; porosity is 5-10%, vugs; gradational lower contact. 21.31-21.90 (28.90-29.70): lower T-marker: dark grey mudstone; faint diagenetic mottling appears to be burrow mottling; porosity is <2%, pinpoint; sharp lower contact. 21.90-25.73 (29.70-34.90): unit 2: light brown-tan massive wackestone; normal marine sequence, although minor coral debris found, not very fossiliferous, good paleofavositids fragments towards the base; porosity is 5-10%, vuggy; sharp lower contact. 25.73-29.31 (34.90-39.75): Williams Mbr: brown to dark brown with grey diagenetic mottling mudstone; massive; minor lamination; porosity is <1%, pinpoint; gradational lower contact.
29.31-56.04 (39.75-74.26)	Stony Mountain Fm: light brown to brown mottled wackestone; abundant hard ground surfaces present in lower half; massive; very minor white tripolized chert present as small nodules; porosity is 3-4%, vugs and pinpoint; sharp lower contact.

56.04-65.58 (74.26-86.90)	Upper Red River Fm (Fort Garry Mbr): grey to dark grey-brown mudstone; minor laminated intervals; minor brecciated intervals with a 7.5cm (10.0) breccia bed at the extreme top; some bituminous partings present at the top; rare pyrite mineralization as blebs; porosity <2%, pinpoint; at lower contact is a thin bituminous shale parting; gradational lower contact.
65.58-99.32 (86.90-131.00)	Lower Red River Fm: light grey-brown wackestone; massive; fine crinoidal debris throughout; scattered white tripolized chert; three scattered fractures present at 96.18-97.02m (126.49-127.59), 45° to core axis; mud infill present at 89.87-90.02m (118.19-118.39) along a bedding plane; mud infill also present at 88.69m (116.64) is 0.5cm thick along a bedding plane; at 78.41m (103.11) is a mud infill along a joint <1.0cm thick; slightly more argillaceous towards the top; at 69.70-69.92m (92.35-92.65) is a near vertical (to core axis) sand-silt fracture infill, 1.0cm thick, possibly a brittle fracture, (sample 88-26-93); slightly more burrow mottled; porosity is 3-5%, pinpoint and minor vugs.
99.32-108.62 (131.00-142.85) 108.62 (142.85)	Winnipeg Fm: (off company log) Precambrian.

Note: Bottom of last box is 160.46m (211.00). Red River Fm-Winnipeg Fm and Winnipeg Fm-Precambrian contacts are missing.

WL 91-19
FALCONBRIDGE - WILLIAM LAKE
8-7-56-13WPM
5963402N
475344E

Ground Elevation: 265.18m

m	Az.	Deg.
0.00	224°10'	45°30'
46.94	226°	45°30'
49.99	226°	45°30'
53.04	225°	45°30'
114.00	229°	46°30'
174.96	222°	47°30'

Map: 63G/14

Logged by R. Bezys, August 11, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-10.87 (0.00-15.24)	Overburden.
10.87-25.82 (15.24-36.20)	Unit consists of interbedded intervals of sand silt and clay, various colours of white to grey to orange to purple, lots of limonitic and hematitic staining; may have been burrowed; at 10.84-13.92m (15.24-19.51) is an intervals of till materials; scattered boulder fragments of dolomite boulders and Precambrian boulders. Sample 88-25-93 [13.92-26.03 (19.51-36.20)] sent to the GSC for dating - barren of fossils.
25.82-30.38 (36.20-42.60)	Stonewall Fm: Williams Mbr: light olive brown to grey mudstone to wackestone; slightly mottled; at 28.61-29.04m (40.11-40.72) is an infill of dark brown clay; lower part of unit looks like Williams Mbr but may still be in the Stony Mountain Fm.; sharp lower contact.
30.38-56.58 (42.60-79.32)	Stony Mountain Fm: light brown-tan wackestone; massive; mottled; some mottled intervals appear brecciated; some sand-clay coatings along joint faces/fracture faces ?; at 33.48-34.17m (46.94-47.91) is a very fine to fine grained red-brown silt infill, unconsolidated; at 52.03-52.25 (72.95-73.25) is a light brown clay infill; porosity is 5-7%, small vugs; sharp lower contact.
56.58-68.47 (79.32-94.39)	Upper Red River Fm (Fort Garry Mbr): green-brown to grey mudstone; massive with brecciated intervals and some laminated intervals; very brecciated in the upper 14.3cm (20.0); porosity is <2%, pinpoint; sharp lower contact.
68.47-102.23 (94.39-139.79)	Lower Red River Fm: light brown to brown mottled wackestone; massive; scattered white tripolized chert throughout as small nodules and lenses; scattered fossiliferous material indistinguishable (crinoids?); becomes more mudstone-rich and extensively bioturbated at the top; at 75.00-75.11m (103.40-103.55) is a clay infill zone, light brown silt-clay, most is washed away; porosity is 5-7%, pinpoint and vuggy.
102.23-111.90 (139.79-152.40)	Winnipeg Fm (off company log)
111.90 (152.40)	Precambrian.

Note: Bottom of last box is 97.93m (135.00). Red River Fm-Winnipeg and Winnipeg Fm-Precambrian contacts are missing.

WL 91-20
FALCONBRIDGE - WILLIAM LAKE
7-7-56-13W
5963372N
475146E

Ground Elevation: 265.2 m

m	Az.	Deg.
0.00	223°	50°
22.86		50°30'
22.86	238°	50°30'
86.56	230°	52°
147.52		52°
147.52	218°	52°

Map 63G/14

Logged by R. Bezys, August 31, 1993

Only 8 boxes available (4,8,10,11,12,15,19,20), therefore picks are approximate

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-12.93 (0.00-16.76)	Lake and overburden.
12.93-50.51 (16.76-64.77)	Only 22.45-50.51 (29.10-64.77) Stony Mountain Fm: light brown to tan wackestone; mottled and nodular.
50.51-53.83 (64.77-68.78)	Upper Red River Fm (Fort Garry Mbr): (incomplete) grey mudstone; 50 cm of infill mud.
53.83-88.71 (68.78-112.57)	Lower Red River Fm: light grey-brown to tan wackestone; nodular.
88.71-93.10 (112.57-118.92)	Winnipeg Fm (off company log).
93.10 (118.92)	Precambrian.

Falconbridge
Corehole WL 91-21
William Lake
5-8-56-13W
5963459N
475788E

Elevation: 270.5m

Map sheet: 63G/14

Logged by R. Bezys, June 15, 1993

m	Az.	Deg.
0	--	45°00'
177	--	41°00'
184	--	42°30'
200	--	43°30'

METRES (MEASURED)
[TRUE DEPTH]

DESCRIPTION

0.00-6.00
[0.00-4.24]
6.00-9.40
[4.24-6.65]

OVERBURDEN

**SILURIAN
INTERLAKE GROUP**

MOOSE LAKE FORMATION:

light brown to tan, massive to faintly laminated packstone to grainstone- porosity is 2-3%, pinpoint; gradational lower contact.

U₁-Marker:

9.40-11.67
[6.65-8.25]

light brown to olive green, laminated to brecciated mudstone- scattered floating sand grains; porosity is <1%, pinpoint; gradational lower contact.

FISHER BRANCH FORMATION:

11.67-23.55
[8.25-16.65]

light brown to tan, massive grainstone to packstone- very fossiliferous in the lower half, mainly coral debris, no well developed *Virgiana decussata* beds at the base; porosity is 5-15%, mainly vugs, fossil solutioning and pinpoint; sharp lower contact.

23.55-55.00 [16.65-37.98]
23.55-24.75 [16.65-17.50]

STONEWALL FORMATION:

Upper Stonewall Marker:

light grey to grey, laminated to brecciated mudstone- porosity is <1%, pinpoint; gradational lower contact.

24.75-27.90 m [17.50-19.73]: unit 8: light brown tan, massive mudstone, minor mottling; porosity is <1%, pinpoint; sharp lower contact.

27.90-29.26
[19.73-20.69]

Upper T-Marker:

distinctly red, mottled, laminated, slightly brecciated mudstone- small veinlets of pyrite mineralization occurs throughout, especially at the upper contact; porosity is <1%, pinpoint; sharp lower contact.

ORDOVICIAN

29.26-47.72
[20.69-32.95]

LOWER STONEWALL FORMATION:

unit 6: light brown tan, slightly mottled wackestone- massive; porosity is 5-8%, vuggy; sharp lower contact.

29.90-34.00 m [20.65-23.48]: unit 5: dark brown to light brown to blue-grey; laminated mudstone- minor brecciated intervals; darker green colouration occurs towards the top; porosity is <1%, pinpoint and small vugs; gradational lower contact. 34.00-41.00 [23.48-28.31]: unit 4: light brown tan mottled wackestone to packstone- abundant fossiliferous debris, mainly corals and favositids; porosity is 10-15%, vuggy and fossil solutioning; sharp lower contact.

41.00-42.35
[28.31-29.24]

Lower T-Marker:

green-grey, laminated to slightly brecciated mudstone- porosity is <1%, pinpoint; gradational lower contact.

42.35-47.72 m [29.24-32.95]: unit 2: light brown to brown, mottled wackestone, becoming more mudstone-rich towards the top; very porous at the base, porosity is 10-15%, vuggy, and decreases upwards to 2-4% at the top, pinpoint; sharp lower contact.

Williams Member:

47.72-55.00
[32.95-37.98]

distinctly blue-grey to brown to olive green, laminated to partly mottled mudstone- extremely finely laminated in places with carbonaceous partings; at 50.72-51.00 m [35.02-35.22] exists a light brown to brown silty clay infill; porosity <1%, pinpoint; gradational lower contact.

55.00-95.30
[37.98-64.19]

STONY MOUNTAIN FORMATION:

light brown to brown, massive wackestone- slight fossiliferous material, mainly crinoidal and coral debris; lower 4.05-7.01 m containing scattered hardground surfaces; slightly bioturbated; porosity is 3-4%, vuggy and pinpoint; sharp lower contact.

95.30-110.41
[64.19-74.36]

UPPER RED RIVER FORMATION

Fort Garry Member:

blue-grey to brown, massive laminated mudstone- some intervals extremely brecciated in the upper 50.0-75.0 cm; porosity is <1%, pinpoint; sharp lower contact.

110.41-158.75
[74.36-104.15]

Lower Red River:

light brown to brown, mottled to burrowed wackestone- massive; scattered white tripolized chert throughout; porosity is 2-3%, pinpoint and vuggy; gradational lower contact.

158.75-172.28
[104.15-113.02]

WINNIPEG FORMATION:

158.75-168.10 m [104.15-110.28] (34.0 cm [23.4] of missing Winnipeg Formation core): upper unit: light grey, essentially well consolidated quartz sandstone- fine grained, minor unconsolidated intervals; gradational lower contact.

168.10-168.93 m [110.28-110.83]: middle unit: slightly argillaceous quartz siltstone/sandstone- interbedded, fine grained; gradational lower contact.

168.93-172.28 m [110.83-113.02]: lower unit: light grey to white, thin bedded to massive quartz sandstone- fine to medium grained; sharp lower contact.

172.28-589.00
[113.02-405.44]

PRECAMBRIAN

NOTE: True depth may not be accurate.

End of Hole

WL 91-22
FALCONBRIDGE - WILLIAM LAKE
16-28-57-14W

5978946N
469133E

Ground elevation: 275.00m

m	Az.	Deg.
0	180°	45°
91.44	--	44°
185.62	--	44°

Map: 63G/14

Logged by R. Bezys June 15, 1993

TRUE DEPTH (m)
(measured depth)

DESCRIPTION

0.00-0.86
(0.00-1.22)
0.86-26.63
(1.22-38.00)

Overburden.

Interlake Group:

0.86-4.74 (1.22-6.71): East Arm Fm: light brown to dark brown, variably textured unit, contains stromatolitic intervals, brecciated intervals, and some wackestone intervals, predominantly mudstone; core becomes very broken and rubbly at the top, not very well preserved; no hint if V-marker.

4.74-6.43 (6.71-9.09): U₂-marker: light brown to brown to green-grey laminated mudstone containing brecciated units and arenaceous intervals; porosity is 2%, mainly pinpoint, some vugs; gradational upper contact.

6.43-10.75 (9.09-15.20): Atikameg Fm: light brown to brown to orange buff, massive, wackestone to packstone to grainstone; no discernable fossil material; very porous, porosity is 15-20%, vugs are filled with green clay material; gradational upper contact; subunit: lower 35.36cm (50.00) of this unit is a light brown to brown conglomeratic/brecciated mudstone, some lamination, upper contact not well preserved to the Atikameg Fm.

10.75-16.71 (15.20-23.84): Moose Lake Fm: light brown to brown variably textured unit with grainstone, packstone and breccia units; well developed stromatolitic units; distinct intraformational breccia bed at 14.63-14.98m (20.69-21.19); porosity is 2-3%, pinpoint; sharp upper contact. 16.71-18.41 (23.84-26.27): U₁-marker: dark brown to brown slightly laminated and brecciated mudstone; porosity is <1%, pinpoint; sharp upper contact; this U₁-marker is not very well preserved or as distinctive as previous U₁-marker.

18.41-26.63 (26.27-38.00): Fisher Branch Fm: light brown to tan, packstone to grainstone, massive, slightly more mudstone-rich at the top; at the lower 35.36-53.03cm (50.00-75.00) is a very fossiliferous interval containing some *Virgiana decussata* and some coral debris.; porosity is 5-8%, large vugs and pinpoint; gradational upper contact.

26.63-41.69
(38.00-59.48)

Stonewall Fm:

26.63-27.47 (38.00-39.19): upper Stonewall Fm: grey to brown mudstone with slightly conglomeratic units at the top, massive; porosity is <1%, pinpoint; sharp upper contact.

27.47-29.49 (39.19-42.07): unit 8: light brown to brown slightly mottled wackestone/mudstone; porosity is <2-3%, small vugs and pinpoint; gradational upper contact.

29.49-30.08 (42.07-42.92): upper T-marker: distinctly red to green brecciated to slightly laminated mudstone; porosity is 1-2%, pinpoint; upper contact is distinctly pyrite mineralized

30.08-30.76 (42.92-43.89): unit 6: light brown tan slightly mottled wackestone, massive; porosity is 2-4%, vuggy and minor pinpoint; sharp upper contact.

30.76-33.11 (43.89-47.24): unit 5: light brown to blue-green laminated mudstone; porosity is <1%, pinpoint; upper contact not preserved.

33.11-36.76 (47.24-52.44): unit 4: light brown to tan mottled wackestone, massive; scattered chert nodules, mainly tripolized with white centers and solid black rims; fine carbonaceous laminae, horsetail stylolites ?; porosity is 3-5%, vuggy and pinpoint; sharp upper contact.

36.76-37.25 (52.44-53.14): lower T-marker: blue-grey to red bioturbated to laminated mudstone; there is pyrite mineralization along fractures at the top; porosity is <1%, pinpoint.

37.25-40.38 (53.14-57.61): unit 2: light brown to brown mottled wackestone which grades upwards to brown mudstone; the wackestone is slightly fossiliferous at the base, mainly coral debris; the entire unit contains fine wispy carbonaceous laminations, they look like horsetail stylolites; becomes distinctly red stained in the mudstone portion upwards in the unit; porosity is 2-3% vuggy in the wackestone, to <1% pinpoint in the mudstone portions; sharp upper contact.

40.38-41.69 (57.61-59.48): Williams Mbr:: brown to red laminated mudstone; red colouration probably due to oxidation along bedding planes; porosity is <1%, pinpoint; sharp upper contact.

- 41.69-70.30 (59.48-101.20)** **Stony Mountain Fm:** brown to lith brown to buff distinctly mottled wackestone; extensive hardground surfaces in the lower 3.47-4.86m (5.00-7.00); scattered fossiliferous horizons, mainly coral debris; becomes more mudstone-rich in the upper half; at 58.02-58.25m (83.52-83.85) there is an interval of white clay infill material; some zones are very porous due to vugs, porosity is 5-10%, although averaging 5%, large and small vugs, and pinpoint; sharp upper contact.
- 70.30-79.40 (101.20-114.30)** **Upper Red River Fm (Fort Garry Mbr):** blue-grey to green-grey brown laminated to slightly brecciated, slightly mottled mudstone; scattered clay laminae throughout; becomes more extensively brecciated from 0.35-0.52m (0.50-0.75) at the top; at 70.72m (101.80) there is a 5.56cm (8.00) clay bed (not infill material); porosity is <1%, pinpoint.
- 79.40-108.02 (114.30-155.50)** **Lower Red River Fm:** light brown to brown to grey, mottled wackestone; some bioturbation; massive; scattered white tripolized chert nodules, there is an increase in chert nodules above 86.83m (125.00); porosity is 2-3%, pinpoint and vuggy; gradational upper contact.
- 108.02-114.68 (155.50-165.09)** **Winnipeg Fm:**
 108.02-110.45 (155.50-159.00): **upper unit:** light grey to white, massive sandstone, fine to medium grained, essentially consolidated; sharp upper contact, but not well preserved.
 110.45-111.15 (159.00-160.01): **middle unit:** dark grey to black argillaceous sandstone to siltstone with interbedded lenses; some pyrite mineralization in a lens shape; no core missing; gradational upper contact.
 111.15-114.68 (160.01-165.09): **lower unit:** light grey to white quartz sandstone, fine to medium grained, essentially consolidated, some minor unconsolidated intervals; scattered pyrite mineralization towards the base as small nodules and knots; gradational upper contact.
- 114.68 (165.09)** **Precambrian.**

WL 91-23
FALCONBRIDGE - WILLIAM LAKE
9-28-57-14W
5978653N
469139E

Ground elevation: 270.00m

m	Az.	Deg.
0	180°	45°
10.36	--	46°
10.36	162°	46°
91.44	--	47°
91.44	164°	47°
137.16	--	50°
137.16	162°	50°

Map: 63G/14

Logged by R. Bezys June 15, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-2.14 (0.00-3.04)	Overburden. 1.32-2.14 (1.82-3.04): Overburden?: broken rubbly pieces, probably overburden till material.
2.14-23.38 (3.02-32.50)	Interlake Group: 2.12-3.95 (3.02-5.49): U₂-marker: orange-brown to gray-brown mudstone; very broken up core, poorly preserved; scattered green-grey clay infill material along bedding planes; porosity is 2-3%, small vugs and pinpoint. 3.95-8.24 (5.49-11.46): Atikameg Fm: buff massive grainstone to packstone; very porous, porosity si 15-20%, vuggy and pinpoint; upper contact probably sharp, but not preserved. 8.24-14.34 (11.46-19.93): Moose Lake Fm: light brown to brown to grey variably textured unit, mainly grainstone, packstone, mudstone; minor breccia unit at 11.73m (16.30), and is 14.39cm (20.00) thick (as seen before); porosity is <2% pinpoint, some vugs; gradational upper contact. 14.34-15.34 (19.93-21.33): U₁-marker: light brown to brown massive mudstone with minor brecciation; ; contains one clay infill bed at 14.59-14.73m (20.28-20.48); porosity is <1% mainly pinpoint; gradational upper contact. 15.34-21.33 (21.33-32.50): Fisher Branch Fm: light brown to brown massive grainstone to packstone; becomes more mudstone-rich towards the top; minor <i>Virgiana decussata</i> fossils in the lower 35.97cm (50.00), very rare; porosity is 5-10%, vuggy; gradational upper contact.
23.38-44.04 (32.50-60.22)	Stonewall Fm: 23.38-24.42 (32.50-33.95): Upper Stonewall Marker: light grey to grey, slightly brecciated conglomeratic mudstone, massive; porosity is <1%, pinpoint; sharp upper contact. 24.42-26.13 (33.95-36.32): unit 6: light brown to brown, slightly mottled wackestone, predominantly mudstone; porosity id 2-3%, vuggy and pinpoint; gradational upper contact. 26.13-26.82 (36.32-37.29): upper T-marker: red to green-grey, slightly brecciated and slightly laminated mudstone; distinct pyrite mineralization at top along bedding plane, as seen before; porosity is <1%, pinpoint; sharp upper contact. 26.82-33.18 (37.29-46.13): unit 4: subdivided into 3 units: 26.82-27.49 (37.29-38.22), light brown tan more normal marine wackestone, mottled, porosity is 2-3%, vuggy and some fossil solution, sharp upper contact; 27.49-29.77 (38.22-41.38), light brown to tan laminated mudstone, slightly brecciation in places, minor black pyrite mineralization, porosity is <1% pinpoint, gradational upper contact; 29.77-33.18 (41.38-46.13), light brown to tan wackestone, mottled, minor red colouration, porosity is 5%, vuggy, gradational upper contact. 33.18-33.77 (46.13-46.95): lower T-marker: green-grey to brown slightly bioturbated to laminated mudstone; abundant cross-cutting black pyrite veinlets; porosity is <1% pinpoint; gradational upper contact. 33.77-37.64 (46.95-51.47): unit 2: light brown to brown wackestone, normal marine

sequence at base, gradually grading upwards to mudstone to the top; porosity is 5-10% at the base, diminishing upwards; sharp upper contact.

37.64-44.04 (51.47-60.22): **Williams Mbr**: light brown to brown-grey laminated mudstone, some portions massive; minor black pyrite in cross-veining in places; minor joint fractures (2); porosity is <1%, pinpoint; upper contact appears sharp but not preserved.

44.04-69.04
(60.22-94.40)

Stony Mountain Fm: light brown to tan, massive, distinctly nodular to burrowed wackestone; extensive hardground surfaces in the lower 3.66-5.12m (5.00-7.00); porosity is 5%, extensive vugs in places; gradational upper contact.

69.04-79.78
(94.40-109.08)

Upper Red River Fm (Fort Garry Mbr): blue-grey to brown massive mudstone; some intervals are faintly mottled and some with lamination; at 78.34-78.42m (107.12-107.22) is a silty clay infill, light brown to grey; scattered throughout are fine argillaceous partings; the upper 0.73m (1.00) is brecciated in places; porosity is <1%, pinpoint; sharp upper contact.

79.78-115.86
(109.08-151.24)

Lower Red River Fm: light brown to tan mottled wackestone, massive; scattered tripolized white chert nodules; porosity is <55, pinpoint and scattered vugs; sharp upper contact.

115.86-124.24
(151.24-162.19)

Winnipeg Fm: light grey to white massive sandstone, fine to medium grained, some coarse grained zones at the base; in the lower 0.38-0.57m (0.50-0.75) the sand is extensively pyrite mineralization, up to 100% mineralization in places as major knots and lenses; in places the sand is finely bedded especially between 122.72-123.72m (160.20-161.50); essentially consolidated sand with some minor unconsolidated intervals; there are some slightly more argillaceous sandstone intervals at 120.12m (156.81), it is 7.66cm (10.00) thick bed; sharp lower contact; sharp upper contact; even representation, no core missing.

124.24 (162.19)

Precambrian.

WL-91-24
FALCONBRIDGE - WILLIAM LAKE
1-7-56-13W
5963006N
475542E

Ground Elevation: 274.30m

m	Az.	Deg.
0	225°	45°00'
13	227°	45°00'
61	226°	45°30'
151	227°	45°30'

Map: 63G/14

Logged by R. Bezys June 15, 1993

TRUE DEPTH (measured depth)	DESCRIPTION
0.00-4.95 (0.00-7.00)	Overburden.
4.95-17.68 (7.00-25.00)	Only 6.98m (9.87) of core exists for this interval; clay and silt infill material throughout; at 4.95-16.26m (7.00-23.00) is a jumbled assortment of mixed lithologic textures that cannot be subdivided due to the extremely fractured and broken up character of the rock; lower contact not preserved.
16.26-37.59 (23.00-52.70)	<p>Stonewall Fm:</p> <p>16.26-17.29 (23.00-24.46): Upper Stonewall Marker: grey to brown, slightly brecciated mudstone; porosity is <1%; lower contact not preserved; description is based only on fragments.</p> <p>17.29-19.89 (24.46-28.00): unit 9: light brown tan, massive mudstone to wackestone; featureless; porosity is 2%, vuggy; lower contact not preserved; core is very poorly represented due to broken core, especially from 17.29-17.68m (24.46-25.00).</p> <p>19.89-20.42 (28.00-28.75): upper T-marker: green-grey brecciated/conglomeratic mudstone; very clayey and disintegrating at the base; porosity is <1%, pinpoint; sharp lower contact.</p> <p>20.42-20.91 (28.75-29.45): unit 7: light brown to brown, mottled massive wackestone; porosity is 2-3%, mainly vuggy; sharp lower contact, not well preserved.</p> <p>20.91-21.27 (29.45-29.95): unit 6: green-grey to grey-brown, slightly brecciated mudstone; appears to be the lower-most portion of the upper T-marker; porosity is <1%, pinpoint; gradational upper contact.</p> <p>21.27-22.92 (29.95-32.28): unit 5: brown to tan laminated mudstone; porosity is <1%, pinpoint; gradational lower contact.</p> <p>22.92-27.87 (32.28-39.24): unit 4: light brown to tan, mottled wackestone; very porous and fragmental, porosity is 5-10%, vuggy and some pinpoint; lower contact not well preserved; very poor core, especially between 24.79-26.99m (34.90-38.00).</p> <p>27.87-28.58 (39.24-40.24): lower T-marker: blue-grey to brown, slightly brecciated mudstone; minor pyrite mineralization; lower half is very clayey; porosity is <1%, pinpoint; sharp lower contact.</p> <p>28.58-32.97 (40.24-46.43): unit 2: light brown to brown to tan, massive wackestone to mudstone towards the top; scattered white tripolized chert nodules; very good normal marine sequence in the lower half with scattered coral head fragments; porosity is 5%, mainly vugs and fossil solutioning, minor pinpoint; sharp lower contact.</p> <p>32.97-37.59 (46.43-52.70): Williams Mbr: brown to dark brown, massive to laminated mudstone; porosity is <1%, pinpoint; gradational lower contact.</p>
37.59-64.48 (52.70-90.40)	<p>Stony Mountain Fm: brown to grey, mottled wackestone, massive with extensive hardground development in the lower 5.00-10.00m; minor fossil material, i.e. gastropods; becomes slightly more mudstone-rich towards the top; porosity is 2-3%, vuggy and pinpoint; sharp lower contact.</p>

64.48-75.00 (90.40-105.15)	Upper Red River Fm (Fort Garry Mbr): blue-grey to brown, laminated to brecciated mudstone; the upper 50.0cm is extremely brecciated; porosity is <1%, pinpoint; gradational lower contact.
75.00-107.70 (105.15-151.00)	Lower Red River Fm: brown to dark brown, burrow mottled massive wackestone; scattered white tripolized chert nodules throughout; scattered fossil material, primarily coral debris; distinctly coloured pyrite mineralization at the base; fracturing occurring at 99.95-100.21m (140.14-140.50), near vertical fractures, three in a row with the top one dilated by 3.0cm and filled with a black silt clay material; porosity is 2-3%, vuggy and pinpoint; sharp lower contact.
107.70-116.26 (151.00-163.00)	Winnipeg Fm: 107.70-114.16 (151.00-160.06): upper unit: light grey to light brown, quartz sandstone, massive, fine to medium grained; minor pyrite mineralization as indiscreet nodules; sharp lower contact. 114.16-114.33 (160.06-160.30): middle unit: blue-grey to green grey, finely bedded siltstone-mudstone; sharp lower contact. 114.33-116.26 (160.30-163.00): lower unit: light grey to white, primarily consolidated quartz sandstone, fine to medium grained; becoming slightly more consolidated and argillaceous towards the top; sharp lower contact.
116.26 (163.00)	Precambrian.

WL-91-25
FALCONBRIDGE - WILLIAM LAKE
1-7-56-13W
5963098N
475566E

Ground elevation: 271.00m

m	Az.	Deg.
0	225°	45°00'
22	228°	45°00'
50	229°	45°30'
124	0	45°30'
124	314°	45°30'

Map: 63G/14

Logged by R. Bezys June 14, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-4.24 (0.00-6.00)	Overburden.
4.24-11.55 (6.00-16.20)	Interlake Group: 4.24-6.36 (6.00-9.00): Overburden? : very broken up rubbly core with distinct boulder fragments from till material intermixed with solid dolomite fragments, looks like in situ bedding? 4.24-11.55 (6.00-16.20): Fisher Branch Fm : light brown tan grainstone packstone; fossiliferous with coralline debris throughout, no well developed <i>Virgiana</i> ; porosity is 5-10%, vuggy; top of well developed brachiopods at 6.36m (9.00).
11.55-35.09 (or 31.74) 16.20-49.20 (or 44.50)	Stonewall Fm: 11.55-12.27 (16.20-17.20): Upper Stonewall Marker : light grey to brown slightly brecciated/conglomeratic mudstone; porosity is <1%; sharp upper contact. 12.27-14.43 (17.20-20.23): unit 7 : light brown tan massive mudstone; distinctive silt bed infill between 13.55-13.69m (19.00-19.20); gradational upper contact. 14.43-15.19 (20.23-21.30): upper T-marker : red to green laminated mudstone, minor bioturbation; pyrite mineralization at top along bedding plane; possible faint cross-lamination ripple beds; porosity is <1% pinpoint; sharp upper contact. 15.19-17.83 (21.30-25.00): unit 5 : light brown to tan massive mudstone; porosity is 2%, small vugs; sharp upper contact. 17.83-22.36 (25.00-31.35): unit 4 : light brown tan wackestone; normal marine sequence, no discernable fossils; porosity is 10-15%, vuggy; gradational upper contact. 22.36-23.14 (31.35-32.45): lower T-marker : green-gray to gray slightly brecciated and laminated mudstone; porosity is <1%, pinpoint; upper contact not preserved. 23.14-27.22 (32.45-38.16): unit 2 : buff light brown wackestone; normal marine sequence, minor fossiliferous coral debris; at the base there's a 10.70cm (15.00) clay infill material (right at the contact to Williams Mbr); porosity is 5-10%, vuggy; sharp upper contact. 27.22-35.09 (or 31.74) (38.16-49.20 (or 44.50)): Williams Mbr : gray to olive brown laminated mudstone, some zones are massive; porosity is <1%; sharp upper contact.
35.09 (or 31.74)- 58.77 (49.20 (or 44.50)- 82.40)	Stony Mountain Fm : light brown tan burrow mottled wackestone to mudstone at top; porosity is 2-4%, pinpoint and vuggy; gradational upper contact
58.77-70.01 (82.40-98.15)	Upper Red River Fm (Fort Garry Mbr) : blue-gray to brown, massive to laminated mudstone; minor breccia beds to extensively brecciated to the upper 0.53-0.71m (0.75-1.00) from the top; porosity is <1%, pinpoint; sharp upper contact.

70.01-101.82 (98.15-142.76)	Lower Red River Fm: light brown to tan massive distinctly mottled to burrow mottled wackestone; at 100.84-101.46m (141.38-142.25) is a zone of jointing with one joint dilated to about 1.00cm and infilled with unconsolidated coarse grained sand and clay from below (photographs: roll #2, frame #7-8); at 80.83-82.42m (113.32-115.55) is a zone of broken up Red River Fm core which may have been joint faces, very closely spaced, no recent infill material along joint; porosity is 2-4%, pinpoint and vuggy; gradational upper contact.
101.82-110.68 (142.76-155.17)	Winnipeg Fm: light gray to white massive consolidated sandstone, very minor unconsolidated intervals, fine to medium grained, coarser towards the top; becomes somewhat argillaceous, at 108.02m there's a 57.06cm (80.00) bed of a very pyrite-rich and argillaceous-rich sandstone, slightly clay-rich towards the base of the unit; lower contact appears sharp, but difficult to determine due to coarse grained nature of Precambrian; scattered pyrite nodules at the base; sharp upper contact; 0.90m (1.26) of missing Winnipeg Fm core.
110.68 (155.17)	Precambrian.

WL-91-26
 FALCONBRIDGE - WILLIAM LAKE
 4-22-57-14W
 5976287N
 469392E
 Ground elevation: 271.3m

m	Az.	Deg.
0.00	104°	45°
53.34	85°	46°
99.06	85°	46°

 Map: 63G/14
 Logged by R. Bezys June 14, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-3.23 (0.00-4.57)	Overburden.
3.23-24.01 (4.57-9.20)	Interlake Group: 3.23-8.37 (4.57-11.83): Atikameg Fm: distinctly orange-brown to buff, appears to be a massive grainstone; porous reefal unit; scattered green-grey clay infill in vugs; porosity is 15-20%, vuggy; sharp lower contact. 6.51-8.37 (9.20-11.83): Marker Bed: light brown to grey-brown, finely laminated mudstone; some disrupted beds possibly due to soft sediment deformation; contorted bedding lamination appears to be stromatolitic lamination?; porosity is 1-2%, pinpoint; contact of base may be 7.35m (10.4)?; gradational lower contact. 8.37-12.97 (11.83-18.18): Moose Lake Fm: light brown, variably textured unit ranging from packstone to grainstone to mudstone; massive with some minor lamination in more mudstone-rich intervals; at 10.86-11.43m (15.22-16.02) is a distinct conglomeratic breccia bed with clasts as big as 2.1-3.6cm (3.0-5.0) and most are <0.7cm (1.0), probably the medial marker bed of the Moose Lake Fm; porosity is 2% pinpoint; gradational lower contact. 12.97-15.50 (18.18-21.73): U₁-marker: light grey to tan laminated to brecciated mudstone; porosity is <1%, pinpoint; gradational lower contact. 15.50-24.01 (21.73-33.67): Fisher Branch Fm: light brown to tan packstone to minor mudstone at top, massive with minor laminations in the mudstone-rich intervals; extremely fossiliferous in lower 3.57m (5.00) with a distinct <i>Virgiana decussata</i> zone in the lower 53.5cm (75.0), the rest is a coralline debris; porosity is 5-10% pinpoint with some associated with fossil solutioning; sharp lower contact.
24.01-44.64 (33.67-62.05)	Stonewall Fm: 24.01-25.00 (33.67-35.05): Upper Stonewall Marker: dark grey to grey, slightly laminated to conglomeratic mudstone; porosity is <1% pinpoint; gradational lower contact. 25.00-27.03 (35.05-37.90): unit 8: light brown tan mudstone, massive with faint lamination in places; porosity is 1-2%, small vugs and pinpoint; sharp lower contact with pyrite veining. 27.03-27.80 (37.90-38.98): upper T-marker: dark purple-red to green brecciated to laminated mudstone, becomes very clay-rich in the middle; scattered zones of black pyrite mineralization along small veinlets; porosity is <1%, pinpoint; gradational lower contact. 27.80-29.23 (38.98-40.64): unit 6: light brown to brown wackestone, massive; becomes slightly more mudstone-rich at the top; porosity is 5%, vuggy. 29.23-29.64 (40.64-41.20): unit 5: brown to light brown laminated mudstone; porosity is <1%, small vugs and pinpoint; gradational lower contact. 29.64-35.83 (41.20-49.81): unit 4: brown to light brown wackestone, massive, mottled; fossiliferous, rare fossils of scattered coralline debris; becomes more laminated at the top; porosity 5-8%, vuggy and minor pinpoint; sharp lower contact. 35.83-36.67 (49.81-50.98): lower T-marker: dark red to purple-red laminated mudstone; quite argillaceous at base to shaley; contains fine breccia beds in the middle; distinct red colouration probably due to diagenetic processes; porosity is <1%, fine pinpoint; sharp lower contact. 36.67-39.51 (50.98-54.92): unit 2: light brown to tan wackestone intervals; very porous and

fossiliferous at base, some coral debris; porosity is 8-10% at the lower base, vuggy and fossil solutioning, to 2-3% at the top, pinpoint; sharp lower contact.

39.51-44.64 (54.92-62.05): **Williams Mbr**: light brown to brown-grey finely laminated mudstone with massive intervals; some red diagenetic coloring; becomes slightly more wackestone at top and grading back to a mudstone; porosity is <1% pinpoint; gradational lower contact.

44.64-72.28
(62.05-100.48)

Stony Mountain Fm: brown to dark brown, mottled wackestone; contains abundant hardground surfaces in lower 7.17m (10.00); becomes slightly more argillaceous in bedding planes towards the top; massive with burrow mottling but essentially having a nodular appearance; becomes more mudstone-rich at top; porosity is 3-4%, vuggy and pinpoint; sharp lower contact.

72.28-84.34
(100.48-117.25)

Upper Red River Fm (Fort Garry Mbr): dark grey to green-grey to brown mudstone with some fine lamination in places, essentially massive; some very fine clay partings throughout; becomes extremely more laminated towards the top; at 72.28-73.45m very brecciated; porosity is <2%, pinpoint; gradational lower contact.

84.34-116.57
(117.25-162.05)

Lower Red River Fm: light brown to brown massive mottled wackestone; burrow mottled throughout; scattered white tripolized chert nodules throughout; porosity is 2-4%, mainly pinpoint with some vugs; sharp lower contact.

116.57-126.79
(162.05-176.26)

Winnipeg Fm: light grey to grey quartz sandstone, very fine to medium grained; some indistinct grey mottling; no divisible units but becomes slightly more argillaceous between 120.13-121.78m (167.00-169.30); quite consolidated, with an interval of extreme unconsolidation between 122.58-123.91m (170.41-172.25); in the lower 0.72-1.08m (1.00-1.50), abundant pyrite mineralization as lenses and knots occur; at the top upper contact, abundant brachiopod fossils are presents; top has infilled dolomite burrows from the overlying Red River Fm, 2.00mm long and wide, very distinctive; sharp lower contact to Precambrian.

126.79 (176.26)

Precambrian.

WL-91-27
FALCONBRIDGE - WILLIAM LAKE
8-6-56-13W
5961833N
475477E
Ground elevation: 282.92m

m	Az.	Deg.
0	225°	45°00'
10	227°	44°30'
61	231°	45°30'
110	231°	45°30'
160	235°	46°00'

Map: 63G/14

Logged by R. Bezys June 14, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-2.12 (0.00-3.00)	Overburden.
2.12-29.81 (3.00-41.80)	<p>Interlake Group:</p> <p>2.12-? (3.00-?): Cedar Lake and East Arm fms (?): buff orange to brown variously textured unit varying from grainstone to mudstone/wackestone; possibly some bedding not well developed; very broken up rubbly core; porosity is 5-10%, vuggy.</p> <p>?-5.39 (?-7.69): V-marker: olive green to green-gray mudstone; massive with some lamination and minor zones of brecciation; distinct fine to medium grained sand beds at base; at the top there's 14.02cm (20.00) carbonate quartz sand bed, fine to medium sand grains / sand bed / oolite bed; porosity is <1%, pinpoint and vuggy.</p> <p>7.71?-12.61 (11.00?-18.00): Atikameg Fm: buff orange massive reefal like unit, packstone to grainstone to minor mudstone at top; porosity 10-15%, vuggy and fossil solution; sharp upper contact.</p> <p>12.61-13.18 (18.00-18.80): Basal marker: light brown massive brecciated mudstone; porosity is <2%, vuggy and pinpoint; sharp upper contact.</p> <p>13.18-19.70 (18.80-28.10): Moose Lake Fm: light brown to tan, variably textured unit with grainstone and mudstone, massive; at 16.63m (23.72) is a conglomeratic unit (as seen before) and is 21.03cm (30.00) thick; porosity is <1-2% pinpoint; sharp upper contact.</p> <p>19.70-20.96 (28.10-29.91): U₁-marker: light gray to brown mudstone, laminated, brecciated; scattered lenses of floating sand grains; porosity is <1%, pinpoint; gradational upper contact.</p> <p>20.96-29.81 (29.91-41.80): Fisher Branch Fm: light tan to orange to brown wackestone at base to mudstone at top, massive; extremely fossiliferous at base, lower 52.57m (75.00) has abundant <i>Virgiana decussata</i>; at 23.83m (34.00) there's a 7.00cm (10.00) white clay infill material; porosity in the lower portion is 5-10% vugs, decreasing to <2% in mudstone as pinpoint; sharp upper contact.</p>
29.81-52.07 (41.80-73.00)	<p>Stonewall Fm:</p> <p>29.81-30.78 (41.80-43.15): Upper Stonewall Marker: gray to dark gray mudstone, some lamination with contorted bedding, faintly conglomeratic; porosity is <1%, pinpoint; sharp upper contact.</p> <p>30.78-32.67 (43.15-45.80): unit 7: light brown tan faintly laminated mudstone; porosity is <1-2%, pinpoint; sharp upper contact.</p> <p>32.67-33.88 (45.80-47.50): upper T-marker: green-gray to yellow-orange, purple-red laminated mudstone, brecciated at base; distinct cross-cut veining occurring with red coloration, very hematitic staining; pyrite mineralization along bedding planes; porosity is <1%, pinpoint; sharp upper contact.</p> <p>33.88-37.66 (47.50-52.80): unit 5: light tan to brown mudstone, massive; porosity is 1-2%, small vugs; gradational upper contact.</p> <p>37.66-41.90 (52.80-58.75): unit 4: brown mottled wackestone, normal marine sequence;</p>

porosity is 5-10%, vuggy; gradational upper contact.

41.90-42.38 (58.75-59.42): **lower T-marker**: light gray to gray mudstone, brecciated; porosity is <1%, pinpoint; sharp upper contact.

42.38-46.54 (59.42-65.25): **unit 2**: light brown to tan wackestone, massive; normal marine sequence, fossiliferous, contains an excellent favositid coral head towards the base, 7.13cm (10.00) in size; porosity is 5-8%, vuggy; sharp upper contact.

46.54-52.07 (65.25-73.00): **Williams Mbr**: dark brown to brown laminated mudstone, in places extremely laminated; porosity <1%, pinpoint; sharp upper contact.

52.07-79.02
(73.00-110.79)

Stony Mountain Fm: light brown to tan to gray mottled wackestone, massive, becomes more mudstone-rich towards the top; abundant hard ground surfaces in lower 3.57-7.13m (5.00-10.00), randomly spaced; porosity is <3%, pinpoint; gradational upper contact.

79.02-88.91
(110.79-124.66)

Upper Red River Fm (Fort Garry Mbr): green-gray to blue-gray, brown mudstone, primarily massive with intervals of lamination and some containing brecciation; extremely brecciated in the upper 35.66-53.49cm (50.00-75.00); clay-mud infill between 83.24-83.73m (116.71-117.40); porosity is <1%, pinpoint; sharp and erosional upper contact.

88.91-125.22
(124.66-174.08)

Lower Red River Fm: light brown to brown, mottled massive wackestone, becomes more mudstone-rich to the top; distinctly mottled to burrow mottled; scattered tripolized white chert nodules throughout; below 119.41m (166.00) to the base, we are constantly hitting fractures, rarely clay filled, and one is distinctly clay filled to 1.00cm with pyrite mineralization at 122.86m (170.80); porosity is 3-4%, pinpoint to vuggy; gradational upper contact.

125.22-135.06
(174.08-187.75)

Winnipeg Fm: colour varies from green-gray to gray to off-white, sand to silt sized quartz, primarily very fine to medium grained, some coarse grained intervals towards the base; some irregular mottled occurring due to burrowing?; pyrite nodules and mineralization occurring throughout, especially at the base where we see large irregular clots; primarily consolidated with unconsolidated intervals between 132.36-133.94; sharp upper contact, although the upper 35.97-53.95cm (50.00-75.00) appears to be interbedded with dolomite cemented sand; sharp upper contact although missing due to unconsolidated nature; 0.60m (0.83) of missing Winnipeg Fm core,

135.06 (187.75)

Precambrian.

WL-91-28
FALCONBRIDGE - WILLIAM LAKE
3-22-57-14W
5976203N
469812E

Ground elevation: 270.5m

m	Az.	Deg.
0.00	284°	45°
37.88	277°	45°
90.91	279°	46°
176.06	278°	46°

Map: 63G/14

Logged by R.Bezys June 13, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-2.16 (0.00-3.05)	Overburden.
2.16-20.60 (3.05-29.13)	<p>Interlake Group:</p> <p>2.16-4.70 (3.02-6.65): Atikameg Fm: brown to buff to orange massive packstone; reefal-like; porosity is 10-15%, vuggy; no discernable fossils; very rubbly core at top; casing went down to 10 feet; sharp lower contact.</p> <p>4.02-4.70 (5.68-6.65): Marker Bed: olive green to grey mudstone, massive, laminated; possible cross-bedding towards the top; porosity is <1%, pinpoint; sharp lower contact.</p> <p>4.70-11.36 (6.65-16.07): Moose Lake Fm: light brown to brown, variably textured grainstone to packstone; distinct breccia/conglomerate bed at 8.48m (11.79) and is 33.0cm (50.0) thick with subangular to subrounded clasts up to 2.2-2.9cm (3.0-4.0) large; rare floating clay sand grains; possibly stromatolitic in places, very broken up; porosity 3-5%, mainly pinpoint, some vugs; sharp lower contact.</p> <p>11.36-12.77 (16.07-18.06): U₁-marker: dark brown to light grey brecciated to laminated mudstone; breccia beds are intraformational with some clasts up to 1.4-2.2cm (2.0-3.0); porosity is <1%, pinpoint; sharp lower contact.</p> <p>12.77-20.60 (18.06-29.13): Fisher Branch Fm: light brown tan wackestone to packstone/grainstone with more mudstone at top; very fossiliferous at base with a 36.0cm (50.0) brachiopod <i>Virgiana decussata</i> hash bed, abundant coralline debris throughout the entire unit; porosity is 5-10%, vuggy and pinpoint; sharp lower contact.</p>
20.60-40.30 (29.13-56.99)	<p>Stonewall Fm:</p> <p>20.60-21.32 (29.13-30.15): Upper Stonewall Marker: light grey to grey distinctly laminated to massive mudstone, becoming slightly conglomeratic at the top; porosity is <1%; gradational lower contact.</p> <p>21.32-23.33 (30.15-33.00): unit 8: light brown to tan massive mudstone, some minor fine lamination; porosity is 1%, vuggy and pinpoint; sharp lower contact.</p> <p>23.33-23.84 (33.00-33.71): upper T-marker: green to red mudstone with some conglomeratic aspect due to fine grained clastic material; slight brecciation at top; colouration probably due to diagenetic processes; contains pyrite mineralization along bedding planes, black in colour; porosity is <1%, pinpoint; sharp lower contact.</p> <p>23.84-24.93 (33.71-24.93): unit 6: light brown to brown wackestone, massive mottled; porosity is 4-5%, vuggy and pinpoint; sharp lower contact.</p> <p>24.93-26.19 (35.26-37.04): unit 5: light grey to brown mudstone, laminated massive; intraformational brecciation occurring at 25.29m (35.76) and is 3.5cm (5.0) thick; porosity is <1%, pinpoint; sharp lower contact.</p> <p>30.89-31.66 (43.68-44.78): lower T-marker: distinctly red to olive brown mudstone, slight diagenetic red colouring with a bloody texture; somewhat shaley at base; porosity is <1%, pinpoint; sharp lower contact.</p> <p>31.66-34.99 (44.78-49.48): unit 2: light brown to tan mottled wackestone, some interbeds of mudstone, massive; slightly fossiliferous with favositids fragments; porosity is 3-5%, vuggy</p>

and pinpoint; sharp lower contact.

34.99-40.30 (49.48-56.99): **Williams Mbr**: light tan to brown mudstone, massive, finely laminated; porosity is <1%, pinpoint; gradational lower contact.

40.30-67.35
(56.99-93.62)

Stony Mountain Fm: light brown to grey massive mottled wackestone; has distinct hardground surfaces in lower 4.24-7.19m (6.00-10.00); appears distinctly burrowed mottled throughout; becomes more nodular and argillaceous towards the top, *i.e.* more mudstone; porosity is 2-4%, vuggy and pinpoint; sharp lower contact.

67.35-78.36
(93.62-108.93)

Upper Red River Fm (Fort Garry Mbr): blue-grey to grey to brown massive mudstone; scattered breccia beds and clay beds; one distinct clay bed at 76.88m (106.88) and is 0.7cm (1.0) thick, black-brown in colour, appears slightly carbonaceous; the upper 57.55cm (80.00) is very brecciated and very distinctive; porosity is <3% small vugs and some pinpoint; gradational lower contact.

78.36-109.03
(108.93-151.57)

Lower Red River Fm: light brown to tan mottled wackestone, massive; distinctly mottled/bioturbated, becomes more bioturbated in upper sequence; slight fossiliferous material, mainly coral and crinoidal debris; scattered tripolized white chert; porosity is 2-4%, pinpoint; sharp lower contact, but not well preserved.

109.03-119.29
(151.57-165.83)

Winnipeg Fm:

109.03-113.09 (151.57-157.21): **upper unit**: dark grey at base to light grey-tan, massive, quartz sandstone, slightly bioturbated, mottled; primarily consolidated, very minor unconsolidated intervals; very fine to coarse grained with coarser grained intervals at top; sharp lower contact, but not well preserved.

113.09-119.15 (157.21-165.64): **middle unit**: green-grey to grey sandstone, very fine to fine grained; interbedded with siltstone and mudstone; some intervals are mudstone-rich to give it a fissile shaley character; becomes more sandy towards the top and very dark blue-grey in colour; rare pyrite mineralization; gradational lower contact; **subunit** at 115.05m (159.94): light grey to grey sandstone, fine to medium grained, massive; essentially well consolidated; abundant pyrite mineralization as small lenses, knots and blebs; very few unconsolidated intervals.

119.15-119.29 (165.64-165.83): **lower unit**: light grey to grey quartzose sandstone lag bed with large clasts of quartzite up to 1.4-2.2cm (2.0-3.0) in diameter, rounded to subangular with scattered fragments of weathered Precambrian; abundant pyrite mineralization as small blebs and knots.

119.29 (165.83)

Precambrian.

WL-91-29
FALCONBRIDGE - WILLIAM LAKE
8-6-56-13W
5962024N
475676E

Ground Elevation: 285.8m

m	Az.	Deg.
0	225°	45°00'
15	229°	46°00'
61	235°	46°00'
115	235°	46°30'
166	234°	47°30'

Map: 63G/14

Logged by R. Bezys June 12, 1993

TRUE DEPTH
(measured depth)

DESCRIPTION

0.00-1.87
(0.00-2.65)

Overburden.

1.87-32.00
(2.65-44.48)

Interlake Group:

1.87-8.37 (2.65-11.63): **Cedar Lake Fm:** packstone to grainstone with interbeds of argillaceous markers, very difficult to determine; between 2.83-3.75m (4.00-5.30) is a very disruptive breccia unit, not very arenaceous which may be the U₂- or V-markers; orange-brown stromatolitic unit with some grainstone beds at top; porosity is interstitial at 5-8%; some pyrite mineralization along fractures; very broken up core, not very well preserved; gradational lower contact.

8.37-11.18 (11.63-15.54): **East Arm Fm:** brown to light brown, grey mudstone with floating green-grey clayey sand lamination; becomes very laminated towards top, possibly cross-bedded; abundant green-grey clay infill material; gradational lower contact; no well-developed U₂-marker.

11.18-15.39 (15.54-21.40): **Atikameg Fm:** 11.18-14.96 (15.54-20.80): orange to brown packstone to grainstone, possibly reefal; abundant deformational cracks that have been infilled with green-grey material (crystals of dolomite); porosity is 10%, mainly pinpoint and vuggy; sharp lower contact

14.96-15.39 (20.80-21.40): **Marker Bed:** conglomeratic mudstone bed, some banding, very contorted unit, contains clay material; porosity is 3% in small vugs; sharp lower contact.

15.39-22.41 (21.40-31.15): **Moose Lake Fm:** light brown tan, variably textured unit from packstone to grainstone at base to mudstone intervals at top; possible oncolite fragments in a breccia conglomeratic bed located at 19.71m (27.4) (43.2cm (60.0) thick); at the top there appears to be tectonic? intraformational breccia with some arenaceous infill material; porosity is 3-4% to under 1% in mudstone, pinpoint and vuggy; sharp lower contact.

22.41-23.26 (31.15-32.33): **U₁-marker:** light grey to green-grey mudstone with some brecciation in the middle, clasts are 2.9-3.6cm (4.0-5.0) in diameter; possible ripple beds; porosity is <1%, small vugs to pinpoint; lower contact not well preserved.

23.26-32.00 (32.33-44.48): **Fisher Branch Fm:** light brown tan wackestone to packstone to grainstone, some mudstone at the top; very fossiliferous in lower 33.0-55.0 cm (50.0-75.0) with *Virgiana decussata* brachiopods, very abundant, some scattered solitary coral fragments; some solid dark brown chert nodules; porosity is 5% at the base to 2% at the top, mainly vuggy, some pinpoint; sharp lower contact.

32.00-52.51
(44.48-73.00)

Stonewall Fm:

32.00-32.95 (44.48-45.80): **Upper Stonewall Marker:** grey to brown massive mudstone with minor conglomeratic intervals, minor lamination; porosity is <2%; gradational lower contact.

32.95-35.00 (45.80-48.65): **unit 7:** light brown tan wackestone/mudstone; porosity is 2-3%; sharp lower contact.

35.00-35.72 (48.65-49.65): **upper T-marker:** olive brown to dark grey to red mudstone, laminated with minor pyrite mineralization along veinlets; porosity is < 1-2%; lower contact

not well preserved.

35.72-38.74 (49.65-53.85): **unit 5:** brown mudstone, laminated to massive; scattered carbonaceous partings, one breccia bed located at 36.90m (51.30); porosity is 2-3%, pinpoint and some vugs; gradational lower contact.

38.74-43.34 (53.85-60.25): **unit 4:** light tan brown wackestone, distinctly mottled; quite porous, porosity is 5-10%, vuggy; sharp lower contact, not well preserved. 43.34-43.99 (60.25-61.15): **lower T-marker:** blue-grey to olive grey mudstone with some banding and some bioturbation; porosity is <1% pinpoint; sharp lower contact, not well preserved.

43.99-49.12 (61.15-66.90): **unit 2:** brown to tan massive wackestone, grading upwards to a mudstone, mottled; scattered fossiliferous material, one large favositid fragment; porosity is 5-7%, vuggy.

49.12-52.51 (66.90-73.00): **Williams Mbr:** light brown to tan to brown mudstone, faintly laminated, massive, with blue-grey diagenetic mottling; scattered pyrite mineralization along small veinlets; some bituminous partings in places; porosity is <1%, pinpoint; sample 88-13-93 is a finely laminated mudstone from 50.02-50.06m (69.54-69.59); gradational lower contact.

52.51-82.18
(73.00-113.30)

Stony Mountain Fm: light brown wackestone, distinctly mottled, massive with burrow mottling; extensive hardground development in lower 4.32-6.47m (6.00-9.00); porosity is 2-3%, pinpoint and vuggy; sharp lower contact.

82.18-92.49
(113.30-127.50)

Upper Red River Fm (Fort Garry Mbr): blue-grey to brown mudstone, massive with some banding; very minor scattered brecciated lenses becoming more frequent towards the top 0.36-0.54m (0.50-0.54) where it's very brecciated; porosity is <1-2%, pinpoint; gradational lower contact.

92.49-131.79
(127.50-178.75)

Lower Red River Fm: brown tan mottled wackestone, becomes more mudstone-rich towards the top, extensively burrow mottled, massive; scattered white tripolized chert nodules; porosity is 2-3%; sharp lower contact.

131.79-140.23
(178.75-190.20)

Winnipeg Fm: light grey to white quartz sandstone, massive, primarily consolidated with unconsolidated intervals, fine to medium grained; distinctly mottled in places, probably pyrite mineralization; there are clots or knots of pyrite nodules occurring between 137.87m (187.00) and the lower bed; a distinct dark grey to olive brown mudstone to shale bed occurs at 138.81-139.35m (188.27-189.00), in places quite fissile with interbedded sand and silt lenses; abundant pyrite mineralization and lenses as large as 1.5-2.2cm (2.0-3.0); 1.08m (1.47) of missing core; sharp lower contact.

140.23 (190.20)

Precambrian.

WL-91-30
FALCONBRIDGE - WILLIAM LAKE
4-15-56-13W
5964651N
479165E

Ground elevation: 278.13m

m	Az.	Deg.
0	82°	45°
7.62	81°	44°
76.50	80°	45°
137.46	79°	44°

Map: 63G/14

Logged by R. Bezys June 12, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-? (0.00-?)	Overburden.
?-20.60 (?-29.66)	<p>Interlake Group: ?-4.10 (?-5.90): Atikameg Fm: orange buff grainstone; porosity is 10-15%, vuggy; very poorly preserved core. 4.10-5.28 (5.90-7.60): Basal marker: upper contact to Atikameg is not well preserved; argillaceous mudstone. 5.28-10.79 (7.69-15.54): Moose Lake Fm: light brown tan mudstone to grainstone sequence; scattered green clay laminae, sandy, along bedding planes; porosity is 2%, pinpoint; core becomes broken up due to proximity of bedrock surface; marker bed occurs in this unit. 10.79-*11.11? (15.54-*16.00?) (pick not certain): U₁-marker: light brown mudstone, intraformational breccia; some arenaceous intervals in matrix of brecciated units; porosity is 2%, pinpoint; gradational upper contact. 12.12-20.60 (17.45-29.99): Fisher Branch Fm: light brown to brown, massive fossiliferous wackestone at base to more mudstone-rich at top; porosity is 10% as vugs in wackestone, and 3-4% in mudstone as pinpoints; lower 0.62m (0.90) is extremely fossiliferous, very well preserved specimens of <i>Virgiana decussata</i>.</p>
20.60-43.54 (29.66-61.57)	<p>Stonewall Fm: 20.60-23.23 (29.66-33.14): Upper Stonewall Marker: brown to tan mudstone, massive, some banding with red coloration, becomes more argillaceous in upper 0.69-1.04m (1.00-1.50); porosity is 1-2%, pinpoint; sharp upper contact. 23.23-25.09 (33.14-35.80): upper T-marker: olive green to blood red-purple mudstone; slightly arenaceous in lower 0.50m to a distinctly red mottled mudstone at top, probably due to diagenetic coloring; porosity is 2% pinpoint; sharp upper contact. 25.09-25.75 (35.80-36.74): unit 7: light brown tan wackestone, massive, irregularly mottled; porosity 5-8%, vuggy; sharp upper contact. 25.75-25.96 (36.74-37.04): unit 6: blue-gray argillaceous mudstone (marker bed?), very shaley fissile character; probably in a lower of extension of upper T-marker; porosity is <1%; gradational upper contact. 25.96-28.59 (37.04-40.79): unit 5: light brown tan mudstone with some lamination, may appear to be algal laminated at approximately 26.70m (38.10); porosity is 2-3%, vuggy and pinpoint; sharp upper contact. 28.59-32.12 (40.79-45.83): unit 4: light brown tan wackestone; normal marine sequence, probably fossiliferous, although missing most of it due to missing core box; rare white tripolized chert nodules; porosity 5-8%, vuggy; gradational upper contact. 32.12-32.82 (45.83-46.46): lower T-marker: gray mudstone, massive, bioturbated; upper unit is brown with less bioturbation; porosity is 4%, pinpoint; sharp upper contact. 32.82-? (46.46-?): unit 2: light brown wackestone/mudstone, massive with some bioturbation; not a good marine sequence at all; some coral fragments scattered throughout</p>

4.21-5.61cm (6.00-8.00), favositids; porosity is 1-2%, mainly fossil solutioning and pinpoint; sharp upper contact.

37.50-43.54 (53.98-61.57): **Williams Mbr**: brown mudstone, massive, slightly laminated, argillaceous partings toward base; porosity is 2-3%; no upper contact determined because box #8 is missing.

43.54-69.09
(61.57-98.57)

Stony Mountain Fm: light brown to brown wackestone, some mudstone, massive, distinctly mottled with abundant hard ground surfaces in lower 4.24-5.66m (6.00-8.00); may have a zone of slight brecciation above Fort Garry Mbr; porosity is 2-4%, vuggy; gradational upper contact.

69.09-80.42
(98.57-114.74)

Upper Red River Fm (Fort Garry Mbr): dark gray to olive green mudstone, minor lamination, some burrow mottling; upper 52.57cm (75.00) is brecciated with distinct breccia bed at top; porosity is <1%, pinpoint; sharp upper contact.

80.42-113.76
(114.74-163.76)

Lower Red River Fm: light brown to brown wackestone, massive, distinctly nodular with some bioturbation; in the lower 2.08m (3.00) there are very large vug fractures, up to 9.01cm (10.00) large, one with pyrite mineralization; good large coral fragments, paleofavositids at 101.44 (146.03); scattered tripolized white chert throughout lower unit; there is a dark black mud-clay infill along a joint plane at 104.36m (150.23); at 70.35-70.56m (100.37-100.67) there's a green-gray brecciated bed; porosity is 5%, vuggy to pinpoint; gradational upper contact.

113.76-120.34
or *123.75
(163.76-173.23
or *178.15)

Winnipeg Fm:

113.76-113.32 (163.76-163.13): **upper unit**: white to light brown sandstone, massive, fine to medium grained, essentially consolidated; more dolomite intervals in upper 27.79cm (40.00); all core present, no missing intervals in core boxes; sharp upper contact.

113.32-120.34 or *123.75 (163.13-173.23 or *178.15): **lower unit**: (note: * indicates value from log) fine to medium grained sand; massive grainstone mudstone with some grain mottling with consolidated and unconsolidated intervals; becomes more argillaceous at 121.32m (174.65), more olive brown, more siltstone argillaceous unit (base is 122.05m (175.70)), goes into a very unconsolidated sand; at base there's a consolidated sandstone with abundant pyrite mineralization; lower contact not preserved, gradational upper contact.

120.34 or 123.75
(173.23 or 178.15)

Precambrian.

WL-91-31
FALCONBRIDGE - WILLIAM LAKE
15-32-55-13W
5960911N
476238E

Ground Elevation: 275.00m

m	Az.	Deg.
0	43°	45°
10.67	35°	40°
76.22	9°	44°
141.77	33°	42°
208.84	34°	42°

Map: 63G/14

Logged by R. Bezys June 18, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-2.16 (0.00-3.05)	Overburden.
2.16-23.94 (3.05-35.78)	<p>Interlake Group:</p> <p>2.16-6.24 (3.05-9.70): Atikameg Fm: light brown to brown-buff, mixture of grainstone to packstone, thin to medium bedded ; the lower 32.1cm (50.0) is a olive green laminated mudstone, intermixed with grainstone textures; no presence of the U₂-marker found, although it should be very close; core is very fragmental and broken at the top; porosity is 5-10%, vuggy.</p> <p>6.24-13.34 (9.70-20.75): Moose Lake Fm: light brown to brown, grainstone to packstone, minor mudstone, massive; at 10.61m (16.50) is a 3.2cm (5.0) conglomeratic bed; in places, the top of this formation is extremely laminated and appears to be stromatolitic with minor breccia beds; core is very broken and rubbly; porosity is <1-2%, pinpoint; sharp upper contact.</p> <p>13.34-14.22 (20.75-22.12): U₁-marker: light grey to grey, laminated to brecciated mudstone; scattered floating sand grains, slightly arenaceous; porosity is 1%, pinpoint; sharp upper contact.</p> <p>14.22-23.94 (22.12-35.78): Fisher Branch Fm: light brown tan, massive mottled wackestone, becomes more mudstone-rich towards the top; slight fossiliferous material in the lower 32.1-48.2cm (50.0-75.0), no <i>Virgiana decussata</i> fragments, possible brachiopod fragments, but not identifiable; this is a difficult contact due to the loss of <i>Virgiana decussata</i>; porosity is 5-10%, pinpoint and small vugs; sharp upper contact.</p>
23.94-47.99 (35.78-69.08)	<p>Stonewall Fm:</p> <p>23.94-24.68 (35.78-36.88): Upper Stonewall Marker: light brown to grey, laminated mudstone, slightly conglomeratic/brecciated; porosity is <1%, pinpoint; sharp upper contact.</p> <p>24.68-26.62 (36.88-39.78): unit 9: light brown tan, massive wackestone/mudstone; very rare pyrite mineralization as veinlets; porosity is 1-2%, pinpoint; gradational upper contact.</p> <p>26.62-27.80 (39.78-41.55): upper T-marker: light green to green, slightly mottled, laminated mudstone; scattered veinlets of pyrite along bedding planes and as cross-cutting veinlets; very broken up and rubbly core; porosity is <1%, pinpoint; upper contact probably sharp but not well preserved.</p> <p>27.80-28.47 (41.55-42.55): unit 7: light brown tan mottled wackestone, slight mudstone; porosity is 2-4%, vuggy; sharp upper contact.</p> <p>28.47-31.61 (42.55-47.24): unit 6: light brown tan, massive mudstone; at 28.47-29.01m (42.55-43.36) is a argillaceous marker bed, slightly argillaceous, brecciated and laminated mudstone, may be a lower portions of the upper-T; porosity is <3%; gradational upper contact.</p> <p>31.61-35.64 (47.24-53.26): light brown, mottled massive wackestone; normal marine sequence, fossiliferous, mainly coral debris (some favositids fragments); rare scattered white</p>

tripolized chert nodules; core very broken up and rubbly in places; porosity is 5-15%, vuggy and pinpoint; gradational upper contact.

35.64-36.68 (53.26-54.81): **lower T-marker**: light grey to dark grey, massive mudstone, slightly more mudstone-rich towards the base, becomes more bioturbated at the top; porosity is <1%, pinpoint; sharp upper contact.

36.68-39.63 (54.81-59.23): **unit 3**: light brown to tan, massive mudstone, slightly mottled; porosity is 4-6%, very small vugs and pinpoint; sharp upper contact.

39.63-42.94 (59.23-61.82): **unit 2**: light brown to tan, mottled wackestone, massive; fossiliferous with coral fragments, normal marine sequence; porosity is 5-10%, small vugs, pinpoint and fossil solutioning; gradational upper contact.

42.94-47.99 (61.82-69.08): **Williams Mbr**: light green to beige, massive to laminated mudstone, essentially massive in appearance; at 43.72m (64.11) is a green-grey clay seam, 2.0cm (3.0) thick; upper contact not well preserved due to broken up core.

47.99-74.47
(69.08-109.19)

Stony Mountain Fm: light brown to tan, distinctly nodular to mottled wackestone, massive; gradually becomes more mudstone-rich towards the top; scattered hardground surfaces development in the lower 6.82-8.18m (10.00-12.00); porosity is 2-4%, small vugs and pinpoint; gradational upper contact.

74.47-85.15
(109.19-127.26)

Upper Red River Fm (Fort Garry Mbr): light brown to brown to blue-grey, massive mudstone with some brecciated and laminated intervals; the upper 16.7-33.4cm (25.0-50.0) is brecciated; scattered thin clay seams throughout; zone of mud infill at 76.23-76.36m (111.77-111.97); porosity is 1-2%, pinpoint; sharp upper contact.

85.15-118.57
(127.26-177.20)

Lower Red River Fm: light brown to tan, mottled to burrow mottled wackestone, massive; becomes very burrow mottled towards the top; scattered white tripolized chert nodules throughout; some fossil fragments, some coral and crinoidal debris; some hardground surfaces towards the lower 3.35m (5.00); at the base is an arenaceous dolomite with abundant floating sand grains; porosity is 3-4%, mainly pinpoint and small vugs; sharp upper contact.

118.57-127.77
(177.20-190.95)

Winnipeg Fm:

118.57-126.43 (177.20-188.95): **upper unit**: light grey to white, consolidated quartz sandstone, mottled to slightly burrow mottled; some pyrite mineralization at the base; at the top is a slightly interbedded sand and dolomite; 13.4cm (20.0) of Winnipeg Fm core is missing; upper contact is sharp to a zone of pyrite mineralization as clots and knots with the Red River Fm contact.

126.43-126.86 (188.95-189.60): **middle unit**: green-grey to grey-brown, siltstone to mudstone, faint lamination to fissile in the more shaley portions; scattered pyrite nodules and blebs throughout; sharp upper contact.

126.86-127.77 (189.60-190.95): **lower unit**: light grey to white, fine to medium grained quartz sandstone, massive, primarily consolidated with unconsolidated intervals; gradational upper contact; lower contact probably sharp, but not preserved.

127.77 (190.95)

Precambrian.

WL-92-32
FALCONBRIDGE - WILLIAM LAKE
15-6-56-13W
5962752N
474986E

Ground Elevation: 265.18m

m	Az.	Deg.
0	41°38'15"	45°00'
32	--	45°30'
32	356°00'	45°30'
89	34°00'	43°30'
125	36°00'	44°00'
152	37°00'	44°00'

Map: 63G/14

Logged by R. Bezys June 17, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-16.95 (0.00-23.77)	Overburden.
16.95-37.21 (23.77-52.17)	<p>Stonewall Fm: 16.95-19.14 (23.77-26.84): unit 7: light brown, massive wackestone/mudstone; rare pyrite mineralization along bedding planes; the upper 3.6cm (5.0) may represent part of the Upper Stonewall Marker (dark grey mudstone); porosity is 2%, vugs. 19.14-19.26 (26.84-27.00): upper T-marker: light brown to brown to light green, slightly brecciated, mottled mudstone; becomes more clay-rich at the base; porosity is <1%, pinpoint; sharp upper contact. 19.26-24.54 (27.00-34.40): unit 5: brown to dark brown, massive mudstone, slightly mottled; porosity is 1-2%, some vugs and pinpoint; sharp upper contact, but not well preserved. 24.54-27.67 (34.40-38.80): unit 4: light brown to tan, massive wackestone; very brecciated and broken up, core not well preserved; porosity is 5-15%, vuggy; gradational upper contact. 27.67-27.92 (38.80-39.15): lower T-marker: light green-grey, slightly brecciated mudstone; more clayey at the base, not well preserved; porosity is <1%, pinpoint; sharp upper contact. 27.92-32.99 (39.15-46.25): unit 2: light brown tan, massive wackestone to grainstone, slightly mottled; normal marine sequence with some coralline debris; porosity is 3-4%, vuggy, fossil solutioning and pinpoint; upper contact probably sharp but not preserved. 32.99-37.21 (46.25-52.17): Williams Mbr: light brown to brown, laminated to minor massive mudstone; core becomes quite rubbly and fractured with abundant zones of clay infill material; porosity is <1%, pinpoint; upper contact probably sharp but not preserved.</p>
37.21-62.87 (52.17-91.34)	<p>Stony Mountain Fm: light brown to brown, massive wackestone; becomes more mudstone-rich in the upper 3.57m (5.00); abundant hardground surfaces in the lower 5.51-6.88m (8.00-10.00); porosity is 3-5%, vugs and pinpoint; gradational upper contact.</p>
62.87-74.81 (91.34-107.70)	<p>Upper Red River Fm (Fort Garry Mbr): blue-grey to light grey with some brown, massive to laminated mudstone; some brecciation in places, extremely brecciated in the upper 0.52-0.69m (0.75-1.00); some fracturing occurs with some clay infill, getting more abundant upwards, at 64.98m (94.40) is a 3.4cm (5.0) light grey clay infill; at 67.53m (98.10) is a small arenaceous bed; some minor fine pyrite mineralization associated with a upper breccia bed; porosity is <1%, pinpoint; sharp upper contact.</p>
74.81-108.30 (107.70-155.90)	<p>Lower Red River Fm: light brown to brown, distinctly mottled to burrow mottled wackestone, massive; scattered white tripolized chert nodules throughout; at 107.67m (155.00) is a 3.4cm (5.0) thick silt infill material; porosity is 3-4%, minor large vugs, mainly vugs and pinpoint; gradational upper contact.</p>

108.30-119.62
(155.90-172.20)

Winnipeg Fm:

108.30-115.80 (155.90-166.70): **upper unit:** light grey to white, quartz sandstone, massive to primarily consolidated with unconsolidated portions, fine to medium grained; similar to lower mudstone unit; upper contact appears sharp, although sand is unconsolidated; 4.33m (6.23) of the Winnipeg Fm core is missing. 115.80-118.02 (166.70-169.90): **middle unit:** olive brown to brown to light green, laminated siltstone to mudstone; scattered fine blebs of pyrite mineralization throughout; sharp upper contact, but not well preserved.

118.02-119.62 (169.90-172.20): light grey quartz sandstone, very fine to fine grained, unconsolidated; upper contact not well preserved; lower contact not well preserved.

119.62 (172.2)

Precambrian.

Note: The general character of this hole indicates some fracturing has taken place throughout the upper half of this hole, although not as intense as seen in other holes,

WL-92-34
FALCONBRIDGE - WILLIAM LAKE
1-7-56-13W
5963214N
475468E

Ground Elevation: 266.70m

m	Az.	Deg.
0.00	222°33'	45°11'
16.00	231°00'	45°00'
16.76	222°37'	45°30'
53.00	232°00'	45°30'
53.35	222°10'	45°51'
82.30	221°52'	46°26'
83.00	229°00'	46°30'
112.78	221°20'	46°51'
113.00	232°00'	46°30'
158.00	228°00'	46°30'

Map: 63G/14

Logged by R. Bezys June 17, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-6.76 (0.00-9.56)	Overburden.
6.76-12.05 (9.56-16.90)	Interlake Group: Fisher Branch Fm: light brown to tan, mottled wackestone to packstone; fossiliferous is the lower 2.12m (3.00), mainly coral debris with no <i>Virgiana</i> present; at 11.00-11.46m (15.55-16.20) is a fractured interval - mainly parallel to core axis and re-healed with calcite.
12.05-32.82 (16.90-46.02)	Stonewall Fm: 12.05-12.84 (16.90-18.00): Upper Stonewall Marker: light grey to grey, finely laminated, mottled mudstone, faint breccia intervals; porosity is <1%, pinpoint; sharp upper contact. 12.84-15.25 (18.00-21.38): unit 7: light brown tan massive mudstone to wackestone; fossil material appears to be coralline debris; porosity increases in the wackestone in the lower half of unit to 4-5%, mainly vugs and minor fossil solutioning; gradational upper contact. 15.25-15.98 (21.38-22.40): upper T-marker: olive brown to red, laminated to slightly conglomeratic mudstone; fine black pyrite mineralization along tiny veinlets; porosity is <1%, pinpoint; upper contact appears sharp, but not preserved. 15.98-18.90 (22.40-26.50): unit 5: light brown tan laminated mudstone; very broken up and rubbly core; porosity is <1%, pinpoint and small vugs; sharp upper contact. 18.90-23.11 (26.50-32.40): unit 4: light brown to tan buff, mottled wackestone, appears to be massive but core is very broken and rubbly; normal marine sequence, but no discernable fossils; porosity is 5-8%, vuggy; gradational upper contact. 23.11-24.14 (32.40-33.84): lower T-marker: light brown to grey, laminated mudstone, slightly brecciated in places; porosity is <1%, pinpoint; sharp upper contact. 24.14-27.88 (33.84-39.09): unit 2: light brown to brown, mottled, massive wackestone; normal marine sequence, but no discernable fossil fragments; porosity is 5-8%, small vugs; gradational upper contact. 27.88-32.82 (39.09-46.02): Williams Mbr: light brown to brown to grey, laminated, mainly massive mudstone; zones of fracturing are quite abundant, very broken up core; porosity is <1%, pinpoint; sharp upper contact.
32.82-58.55 (46.02-80.80)	Stony Mountain Fm: light brown to brown, distinctly nodular, massive wackestone; becomes more mudstone-rich towards the top; hardground surfaces in the lower 3.57-5.71m (5.00-8.00); scattered coral debris throughout; at 41.97-42.69m (58.50-59.50) is a zone of very broken up core; porosity is 2-3%, pinpoint; gradational upper contact.

58.55-68.59 (80.80-94.56)	Upper Red River Fm (Fort Garry Mbr): light brown to brown to grey, massive to laminated mudstone; brecciation occurs in some places, primarily in the upper 36.3-54.4cm (50.0-75.0); throughout this interval the core is very broken up along bedding planes and joints; porosity is <1%, pinpoint; sharp upper contact.
68.59-97.87 (94.56-134.93)	Lower Red River Fm: light brown to brown, distinctly mottled wackestone, appears to be burrow mottled in places; scattered white tripolized chert nodules and lenses throughout; at 66.73-69.27 (92.00-95.50), the core is very rubbly and broken up; porosity is 2-4%, mainly vugs, some pinpoint and fossil solutioning (coralline); gradational upper contact, not well preserved.
97.87-106.59 (134.93-146.95)	Winnipeg Fm: light grey to white, massive to unconsolidated quartz sandstone, fine to medium grained; unconsolidated interval at 103.73-105.69m (143.00-145.70); pyrite mineralization located as irregular nodules and lenses; 3.36m (4.63) of Winnipeg Fm is missing; sharp upper contact; lower contact not preserved due to rubbly nature of core.
160.59 (146.95)	Precambrian.

WL-92-36
FALCONBRIDGE - WILLIAM LAKE
3-7-56-13W
5963199N
474807E

Ground Elevation: 265.18m

m	Az.	Deg.
0.0	44°57'25"	45°00'
10.7	--	43°30'
15.2	45°22'	42°35'
30.5	45°43'	43°10'
36.6	64°00'	43°10'
45.7	45°37'	43°20'
50.9	36°00'	42°30'
61.0	45°51'	44°15'
76.2	44°43'	44°22'
91.4	45°40'	43°55'
106.7	45°15'	44°45'
120.1	30°00'	44°00'
121.9	45°13'	45°10'
137.2	45°16'	45°15'
152.4	45°17'	45°22'
167.6	44°36'	45°25'

Map: 63G/14

Logged by R. Bezys June 17, 1993

TRUE DEPTH (m)
(measured depth)

DESCRIPTION

0.00-22.93
(0.00-33.53)

Overburden.

22.93-26.58
(33.53-38.85)

Sand and clay infill; at 23.53-26.56m (34.40-38.85) is a clay infill, dark brown to black-grey, some intervals are more of a light green colour, mud silt infill material, quite consolidated, one pyrite nodule at 23.19m (33.90); difficult to determine if this is Quaternary age or older; it appears to have a similar affinity to the large infill interval below; sample 88-17-93 is of the more argillaceous mud intervals of this possible infill material, overlying bedrock, to date for Quaternary age or older, sample is from 23.53-26.58 (34.40-38.85). Sample **88-17-93** was sent to the GSC and was dated as Cretaceous (Late Albion - Cenomanian).

26.58-36.41
(38.85-53.90)

Stonewall Fm:

26.58-30.43 (38.85-44.35): **unit 3:** light brown to brown, massive, mottled wackestone/mudstone; towards the base is a wackestone, more normal marine sequence; more mudstone towards the top; porosity is <1%, pinpoint, but is 5-8% towards the base of the wackestone.

30.43-30.74 (44.35-44.80): **unit 2:** grey to dark grey mud silt infill.

30.74-36.41 (44.80-53.90): **Williams Mbr:** light brown to dark brown-grey, massive to slightly laminated mudstone; from the base to the top of the bedrock, the core is very broken and fractured, very difficult to place contacts.

36.41-74.41?
(53.90-105.70?)

Stony Mountain Fm: light brown to brown distinctly, mottled, massive, wackestone to packstone; slightly fractured in places; porosity is 2-4%, small vugs and pinpoint; gradational upper contact; at 42.12-74.41m (62.35-105.7) **Sample 88-16-93** is a variable mixture of light grey to dark grey to brown to light green clays, muds, silts and sands, most of the claystone is consolidated, much of the sand is unconsolidated, most of this unit lies at the interval of the upper Red River Fm and lower Stony Mountain Fm, possibly a cavern infill. Sample was sent to the GSC and was dated as Cretaceous (Late Albion - Cenomanian).

74.41?-77.52 (105.70?-110.12)	Upper Red River Fm (Fort Garry Mbr): blue-grey to grey, massive to slightly laminated mudstone; only 0.55m (0.78) of core exists.
77.52-109.60 (110.12-154.02)	Lower Red River Fm: light brown to brown, mottled to burrow mottled wackestone, massive; porosity is 2-3%, vuggy and pinpoint; at 98.18m (138.24) is a cross-cutting fracture, brittle fracture and a smaller one at 98.46m (138.64); at 79.19m (112.48) is a mud infill along a fracture and bedding planes; another mud infill at 79.82m (114.90); at 77.53-74.96m (110.12-106.48) is a dark brown to green mud-silt infill material; 1.28m (1.83) is the length of core preserved.
109.60-120.60 (154.02-169.33)	Winnipeg Fm: 109.60-117.74 (154.02-165.31): upper unit: light grey quartz sandstone, fine to medium grained, mainly consolidated; slightly more mudstone-rich towards the base; 2.55m (3.58) of core is missing at the top of the unit; 2.16m (3.03) of Winnipeg Fm core is missing. 117.74-118.54 (165.31-166.44): middle unit: brown to olive brown to blue-grey, sandstone/siltstone/shale, massive with minor lamination; extensive pyrite mineralization as small nodules; gradational upper contact. 118.54-120.60 (166.44-169.33): lower unit: brown to light brown to olive brown sandstone, massive, primarily consolidated; gradational upper contact; lower contact is sharp with a pebble lag of quartzite pebbles.
120.60 (169.33)	Precambrian.

WL-92-37
FALCONBRIDGE - WILLIAM LAKE
5-9-56-13W
5963391N
474242E

Ground Elevation: 265.18m

m	Az.	Deg.
0	44°36'10"	45°00'
47	35°00'	44°30'
98	32°00'	45°00'
174.35	32°00'	46°00'

Map: 63G/14

Logged by R. Bezys June 17, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-26.70 (0.0038.10)	Water and overburden.
26.70-53.18 (38.10-75.21)	Stony Mountain Fm: light brown to brown, distinctly mottled wackestone, massive; scattered hardground development in the lower 3.50-5.61m (5.00-8.00); two cross-cutting joints infilled with clay at 45.91m (65.50) and 50.47m (72.00); from about 32.94m (47.00) to the top, the core becomes very broken up; porosity is 3-5%, vuggy and pinpoint.
53.18-64.16 (75.21-90.74)	Upper Red River Fm (Fort Garry Mbr): light brown to blue-grey, laminated to massive mudstone; some minor brecciated intervals, extensive brecciation in the upper 53.0cm (75.0), also in this interval is a vertical joint filled in with a 0.50cm of green-grey silt-clay; porosity is <1%, pinpoint; sharp upper contact.
64.16-96.07 (90.74-135.86)	Lower Red River Fm: light brown to tan, mottled wackestone, massive; scattered white tripolized chert nodules throughout; clay seam reported at 77.87-77.94m (110.13-110.23); porosity is 2-4%, pinpoint and some large vugs; sharp upper contact.
96.07-107.79 (135.86-149.85)	Winnipeg Fm: 96.07-104.41 (135.86-145.15): upper unit: light grey, massive, consolidated to minor unconsolidated sandstone; unconsolidated zone between 98.45-99.16m (138.03-139.03); 2.18m (3.06) of core missing; similar to lower unit; upper contact appears sharp, but not well preserved. 104.41-105.38 (145.15-146.50): middle unit: dark brown to green-grey, siltstone/sandstone with some shale, essentially massive with some very fine bedding in shaley intervals; upper contact not preserved. 105.38-107.79 (146.50-149.85): lower unit: light grey sandstone, quartzose, essentially consolidated, very fine to fine to medium grained; upper contact appears sharp, but not well preserved; lower contact not well preserved.
107.79 (149.85)	Precambrian.

WL-92-39
FALCONBRIDGE - WILLIAM LAKE
11-6-56-13W
5962173N
474663E

Ground Elevation: 265.18m

m	Az.	Deg.
0	48°45'	43°00'
16	--	42°30'
16	25°00'	42°30'
73	--	41°30'
73	39°00'	41°30'
101	--	42°00'
101	39°00'	42°00'
122	--	42°00'
122	40°00'	42°00'
152	--	42°30'
152	39°00'	42°30'

Map: 63G/14

Logged by R. Bezys, June 16, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-6.44 (0.00-9.53)	Water and overburden.
6.44-11.52 (9.53-17.05)	Interlake Group: Fisher Branch Fm: light brown tan, massive wackestone/packstone; extensive <i>Virgiana decussata</i> brachiopods in the lower 33.8cm (50.0), along with favositids fragments; the rest of the unit is mottled with extensive porosity development in vugs, porosity is 8-10%.
11.52-32.56 (17.05-48.66)	Stonewall Fm: 11.52-12.54 (17.05-18.56): Upper Stonewall Marker: brown to olive brown, brecciated to massive to laminated mudstone; porosity is <1%, pinpoint; upper contact probably sharp, but not well preserved. 12.54-14.28 (18.56-21.13): unit 8: light brown to tan, massive, mudstone/wackestone, very faint mottling; porosity is <2%, fine vugs and pinpoint; gradational upper contact. 14.28-15.39 (21.13-22.78): upper T-marker: distinctly brick red to light green to grey, slightly brecciated/conglomeratic laminated mudstone; porosity is <1%, pinpoint; gradational upper contact. 15.39-16.31 (22.78-24.14): unit 6: light brown tan, slightly mottled, massive wackestone, slight conglomeratic base; porosity is 2-3%, mainly vugs; sharp upper contact. 16.31-18.92 (24.14-28.00): unit 5: light brown to tan mudstone, some faint irregular mottling, essentially massive; porosity is <2%, small vugs and pinpoint. 18.92-23.42 (28.00-35.00): unit 4: light brown to buff, mottled wackestone, massive; scattered fossil fragments, favositids; porosity is 10-15%, decreasing towards the top, very vuggy, mainly fossil solutioning; gradational upper contact. 23.42-23.95 (35.00-35.80): lower T-marker: light brown to green-grey mudstone, slightly bioturbated with minor brecciation; porosity is <1%, pinpoint; upper contact not well preserved. 23.95-28.47 (35.80-42.55): unit 2: light brown to tan, distinctly mottled, massive wackestone (normal marine sequence) with mudstone intervals; abundant coralline debris in the lower 0.67m (1.00), mainly favositids; porosity is 5% in the very well mottled wackestone beds, decreasing to <1% in the more mudstone-rich intervals; gradational upper contact. 28.47-32.56 (42.55-48.66): Williams Mbr: light brown to tan to olive brown, laminated mudstone; the entire Williams interval is somewhat fractured and broken up, poor core; porosity is <1%, pinpoint; sharp upper contact.

32.56-60.89 (48.66-91.00)	Stony Mountain Fm: light brown to brown, mottled mudstone, massive; slightly more mudstone-rich towards the top; scattered dark brown solid chert nodules towards the base; scattered coralline fossiliferous material; some scattered hardground surfaces towards the base; porosity is 2-3%, small vugs and pinpoint; gradational upper contact.
60.89-70.50 (91.00-105.36)	Upper Red River Fm (Fort Garry Mbr): dark grey to blue-grey to brown, laminated to brecciated mudstone; numerous clay bands at the base located at 69.76m (104.25), 104.91m (70.20) and 70.50m (105.36); at 61.56m (92.00) the core is very broken and rubbly, contains some green-grey clay infill (not in situ); upper 33.5-50.2cm (50.0-75.0) of the unit is brecciated; porosity is <1%, pinpoint; sharp upper contact.
70.50-106.07 (105.36-157.00)	Lower Red River Fm: light brown to brown, distinctly burrow mottled, massive wackestone; scattered white tripolized chert nodules throughout; becomes slightly more argillaceous in the upper 3.35m; scattered hardground surfaces; rare near vertical joints; porosity is 2-4%, medium to large vugs and pinpoint; gradational upper contact.

WL-92-40
FALCONBRIDGE - WILLIAM LAKE
7-6-56-13W
5962628N
475137E

Ground Elevation: 265.2m

m	Az.	Deg.
0	223°00'	47°30'
29	226°00'	48°00'
30	223°53'	48°08'
60	224°59'	48°30'
80	226°00'	49°00'
90	225°21'	49°10'
120	224°13'	49°30'
140.18	225°00'	50°00'
150	224°54'	50°00'
180	226°33'	49°33'

Map: 63G/14

Logged by R. Bezys June 16, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-16.27 (0.00-21.90)	Water and overburden.
16.27-30.16 (21.90-40.50)	Unidentified units due to poor core return; light brown tan, sand, clay to mud infill; possibly a Cretaceous infill; very fractured and broken core, especially in the upper 3-5 boxes; scattered joint fractures throughout; between 16.27-37.45m (21.90-50.00), 11.25m (15.08) of the core is missing.
30.16-32.77? (40.50-44.00?)	Stonewall Fm (Williams Mbr): light brown to brown, massive mudstone; very broken up core; very distinct green-grey sand-clay infill along a joint at 32.39-32.77 (43.50-44.00), 1.0cm thick, the host rock is somewhat brecciated next to the joint, the joint is tortuous; porosity is 1-2%, pinpoint; lower contact not preserved.
32.77?-60.94 (44.00?-80.75)	Stony Mountain Fm: light brown tan, distinctly mottled wackestone, massive; becomes slightly more mudstone-rich towards the top; extensive hardground development in the lower half of the unit; small clay infill bed at 38.50-38.57m (51.40-51.50); porosity is 2-5%, small vugs and pinpoint; sharp lower contact.
60.94-72.33 (80.75-95.60)	Upper Red River Fm (Fort Garry Mbr): blue-grey to brown mudstone; primarily massive; in places brecciated; some lamination in places; porosity is <1%, pinpoint; sharp lower contact.
72.33-107.38 (95.60-140.18)	Lower Red River Fm: light brown tan, mottled wackestone, massive; scattered white tripolized chert throughout as nodules; clay infill at 78.69m (104.00) and is 7.6cm (10.0) thick; porosity is 2-3%, pinpoint.
107.38-134.00 (140.18-176.09)	No core remaining because hole was tri-coned, therefore no Winnipeg Fm-Precambrian contact preserved.
134.00 (176.09)	Precambrian.

WL-92-41
FALCONBRIDGE - WILLIAM LAKE
3-7-56-13W
5962998N
474546E

Ground Elevation: 265.18m

m	Az.	Deg.
0	56°33'50"	45°00'
24.38	--	47°30'
24.38	330°00'	47°30'
72.24	--	47°30'
72.24	45°00'	47°30'
124.10	--	48°30'
124.10	45°00'	48°30'

Map: 63G/14

Logged by R. Bezys June 16, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-21.80 (0.00-29.57)	Water and overburden.
21.80-31.70 (29.57-43.00)	Intermixed sequence of till, dolomite and clay infill material; 3.80m (5.16) of missing core; possible cavern that was infilled.
31.70-33.04 (43.00-44.81)	Stonewall Fm (Williams Mbr): light brown tan, massive mudstone, very faint lamination; porosity is <1%, pinpoint.
33.04-66.64 (44.81-90.38)	Stony Mountain Fm: light brown to brown, distinctly mottled wackestone, some portions are burrowed; scattered hardground surfaces, especially in the lower half; very poor core representation because the core is very broken up, it get more broken towards the top; porosity is 2-3%, large vugs and pinpoint; gradational upper contact.
66.64-72.39 (90.38-98.18)	Upper Red River Fm (Fort Garry Mbr): light grey to grey, massive to laminated mudstone, slightly mottled intervals and slight brecciation in places; mud infill occurs along joints all the way through to 66.64m (90.38); between 57.75-66.64m (78.33-90.38) is aintermixed zone of infill material ranging from fine to medium grained unconsolidated sand; 3.41m (4.62) of core is missing for this formation; the Red River Fm-Stony Mountain Fm contact is missing; porosity is <1%, pinpoint.
72.39-92.95* (98.18-124.10*)	Lower Red River Fm: (* note: 92.95m (124.10) is not the true lower contact of this formation; between 92.95-117.34m (124.10-156.67), the core was tri-coned) light brown to brown, mottled to slightly burrow mottled wackestone, massive; clay infilled joint at 75.34-75.79m (100.60-101.20); scattered white tripolized chert lenses and nodules; porosity is 2-5%, small vugs and pinpoint; sharp upper contact.

MB-92-42
FALCONBRIDGE - MUDDY BAY
12-30-48-21W
Ground Elevation: 253.0m or 260.0m?

m	Az.	Deg.
0	180°00'	50°00'
38	179°30'	49°30'
89	177°30'	50°30'
149	176°00'	52°00'
200	178°00'	53°00'
250	177°30'	53°00'
308	177°30'	53°00'

Map 63 F/2
Logged by R. Bezys June 16, 1993

TRUE DEPTH (m)
(measured depth)

DESCRIPTION

0.00-23.19
(0.00-30.50)

Water and overburden.

23.19-108.45
(30.50-137.62)

Interlake Group:

23.19-78.77(30.50-101.00): **Cedar Lake Fm:** variably textured unit ranging from packstone to grainstone; argillaceous mudstone units occur throughout and the lower-most argillaceous cannot be picked unit to signify the base of the Cedar Lake Fm; this unit is unusual in that the argillaceous marker beds are interbedded throughout; generally light brown to buff with some grey argillaceous sequences; some units are very fossiliferous but solutioned (a more normal marine sequence); some very badly broken core intervals of green-grey to black mud infill; from 23.19-49.00m (30.50-63.50) the entire unit is essentially a sequence of either massive to laminated, slightly brecciated mudstone with frequent intervals containing clay infill and/or *in situ* brecciated beds (possibly solution breccia?); sample 88-15-93 is from 45.40-45.53m (59.70-59.87) of a brecciated solution infill? with some *en echelon* fracturing/faulting rehealed with pyrite;

23.19-34.14m (30.50-44.90): very confusing series of rock types, abundant clay infill material as well as clasts of medium crystalline grey *limestone* (maybe Devonian), intermixed with solid pieces of (normal) looking dolomite, some portions are extremely brecciated and fractured, and may represent a collapsed breccia sequence; the entire core is broken and rubbly;

45.40-46.08m (59.70-60.60): *in situ* breccia, may be cavern infill or solution breccia, this is similar to what has been seen in the Gulf Minitonas holes;

50.16-52.86m (65.00-68.50): brown massive mudstone, very faint lamination in places;

53.32-54.00m (69.10-70.0): dark grey to grey, slightly laminated mudstone;

61.65-66.10m (79.90-85.66): light brown to tan laminated to massive mudstone;

69.21-70.09m (89.70-90.83): light brown-grey, massive mudstone;

71.61-72.10m (92.80-93.44): grey massive mudstone;

76.91-77.58m (99.67-100.54): laminated mudstone with slight brecciation at the top; lower contact not preserved.

78.77-79.37 (101.00-101.77): **V-marker:** light green to brown laminated to arenaceous mudstone/sandstone with a 19.3cm (25.0) thick sandstone at the top; probable core loss associated with the sand unit, but can not be determined; porosity is <1-2%, pinpoint; lower contact appears gradational, but not preserved.

79.37-83.45 (101.77-107.00): **East Arm Fm:** light brown to brown, massive mudstone with some slight wackestone intervals; wackestone intervals are more mottled and more porous; contains a marker bed at 79.45-80.40 (102.97-104.20), grey laminated mudstone, probably part of the lower V-marker?; porosity is <1% in the mudstone, pinpoint, and 2-3% in the wackestone intervals, small vugs; sharp lower contact.

83.45-85.40 (107.00-109.50): **U₂-marker:** light green-grey to grey-brown, massive mudstone with faint lamination in places; becomes slightly more arenaceous with floating sand grains at the top; slight tiny breccia beds throughout; scattered clay beds, one at the base and one at

84.19m (107.95); porosity is <1%, pinpoint; sharp lower contact.

85.40-90.47 (109.50-116.00): **Atikameg Fm**: light brown tan, massive packstone to grainstone, contains unidentifiable grains; porosity is 5-10%, pinpoint and small vugs; sharp lower contact; **subunit**: top at 89.76m (115.10), light brown tan, slightly laminated to slightly brecciated mudstone (marker bed), porosity is <1%, pinpoint, gradational lower contact.

90.47-96.86 (116.00-124.20): **Moose Lake Fm**: light brown to brown, variably textured unit, ranging from mudstone to grainstone to packstone; some fossiliferous debris towards the base, coralline; thin argillaceous and brecciated mudstone bed at 93.27-93.59m (119.60-120.00); poorly preserved core, very broken up; porosity is 2-3%, mainly pinpoint and some fossil solutioning; sharp lower contact.

96.86-97.64 (124.20-125.20): **U₁-marker**: light brown to grey, brecciated, slightly arenaceous mudstone; porosity is <1%, pinpoint; gradational lower contact.

97.64-108.45 (125.20-137.62): **Fisher Branch Fm**: light brown to tan, mottled wackestone to packstone/grainstone; more mudstone-rich units towards the top; fossiliferous with abundant coral debris throughout, and *Virgiana decussata* present at 107.17m (136.00) for a 39.4cm (50.0), band, although no *V. decussata* was found closer to the contact with the Stonewall Fm; porosity is 5-8%, mainly vuggy and fossil solutioning; sharp lower contact.

108.45-130.28
(137.62-165.33)

Stonewall Fm:

108.45-110.03 (137.62-139.63): **Upper Stonewall marker**: brown to grey, slightly brecciated/conglomeratic mudstone, contains some lamination; porosity is <1%, pinpoint; sharp lower contact.

110.03-112.45 (139.63-142.70): **unit 7**: light brown tan mudstone/wackestone, slightly mottled, massive; porosity is <2%, mainly pinpoint and minor vugs; sharp lower contact.

112.45-114.54 (142.70-145.35): **upper T-marker**: olive green to brick red, laminated to brecciated to slightly bioturbated mudstone; a very distinct argillaceous marker bed; floating sand grains and lenses at the extreme top; porosity is <1%, pinpoint; sharp lower contact.

114.54-117.41 (145.35-149.00): **unit 5**: light brown to tan massive mudstone with some slight lamination; rare white and tripolized chert nodules and lenses; porosity is <1%, pinpoint; sharp lower contact.

117.41-122.77 (149.00-155.80): **unit 4**: light brown to tan, mottled massive wackestone; normal marine sequence, although no well preserved fossil material seen; at 119.62-121.55m (151.80-154.25) the core is very broken up and rubbly; porosity is 15-20%, vuggy; gradational lower contact.

122.77-123.72 (155.80-157.00): **unit 3**: olive green to red, massive mudstone; argillaceous marker bed; could possibly be the true top of Williams or lower T-marker?; porosity is <1%, pinpoint; gradational lower contact.

123.72-125.21 (157.00-158.90): **unit 2**: light brown to brown, massive wackestone; porosity is 5-10%, vuggy; gradational lower contact.

125.21-130.28 (158.90-165.33): **Williams Mbr**: light brown to brown to grey, laminated mudstone; some grey colouration due to diagenetic discolouration; porosity is <1%, pinpoint; sharp lower contact.

130.28-164.93
(165.33-206.51)

Stony Mountain Fm: light brown to brown, mottled wackestone, massive; becomes slightly more mudstone-rich towards the top; hardground surfaces developed in the lower one third of the unit; scattered fossiliferous fragments, probably coral material?; porosity is 2-4%, pinpoint and vuggy; sharp lower contact.

164.93-175.14
(206.51-219.30)

Upper Red River Fm (Fort Garry Mbr): brown to dark brown to grey to blue-grey, laminated to brecciated mudstone; abundant core loss and broken up core at 170.43-172.11m (213.40-215.50), possibly due to a cavern (?), although no infill material remains; porosity is <1%, pinpoint, to 2-3% in the upper portions; sharp lower contact.

175.14-229.88
(219.30-287.84)

Lower Red River Fm: light brown to brown, distinctly mottled to burrow mottled, massive wackestone; scattered white tripolized chert nodules throughout, chert increases in abundance towards the top; scattered fossiliferous material, mainly coralline; very rare cross-cutting joints; in the lower 31.9cm (40.0) is a very dark brown to arenaceous dolomite bed, possibly equivalent to the Hecla Beds?, containing pyrite mineralization; sharp upper contact from a burrow mottled wackestone to a brown unmottled mudstone; porosity is 3-5%, predominantly pinpoint with increasing larger vugs towards the top; sharp lower contact, but not well preserved.

229.88-243.18
(287.84-300.50)

Winnipeg Fm:

229.88-231.36 (287.84-289.70) (0.61m (0.77) of Winnipeg Fm core missing): **unit 4:** dark grey to brown, siltstone to sandstone, well cemented quartzose, fine to medium grained, massive to medium bedded; lower contact not preserved; similar to unit 2.

231.36-238.59 (289.70-298.75): **unit 3:** light grey white with some brown staining, unconsolidated quartz sandstone, minor unconsolidated portions, very fine to medium grained; sharp lower contact.

238.59-239.99 (298.75-300.50): **unit 2:** olive brown to grey, slightly argillaceous quartz siltstone to sandstone, well cemented and indurated compared to the underlying unit; no well developed mudstone beds; sharp lower contact.

239.99-243.18 (300.50-304.50): **unit 1:** light grey to white, quartz sandstone, fine to medium grained, completely unconsolidated; contains large grains of quartzite pebbles as a lag at the base; lower contact appears sharp, although not well preserved.

243.18 (287.84)

Precambrian.

WL-92-43
FALCONBRIDGE - WILLIAM LAKE
3-7-56-13W
5963042N
474590E

Ground Elevation: 265.18m

m	Az.	Deg.
0	56°33'	45°00'
30	55°47'	47°43'
32.61	46°00'	46°30'
60	54°08'	47°57'
90	52°22'	47°35'
96.62	42°00'	47°00'
120	52°04'	47°48'
150	51°56'	48°02'

Map: 63G/14

Logged by R. Bezys June 16, 1993

TRUE DEPTH(m) (measured depth)	DESCRIPTION
0.00-25.87 (0.00-35.66)	Water and overburden.
91.90*-110.11 (124.05*-148.09)	Lower Red River Fm: (* note: 91.90m (124.05) is the depth where the core begins, not the actual upper contact) light brown to brown, mottled, massive wackestone; scattered white tripolized chert nodules; porosity is 2-3%, mainly small vugs and pinpoint.
110.11-122.29 (148.09-164.47)	Winnipeg Fm: 110.11-117.11 (148.09-157.50): upper unit: light grey to white with a brown stain, massive quartz sandstone, fine to medium grained, appears quite consolidated although some portions are weathering out very unconsolidated; upper contact probably sharp, but not preserved. 117.11-122.29 (157.50-164.47): lower unit: dark grey to grey, interbedded sandstone-siltstone, minor shale, massive, the argillaceous portions are finely bedded, fine to medium grained, primarily consolidated, faint mottling in places; some pyrite mineralization as lenses and knots; sharp upper contact; lower contact appears sharp but not preserved.

MN-92-44
FALCONBRIDGE - MINAGO RIVER
5990078N
485611E

m	Az.	Deg.
0	57°00'	45°00'
53	47°30'	45°00'
107	48°30'	45°30'
150	50°30'	48°00'

Logged by R. Bezys June 18, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-9.68 (0.00-13.69)	Overburden.
9.68-13.71 (13.69-19.39)	Stony Mountain Fm: light brown to beige, mottled wackestone, massive; scattered hardground surfaces at the base; fossiliferous material present, cup corals and possible crinoidal debris; small veinlets of pyrite mineralization at the base; porosity is 3-4%, pinpoint and small vugs.
13.71-23.33 (19.39-33.00)	Upper Red River Fm (Fort Garry Mbr): light brown to grey to green, massive to mottled mudstone with laminated intervals and brecciated intervals; scattered clay bed seams throughout; scattered black veinlets of pyrite mineralization throughout; porosity is <1%, pinpoint and associated with burrows; sharp upper contact but not preserved.
23.33-55.16 (33.00-78.01)	Lower Red River Fm: light brown to brown to grey, massive, distinctly mottled wackestone with some mudstone intervals towards the top; scattered white tripolized chert nodules throughout; the base contains an arenaceous interval of floating sand grains; scattered hardground surfaces towards the base; porosity is 3-6%, small vugs and pinpoint; sharp upper contact.
55.16-67.62 (78.01-94.80)	Winnipeg Fm: light grey to white, fine to medium grained quartz sandstone, massive, primarily consolidated, becomes unconsolidated at 63.48m (89.00); no pyrite mineralization at all as seen in previous holes in the William Lake area; 5.57m (7.81) of Winnipeg Fm core is missing; sharp upper contact; lower contact very difficult to determine, possibly sharp.
67.62 (94.80)	Precambrian.

MN-92-45
FALCONBRIDGE - MINAGO RIVER
5990919N
483248E

m	Az.	Deg.
0	58°	45°
50	310°	45°
113	70°	46°
150	51°	44°30'

Logged by R. Bezys June 18, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-20.41 (0.00-28.86)	Overburden.
20.41-26.73 (28.86-37.80)	Stony Mountain Fm: light brown to tan, mottled wackestone, massive; extensive hardground surface development at the base; porosity is 2-3%, pinpoint; at 20.41-20.51m (28.86-29.00) is a fragment of Stony Mountain Fm flatlying, probably an overburden fragment; at 20.51-20.58m (29.00-29.10) is a green chlorite schist fragment, from overburden, till fragment.
26.73-36.60 (37.80-51.76)	Upper Red River Fm (Fort Garry Mbr): blue-grey to brown, massive to laminated mudstone; in places slightly brecciated, especially at 33.59m (47.30) and in the upper 35.4-53.0cm (50.0-75.0); very broken up and rubbly core; porosity is 1-3%, small vugs and pinpoint; sharp and erosional upper contact.
36.60-70.35 (51.76-97.80)	Lower Red River Fm: light brown tan, mottled to burrow mottled wackestone with some mudstone at the top, massive; lower contact has some interbedded floating sand grains, therefore an arenaceous sequence; scattered white tripolized chert throughout; near vertical fractures at 59.71m (83.00) and 57.91m (80.50); porosity is 2-5%, pinpoint and very small vugs; sharp upper contact.
70.35-80.52 (97.80-111.93)	Winnipeg Fm: light grey to white, quartz-rich sandstone, very fine to medium grained, consolidated and unconsolidated, massive where consolidated; at 74.81m (104.00) is a red hematitic and limonitic claystone bed, 3.6cm (5.0) thick, probably part of this formation?; 3.39m (4.71) of Winnipeg Fm core is missing; sharp upper contact.
80.52 (97.80)	Precambrian.

WL-92-46
FALCONBRIDGE - WILLIAM LAKE
11-31-57-13W
5980250N
474853E

Ground Elevation: 268.83m

m	Az.	Deg.
0	284°	45°30'
50	296°	46°00'
101	293°	46°30'
164	294°	47°30'

Map: 63G/14

Logged by R. Bezys June 19, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-7.16 (0.00-10.04)	Overburden.
7.16-9.29 (10.04-13.02)	Interlake Group (Fisher Branch Fm): light brown to tan, mottled grainstone to packstone; appears to have some coral debris as fossiliferous material, no <i>Virgiana decussata</i> present; at 6.56-7.13m (9.20-9.99) is a dark brown clay-mud (probably till) interval, only 46.4cm (65.0) of the interval is preserved; core very broken up and poorly preserved; porosity is 4-5%, small vugs and pinpoint.
9.29-28.92 (13.02-40.21)	<p>Stonewall Fm:</p> <p>9.29-10.36 (13.02-14.53): Upper Stonewall Marker: light grey to grey laminated mudstone; slightly conglomeratic; some minor pyrite veining; porosity is <1%, pinpoint; sharp upper contact.</p> <p>10.36-12.54 (14.53-17.58): unit 8: light brown to tan, massive mudstone; at 12.48m (17.50) is a good 0.5cm thick bed of pyrite along bedding planes with cross-cutting veinlets and blebs; porosity is 2-3%, pinpoint; gradational upper contact.</p> <p>12.54-12.72 (17.58-17.84): unit 7: dark red mudstone; faintly laminated; very poorly preserved and broken up core; not sure is this a fragment that has been misplaced; part of upper T-marker?</p> <p>12.72-13.84 (17.84-19.41): unit 6: light brown to brown, mottled wackestone; porosity is 5%, small to medium sized vugs; upper contact not preserved.</p> <p>13.84-14.41 (19.41-20.20): unit 5: distinctly red with light green at top, mottled wackestone; very distinct red mottling colouration; lower-most part of the upper T-marker?; porosity is <1%, pinpoint; sharp upper contact.</p> <p>14.41-19.90 (20.20-27.66): unit 4: brown to light brown at base, predominantly a mottled wackestone; more of a brown mudstone towards the top; in the mudstone are some more mottled intervals, others massive; scattered small white tripolized chert nodules; porosity is 2-7%, small vugs and pinpoint.</p> <p>19.90-20.65 (27.66-28.70): lower T-marker: red to green bioturbated mudstone; porosity is <1%, pinpoint; upper contact not preserved.</p> <p>20.65-24.44 (28.70-33.97): unit 2: light brown to tan, mottled wackestone; becomes more mudstone-rich towards the top; normal marine sequence at the base, quite fossiliferous with abundant coral debris; very difficult to subdivide the unit because core is very broken up and rubby; porosity is 5-8% at the base, vuggy and fossil solutioning, decreasing to 2-3% at the top, pinpoint; upper contact appears sharp, but not preserved.</p> <p>24.44-28.92 (33.97-40.21): Williams Mbr: light brown to tan, laminated to massive mudstone; porosity is <1%, pinpoint; sharp upper contact.</p>

28.92-56.99 (40.21-78.56)	Stony Mountain Fm: light brown to brown, distinctly mottled to nodular wackestone; massive; scattered brown chert nodules throughout; in lower half of unit is a distinct hardground surface; at 42.80m (59.50) and up the entire core is very broken up and rubbly; becomes more mudstone-rich towards the top; porosity is 2-3%, pinpoint; gradational upper contact.
69.07-103.55 (101.43 off log) (95.22-140.45 (137.45 off log))	Lower Red River Fm: light brown to tan, mottled wackestone; bioturbated in places; massive; scattered crinoidal debris; scattered white tripolized chert nodules throughout; in the lower 36.3cm (50.0) are arenaceous intervals of sand in dolomite; porosity is 2-3%, pinpoint; gradational upper contact.
103.55 (101.43 off log)-113.75 (140.45 (137.45 off log)-154.29)	Winnipeg Fm: (3.22m (4.37) of missing core) light grey to grey to white, massive quartz sandstone, fine to medium grained; half consolidated, half unconsolidated; no distinct shaley beds present; no visible pyrite mineralization; lower contact appears sharp, but not preserved; upper contact appears sharp, but not preserved.
113.75 (154.29)	Precambrian.

MN-92-47
FALCONBRIDGE - MINAGO RIVER
5993725N
485407E

m	Az.	Deg.
0	63°	45°00'
50	51°	44°30'
150	60°	46°00'

Map: 63J/3

Logged by R. Bezys June 18, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-9.50 (0.00-13.44)	Overburden.
9.50-21.66 (13.44-30.90)	Stony Mountain Fm: light brown tan, massive wackestone; abundant hardground surfaces throughout; rare white tripolized chert nodules; at 10.96m (15.50) is a 3.5cm (5.0) piece of sandstone core that appears to be out of place?; above this interval, core becomes very dark blue-grey, not sure if this is diagenetic discolouration; porosity is 2-3%, pinpoint; core is somewhat broken up towards the top.
21.66-32.35 (30.90-46.15)	Upper Red River Fm (Fort Garry Mbr): light brown to brown to grey to blue-grey, massive to mottled to laminated mudstone; some intervals slightly brecciated, minor brecciation occurring below contact due to broken up nature of core; the lower 1.75m (2.50) contains a somewhat nodular brecciated interval to the base, dolomite, not sure if this is early deformation or diagenetic deformation; scattered clay seams throughout with none quite broken up in places, at 24.11-24.37m (34.40-34.77) is a dark black silt with pebbles clay seam; sharp upper contact.
32.35-62.84 (46.15-89.65)	Lower Red River Fm: light brown to brown, nodular to burrowed wackestone, massive; becomes more mudstone-rich towards the top; scattered white tripolized chert nodules throughout; scattered crinoidal debris; porosity is 3-5%, mainly pinpoint with small vugs; sharp upper contact.
62.84-74.81 (89.65-104.00)	Winnipeg Fm: 62.84-67.95 (89.65-96.94): upper unit: light grey to dark grey, massive, slightly mottled, slightly fossiliferous quartz sandstone, very fine to medium grained; distinct fossiliferous interval at 63.38-63.59m (90.42-90.72), somewhat conglomeratic, containing primarily crinoidal debris, some pyrite mineralization within vugs; sharp upper contact. 67.95-68.69 (96.94-98.00): middle unit: grey to olive grey-brown, thinly bedded siltstone/mudstone, faintly burrow mottled; sharp upper contact. 68.69-74.81 (98.00-104.00): lower unit: light grey to grey, very fine to fine grained quartz sand, unconsolidated; 2.80m (4.00) of Winnipeg Fm core is missing; gradational upper contact; lower contact to Precambrian not preserved.
74.81 (104.00)	Precambrian.

MN-92-48
FALCONBRIDGE - MINAGO RIVER
5994334N
483919E

m	Az.	Deg.
0	64°00'	45°00'
50	51°30'	44°00'
100	50°00'	44°30'
150	55°30'	44°30'

Map: 63J/3

Logged by R. Bezys June 18, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-13.76 (0.00-19.46)	Overburden.
13.76-32.53 (19.46-46.83)	Stony Mountain Fm: light brown to tan, distinctly mottled wackestone, some buff intervals, massive; some well developed hardground surfaces in the lower 7.07m (10.00); fossil fragments are undeterminable, possibly crinoid material; core is very broken up above 20.84m (30.00); porosity is 3-5%, variable small vugs, mainly pinpoint and minor fossil solutioning; probably very close to contact with the Stonewall Fm.
32.53-44.58 (46.83-64.17)	Upper Red River Fm (Fort Garry Mbr): brown to dark grey, massive laminated mudstone, brecciated interval 0.96-1.04m (1.00-1.50) thick; fine clay partings scattered throughout; clay-mud infill at 35.85-35.89m (51.61-51.66); porosity is <1%, pinpoint; upper contact is a distinctly erosional surface with scour infill of overlying Stony Mountain Fm; sharp upper contact.
44.58-74.09 (64.17-105.70)	Lower Red River Fm: light brown to tan, mottled to burrow mottled, massive wackestone; scattered white tripolized chert as small nodules throughout; scattered fossiliferous material, mainly coralline; minor hardground surfaces at the base; porosity is 2-3%, fine pinpoint and vuggy; gradational upper contact.
74.09-83.41 (105.70-119.00)	Winnipeg Fm: light grey to grey, massive quartz sandstone, slightly burrow mottled, fine to medium grained; 1.94m (2.77) of Winnipeg Fm core is missing; sharp upper contact, very mottled and pyritized.

WL-92-49
FALCONBRIDGE - WILLIAM LAKE
8-12-57-14W
5973046N
473975E

Ground Elevation: 265.18m

m	Az.	Deg.
0	284°54'35"	45°30'
11	294°00'	45°00'
62	294°00'	45°00'
113	296°00'	46°00'
179	295°00'	46°00'

Map: 63G/14

Logged by R. Bezys June 19, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-4.35 (0.00-6.10)	Overburden.
4.35-14.37 (6.10-20.32)	<p>Interlake Group:</p> <p>4.35-5.66 (6.10-8.00): U₁-marker: (only 28.3cm (40.0) of good core preserved for this unit) light brown to brown, laminated to brecciated mudstone with fine grained sand intervals; porosity is 1-2%, pinpoint.</p> <p>5.66-14.37 (8.00-20.32): Fisher Branch Fm: light brown tan, mottled wackestone to grainstone/packstone, massive; 35.4cm (50.0) thick interval of well preserved <i>Virgiana decussata</i> at base; porosity is 5%, pinpoint with small vugs; upper contact not preserved, core all broken up.</p>
14.37-30.24 (20.32-42.76)	<p>Stonewall Fm:</p> <p>14.37-15.72 (20.32-22.23): Upper Stonewall Marker: light grey to grey to brown, laminated mudstone, slightly conglomeratic; porosity is <1%, pinpoint; sharp upper contact.</p> <p>15.72-17.35 (22.23-24.53): unit 8: light brown tan slightly mottled mudstone/wackestone; porosity is 1-3%, fine pinpoint and small vugs; gradational upper contact.</p> <p>17.35-18.24 (24.53-25.80): upper T-marker: light brown to brown to green-grey; brecciated/conglomeratic mudstone; polymictic assortment of breccia clasts in the middle; fine intraformational breccia at the top; porosity is 1-2%, pinpoint and small vugs; gradational upper contact.</p> <p>18.24-19.04 (25.80-26.92): unit 6: light brown to tan, mottled wackestone, massive; porosity is 2-4%, vuggy; gradational upper contact.</p> <p>19.04-21.23 (26.92-30.03): unit 5: light brown to brown, laminated to massive mudstone, some intervals have minor brecciation; porosity is <1%, pinpoint; gradational upper contact.</p> <p>21.23-24.89 (30.03-35.20): unit 4: light brown to tan, mottled, massive wackestone; normal marine sequence, fossiliferous with coral debris; scattered white tripolized chert throughout; porosity is 5%, vuggy and fossil solutioning; sharp upper contact.</p> <p>24.89-25.54 (35.20-36.12): lower T-marker: grey to dark grey, laminated mudstone, fine breccia lamination in places; fine pyrite mineralization along small veinlets; porosity is <1%, pinpoint; gradational upper contact.</p> <p>25.54-28.99 (36.12-41.00): unit 2: light brown to tan, mottled wackestone; normal marine sequence with scattered coral debris at the base; porosity is 5%, vuggy and fossil solutioning; sharp upper contact.</p> <p>28.99-30.24 (41.00-42.76): Williams Mbr: light brown to light green, laminated to massive mudstone; core is very broken up and rubbly; porosity is <1%, pinpoint; sharp upper contact.</p>

30.24-60.29 (42.76-85.27)	Stony Mountain Fm: light brown to brown, mottled wackestone, massive; decreasing mudstone-rich towards the top; scattered hardground surfaces in the lower 3.54-7.07m (5.00-10.00); porosity is 2-5%, variable pinpoint and vuggy; gradational upper contact.
60.29-72.73 (85.27-101.10)	Upper Red River Fm (Fort Garry Mbr): blue-grey to green-grey, laminated to massive mudstone; some brecciated intervals, especially in the upper 36.0-54.0cm (50.0-75.0); porosity is 1-2%, pinpoint; sharp upper contact.
72.73-108.17 (101.10-150.37)	Lower Red River Fm: light brown to tan, mottled wackestone; more mudstone-rich towards the top; burrowed with fine granular material, probably crinoidal debris; scattered white tripolized chert nodules throughout; scattered blebs of mineralization along fractures; at 91.15m (126.72) to the base, the entire unit is distinctly mottled with a matrix containing sucrosic dolomite, this may be a zone of enhanced porosity development due todolomitization; at the base is are interbedded faint quartz grains giving an arenaceous appearance; this whole interval of enhanced porosity is very broken up and rubbly, does not appear as competent as overlying Red River Fm; porosity is 10%, pinpoint and vuggy for the lower part of the unit, and 2-5%, pinpoint for the upper part of the unit; gradational upper contact.
108.17-117.97 (150.37-164.00)	Winnipeg Fm: (1.53m (2.13) of missing core) 108.17-114.72 (150.37-159.48): upper unit: light grey to off white, quartz sandstone; fine to medium grained, majority consolidated with minor unconsolidated portions; no obvious signs of pyrite mineralization. 114.72-115.81 (159.48-161.00): middle unit: grey to olive brown, laminated siltstone with argillaceous laminae, essentially consolidated with minor unconsolidated portions; gradational upper contact. 115.81-117.97 (161.00-164.00): lower unit: light grey to off white, quartz sandstone, fine to medium grained, completely unconsolidated; lower contact probably sharp but not preserved; upper contact sharp, but not preserved.
117.97 (164.00)	Precambrian.

WL-92-50
FALCONBRIDGE - WILLIAM LAKE
12-19-57-13W
5976833N
474276E

Ground Elevation: 265.18m

m	Az.	Deg.
0.00	194°27'20"45°00'	
17.00	--	44°30'
17.00	200°00'	44°30'
119.00	--	45°00'
119.00	212°00'	45°00'
170.45	--	44°30'
170.45	225°00'	44°30'

Map: 63G/14

Logged by R. Bezys June 19, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-6.51 (0.00-9.29)	Overburden.
6.51-24.53 (or 26.63) (9.29-35.00 (or 38.50)	<p>Stonewall Fm: 6.51-7.11 (9.29-10.14): Upper Stonewall Marker: light grey to grey, laminated mudstone; small laminae in brecciated intervals; porosity is <1%, pinpoint. 7.11-9.07 (10.14-12.94): unit 9: light brown to tan, mottled wackestone; faint lamination in places; porosity is 4-5%, vugs and pinpoint; upper contact not preserved. 9.07-9.60 (12.94-13.69): upper T-marker: light brown to brown to buff to light green-grey, slightly brecciated mudstone; laminated; thin arenaceous beds towards top of fine quartz sand grains; upper contact contains pyrite laminae along bedding planes; porosity is 1-2%, small vugs and pinpoint; sharp upper contact. 9.60-10.16 (13.69-14.50): unit 7: light brown to buff, mottled wackestone; part of upper T-marker?; porosity is 2-4%, vugs; sharp upper contact. 10.16-10.60 (14.50-15.12): unit 6: light grey to brown, slightly brecciated mudstone; part of the upper T-marker?; porosity is 4%, pinpoint; sharp upper contact. 10.60-12.53 (15.12-17.87): unit 5: light brown to tan, massive mudstone; laminated in places; core is very broken and rubbly; porosity is 1-2%, small vugs and pinpoint; upper contact appears sharp, but not well preserved. 12.53-16.30 (17.87-23.25): unit 4: light brown to brown, mottled wackestone; normal marine sequence, fossiliferous, mainly coral debris; scattered small white tripolized chert nodules; porosity is 5-10%, vuggy and fossil solution; gradational upper contact. 16.30-16.68 (23.25-23.80): lower T-marker: distinctly red to green, laminated mudstone; porosity is <1%, pinpoint; upper contact not preserved. 16.68-20.62 (23.80-29.42): unit 2: light brown to tan, mottled wackestone; massive; more mudstone-rich towards the top; normal marine sequence, although no discernable fossils; porosity is 5-10%, vuggy; sharp upper contact. 20.62-24.53(or 26.63) (29.42-35.00(or 38.50)): Williams Mbr: light brown to brown to tan, laminated mudstone; core is very broken up and rubbly above 22.43m (32.00) to the surface; porosity is <1%, pinpoint; upper contact not well preserved.</p>
24.53 (or 26.63)- 53.55 (35.00 (or 38.50)- 75.43)	<p>Stony Mountain Fm: light brown to brown, distinctly mottled/nodular wackestone to mudstone at top; massive; distinctive hardground surfaces in lower 7.07m (10.00); rare white tripolized chert nodules throughout; becomes more mudstone-rich towards the top, therefore it is very difficult to discern upper contact; porosity is 2-4%, vuggy and pinpoint; gradational upper contact.</p>

53.55-65.05 (75.43-92.00)	Upper Red River Fm (Fort Garry Mbr): light brown to brown to blue-grey, massive to laminated mudstone; some brecciated intervals; at the top it is difficult to discern contact due to broken up nature of core; the upper 2.12m (3.00) contains various intervals of brecciation; porosity is <1%, pinpoint; sharp upper contact.
65.05-97.20 (92.00-137.46)	Lower Red River Fm: light brown to tan, mottled wackestone; massive; scattered white tripolized chert nodules throughout, some are 2.8-3.5cm (4.0-5.0) in diameter; at 84.29-84.38m (119.20-119.33) are intervals of joint fractures that are filled with mud and silt; porosity is 3%, pinpoint and small vugs; upper contact not preserved due to missing ground core between 67.18-65.73m (119.20-119.33).
97.20-105.54 (137.46-150.57)	Winnipeg Fm: (44.5cm (63.0) of missing core) 97.20-102.53 (137.46-145.00): upper unit: light grey to off-white, quartz sandstone; massive; consolidated, minor portions unconsolidated; sharp upper contact. 102.53-104.35 (145.00-147.47): middle unit: grey to dark grey, siltstone; primarily consolidated with minor portions unconsolidated; fine grained quartz interbedded with faint laminae of mud, darker green in colour; scattered rare pyrite nodules throughout; minor hematitic staining; gradational upper contact; gradational lower contact. 104.35-105.54 (147.57-150.57): lower unit: light grey to off-white, unconsolidated quartz sandstone, very fine to medium grained; lower contact appears sharp, but not well preserved.
105.54 (150.57)	Precambrian.

WL-92-51
FALCONBRIDGE - WILLIAM LAKE
16-6-56-13W
5962919N
475593E

Ground Elevation: 278.10m

m	Az.	Deg.
0	223°09'	45°00'
8	219°00'	45°00'
9	223°03'	45°24'
26	230°00'	46°00'
27	223°21'	45°39'
77	232°00'	46°30'
78	224°21'	46°18'
128	231°00'	46°30'
129	224°12'	46°53'
179	229°00'	47°00'

Map: 63G/14

Logged by R. Bezys June 19, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-1.94 (0.00-2.74)	Overburden.
1.94-17.14 (2.74-23.83)	<p>Interlake Group:</p> <p>1.94-8.25 (2.74-11.59): Moose Lake Fm: light brown to tan, grainstone to packstone to mudstone; some slightly brecciated intervals; cannot identify the medial marker bed; very difficult to describe due to poor core; porosity is 2-3%, pinpoint.</p> <p>8.25-9.42 (11.59-13.10): U₁-marker: light brown to grey, brecciated/conglomeratic to laminated mudstone; slightly arenaceous with fine sand grains in matrix of breccias; above this interval, the core is very broken and poorly preserved; porosity is <1%, pinpoint; sharp upper contact</p> <p>9.42-17.14 (13.10-23.83): Fisher Branch Fm: light brown to tan, massive wackestone; very fossiliferous towards the base, coralline debris, not <i>Virgiana decussata</i> present; porosity is 5-15%, small vugs and pinpoint; sharp upper contact.</p>
17.14-36.65 (23.83-51.25)	<p>Stonewall Fm:</p> <p>17.14-18.09 (23.83-25.15): Upper Stonewall Marker: light brown to grey, slightly laminated to conglomeratic mudstone; porosity is <1%, pinpoint; sharp upper contact.</p> <p>18.09-19.79 (25.15-27.68): unit 8: light brown to tan, massive mudstone/wackestone; minor lamination in places; porosity is 3-5%, vuggy; gradational upper contact.</p> <p>19.79-20.83 (27.68-29.13): upper T-marker: red to dark red to green, laminated mudstone, slightly conglomeratic at the base; black pyrite mineralization in small veinlets and along bedding planes at the base and top; porosity is <1%, pinpoint; gradational upper contact.</p> <p>20.83-21.52 (29.13-30.10): unit 6: light brown to brown, mottled wackestone, massive; porosity is 4-5%, mainly vugs; sharp upper contact.</p> <p>21.52-23.54 (30.10-32.92): unit 5: light brown to brown, laminated to slightly massive mudstone; capped by a 10.7-14.3cm (15.0-20.0) intervals of an argillaceous marker bed, green-grey clay interbedded with mudstone; porosity is 1-2%, small vugs and pinpoint; gradational upper contact.</p> <p>23.54-28.05 (32.92-39.23): unit 4: light brown to brown to buff, mottled wackestone; grades upwards to more of a mudstone; very porous and fossiliferous (coralline debris) at the base; porosity is 10-15%, vuggy; gradational upper contact.</p> <p>28.05-28.47 (39.23-39.82): lower T-marker: light brown to slight green, slightly brecciated to laminated mudstone; porosity is 4%, pinpoint; sharp upper contact.</p> <p>28.47-32.65 (39.82-45.66): unit 2: light brown-tan, mottled wackestone; becomes slightly more mudstone-rich towards the top; small scattered coralline debris at the base, very good</p>

normal marine sequence; porosity is 5-8%, vugs to pinpoint; upper contact probably sharp, but not well preserved.

32.65-36.65 (45.77-51.25): **Williams Mbr**: light brown to brown/olive brown, massive mudstone with some laminated intervals; some clay infill at 33.68-33.72m (47.10-47.15); porosity is <1%, pinpoint; sharp upper contact.

36.65-64.05
(51.25-88.60)

Stony Mountain Fm: light brown to brown, distinctly mottled, massive wackestone; scattered hardground surfaces towards the base lower 3.63-7.25m (5.00-10.00); rare solid brown chert nodules; porosity is 3-5%, pinpoint and small vugs; gradational upper contact.

64.05-76.40
(88.60-105.32)

Upper Red River Fm (Fort Garry Mbr): light grey to grey to brown, massive to sometimes laminated mudstone; some brecciated intervals especially in the upper 0.50-0.75m; extremely laminated mudstone at 66.51-66.66m (92.00-92.20); some pyrite mineralization along cross-cutting veinlets; porosity is <1%, pinpoint; sharp upper contact.

76.40-110.88
(109.43 off log)
(105.32-151.90
(150.86 off log))

Lower Red River Fm:

light brown to beige-brown, massive, mottled to burrow mottled wackestone; scattered white tripolized chert nodules throughout; scattered hardground surfaces towards the base, lower 3.61-5.06m (5.00-7.00); arenaceous dolomite at the base with floating sand grains; at 80.84-80.95 (111.45-111.60) is a mud infilled near vertical fracture; very minor subvertical fractures; porosity is 3-4%, pinpoint and small vugs; gradational upper contact.

110.88 (109.43 off
log)-119.94
(151.90 (150.86
off log)-164.00)

Winnipeg Fm: (2.63m (3.60) of missing core)

110.88 (109.43 off log)-117.46 (151.90 (150.86 off log)-160.60): **upper unit**: light grey to grey with buff weathering, massive quartz sandstone, fine to medium grained; scattered pyrite mineralization as nodules and blebs at the base, in the middle and at the top; upper contact is sharp to a zone of pyrite weathered sand.

117.46-117.75 (160.60-161.00): **middle unit**: (only 34.4cm (47.0) of core for this unit remaining) blue-grey to grey, laminated mudstone with quartz sand-silt interbeds; lots of core missing; upper contact not preserved.

117.75-119.94 (161.00-164.00): **lower unit**: (only 11.0cm (15.0) of core for this unit remaining) light grey to grey, unconsolidated quartz sandstone, fine to medium grained; very difficult to make a description due to lack of core; upper and lower contacts not preserved.

119.94 (164.00)

Precambrian.

WL-92-52
FALCONBRIDGE - WILLIAM LAKE
16-23-56-14W
5967588N
472440E

Ground elevation: 278.1m

m	Az.	Deg.
0	123°	45°00'
162	16°	45°00'
212	48°	50°00'

Map: 63G/14

Logged by R. Bezys June 10, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-3.41 (0.00-4.82)	Overburden.
3.41-17.97 (4.42-25.42)	<p>Interlake Group:</p> <p>3.41-7.71 (4.82-10.90): Moose Lake Fm: light brown to tan mudstone, wackestone to grainstone; some zones fossil-rich with colonial coral and paleofavositids; porosity is 1-5%, vuggy, pinpoint, and fossil solution; very broken core to top of bedrock surface.</p> <p>7.71-9.55 (10.90-13.50): U₁-marker: brown mudstone, brecciated in places, massive; porosity is 1-2%, pinpoint; gradational lower contact.</p> <p>9.55-17.97 (13.50-25.42): Fisher Branch Fm: light brown to tan buff, lower unit is wackestone grading upward to mudstone; do not see distinct <i>Virgiana</i> zone at base, appears only slightly fossiliferous, possibly minor brachiopod fragments; porosity is highly vuggy in places up to 25%, average of about 10%; sharp lower contact.</p>
17.97-36.56 (25.42-51.70)	<p>Stonewall Fm:</p> <p>17.97-18.49 (25.42-26.15): Upper Stonewall Marker: grey to light grey mudstone, laminated, scattered floating grains of debris, i.e. conglomeratic; porosity is 1-2%, pinpoint; sharp lower contact.</p> <p>18.49-20.51 (26.15-29.01): unit 8: light brown to tan wackestone to mudstone, grainstone, slightly normal marine sequence; no fossil material distinguishable; porosity is 2-3%, vuggy; sharp lower contact.</p> <p>20.51-21.77 (29.01-30.79): upper T-marker: distinctly red to blue-grey mudstone bed, red portion of bed is very distinctly coloured probably due to diagenetic effects and due to the fact that unit is brecciated; porosity is 1-2%, pinpoint; some pyrite mineralization (black) along veinlets; sharp lower contact.</p> <p>21.77-24.40 (30.79-34.50): unit 6: tan to brown mudstone, laminated, massive; porosity is 1-2%, pinpoint; sharp lower contact.</p> <p>24.40-26.48 (34.50-37.45): unit 5: tan to brown buff wackestone, normal marine sequence; appears to be fossiliferous but no distinct fossils found, some bioturbation; porosity is 5-10%, vuggy; sharp lower contact.</p> <p>26.48-28.99 (37.45-41.00): lower T-marker: light grey to tan mudstone; porosity is 2 %, tight; very poorly preserved and broken up core; lower contact not preserved.</p> <p>28.99-30.14 (41.00-42.62): unit 3: light brown to tan mudstone, massive, structureless; porosity is 1-3%, pinpoint; core broken up; lower contact not preserved.</p> <p>30.14-33.06 (42.62-46.76): unit 2: light brown, tan to slightly orange wackestone, appears to be normal marine sequence, no determinable fossil material; scattered zones of tripolized white chert; porosity is 5-10%, very vuggy; very broken up core; sharp lower contact, not well preserved.</p> <p>33.06-36.56 (46.76-51.70): Williams Mbr: brown to light brown with olive green mudstone, massive with lamination, some burrowing, one breccia bed located at 34.33m (48.55); porosity is 1-2%, pinpoint; gradational lower contact.</p>

36.56-64.11 (51.70-90.67)	Stony Mountain: light brown to brown wackestone, distinctly nodular, massive, some bioturbation, very well developed hardground surfaces at base to Red River; porosity is 3-5%, mainly vuggy; sharp lower contact.
64.11-69.30 (90.67-98.00)	Upper Red River Fm (Fort Garry Mbr): blue-grey to brown mudstone, massive, distinctly brecciated in places (at 66.68m (94.30) and at the top); containing distinct colour mottling due to diagenesis?; at 65.39-65.64m (92.48-92.83) exists a brown silt sand infill; porosity is 1-2%, pinpoint; gradational lower contact.
69.30-100.52 (98.00-142.15)	Lower Red River Fm: light brown to brown wackestone, massive, burrow mottled to nodular in places; tripolized white chert throughout (nodular); porosity is 4-5%, mainly vuggy, some pinpoint.
100.52-114.55 (142.15-162.00)	Winnipeg Fm: 100.52-111.09 (142.15-157.10): upper unit: light brown to brown to grey quartz sandstone, massive with bioturbation; becoming lighter in colour between 100.52m (142.15) and 109.04m (154.20); between 105.36-107.48m (149.00-152.00) there is reported sand loss; the top 21.2cm (30.0) is very consolidated and interbedded with Red River dolomite; overall 2.89m of core is lost for the Winnipeg Fm, 2.12m (3.00) is accounted for in reported sand core loss; lower contact not well preserved. 111.09-111.94 (157.10-158.30): middle unit: grey to dark grey quartz siltstone to sandstone, siltstone is more argillaceous and occurs at the top, lower unit is white to off white; becomes a sandstone towards the base, and more brown. 111.94-114.55 (158.30-162.00): lower unit: predominantly white quartz sandstone, massive, fine to coarse grained, consolidated, slight lamination, sandstone becomes slightly more argillaceous towards the top; scattered pyrite nodules and knots, 0.5-1.0cm in diameter; slight green colouration in sandstone overlying the Precambrian; lower contact not very well preserved due to broken core, but probably sharp to ultramafics rock types.
114.55 (162.00)	Precambrian.

WL-92-53
FALCONBRIDGE - WILLIAM LAKE
15-23-56-14W
5967831N
472092E

Ground elevation: 278.1m

m	Az.	Deg.
0	121°	45°
50	121°	43°
176	121°	52

Map: 63G/14

Logged by R. Bezys June 9, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-1.66 (0.00-2.35)	Overburden.
1.66-23.79 (2.35-34.25)	<p>Interlake Group:</p> <p>1.66-7.78 (2.35-11.00): Atikameq Fm: light yellow-orange to brown grainstone, some minor lamination; reefal, no well preserved fossil remains; core is very broken up; porosity is 10-15%; upper 35.4cm (50.0) to 71.0cm may be East Arm Fm?; lower contact not preserved.</p> <p>7.21-7.78 (10.20-11.00): Marker Bed: light brown to grey conglomeratic bed, irregular clast size, angular to rounded, <0.1cm to 4.0cm in size; porosity 2-3%, vuggy; gradational lower contact.</p> <p>7.78-14.31 (11.00-20.60): Moose Lake Fm: light brown, variably textured grainstone to mudstone, more brecciation at top with floating sand grains, green in colour (stromatolitic towards top); scattered stromatoporoid fragments, some fossiliferous debris, some brachiopods and corals; porosity is <3-4%, vuggy; sharp lower contact.</p> <p>14.31-15.63 (20.20-22.55): U₁-marker: light brown to grey mudstone, laminated with intervals of brecciation; porosity is <2%, pinpoint; sharp lower contact.</p> <p>15.63-23.79 (22.55-34.25): Fisher Branch Fm: fossiliferous wackestone from base to 18.76m (27.00) with a distinct 34.7cm (50.0) <i>Virgiana decussata</i> debris at base; the lower Fisher Branch Fm is more of a mudstone, slightly laminated; porosity is 10% for the lower part and grading up to 5% towards top; sharp lower contact.</p>
23.79-42.17 (34.25-61.83)	<p>Stonewall Fm:</p> <p>23.79-24.21 (34.35-35.50): Lower Stonewall Marker: dark brown to grey mudstone with conglomeratic and brecciated intervals, laminated; porosity is 1-2%; sharp lower contact.</p> <p>24.21-26.43 (35.50-38.76): unit 7: light brown to tan wackestone/mudstone, somewhat normal marine, mottled, no well developed fossils; porosity is 3-5%, vuggy to pinpoint.</p> <p>26.43-26.94 (38.76-39.50): upper T-marker: distinctly red mudstone, very discoloured, very clayey; broken up, i.e. core not very well preserved; porosity is 1-2%.</p> <p>26.94-29.94 (39.50-43.90): unit 5: light brown to brown, massive to laminated mudstone; porosity is 2-3%, vuggy; gradational lower contact.</p> <p>29.94-33.76 (43.90-49.50): unit 4: light brown to tan wackestone, good normal marine sequence, fossiliferous with coralline debris, mainly colonial and coral fragments; porosity is 5-10%, vuggy; gradational lower contact.</p> <p>33.76-34.80 (49.50-51.02): lower T-marker: distinctly dark grey to some grey mudstone, bioturbated in places, some breccia fragments (minor); nil porosity; sharp lower contact.</p> <p>34.80-38.55 (51.02-56.52): unit 2: light brown to tan, good marine wackestone sequence, becoming more mudstone-rich towards top; fossiliferous, good colonial coral fragments; porosity is 5-7%, vuggy; sharp upper contact.</p> <p>38.55-42.17 (56.52-61.83): Williams Mbr: brown to grey massive mudstone, finely laminated; porosity is <1-2%, tight; very broken core in the center of the member; gradational lower contact.</p>

42.17-71.61 (61.83-97.13)	Stony Mountain Fm: predominantly light brown to dark brown wackestone, distinctly mottled to nodular, lower 3.41-4.77m (5-7) containing hardground surfaces; porosity is 5%, mainly vuggy; at basal contact some very distinctly burrowed mottled zones with an increase in porosity up to 10%; some pyrite mineralization; clay infill zone at 56.89-57.06m (80.10-80.35), white kaolin?; at the upper contact is a slight increase in mudstone content.
71.61-81.65 (97.13-110.75)	Upper Red River Fm (Fort Garry Mbr): blue-grey to grey mudstone with some lamination, very irregular due to diagenetic discolouring, massive, towards top becoming more brecciated to contact of Stony Mountain; porosity is <2-3%, generally tight; possible tiny brachiopod fragments along bedding planes at base (ostracods?).
81.65-117.46 (110.75-153.90)	Lower Red River Fm: brown to tan massive wackestone, burrow mottled, becomes slightly more argillaceous at top; scattered white tripolized chert development; scattered fossils, solitary coral; porosity is <3%, vuggy and pinpoint; at 86.78m (117.7) is a 7.4cm (10.0) thick clay infill, probably along a bedding plane; sample 88-10-93 is from 107.42-107.62m (140.75-141.00), a 1.0cm thick, very black shale joint infill with white flecks of possibly kaolin?, minor pyrite; lower contact not well preserved, but probably sharp.
117.46-125.93 (153.90-165.00)	Winnipeg Fm (1.34m (1.76) of missing core): 117.46-121.83 (153.90-159.63): upper unit: light brown sandstone with fine to medium quartz grains, massive, identical to lower unit; gradational lower contact. 121.83-122.35 (159.63-160.30): middle unit: brown argillaceous quartz siltstone to light grey mudstone; some fissility in mudstone, i.e. to shale; gradational lower contact. 122.35-125.93 (160.30-165.00): lower unit: white to tan quartz sand, very fine to medium grained, primarily consolidated, massive; present at the base, small quartzite pebbles <1cm in size; base is very sharp to Precambrian, very unusual with tiny veins of sand coursing into the Precambrian.
125.93 (165.00)	Precambrian.

WL-92-54
FALCONBRIDGE - WILLIAM LAKE
10-35-56-14W
5970590N
471723E

Ground elevation: 274.00 m (?)

m	Az.	Deg.
0	225°	45°00'
50	225°	44°30'
100	225°	44°30'
150	228°	46°00'

Map: 63G/14

Logged by R. Bezys June 11, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
1.00-5.44 (0.00-7.70)	Overburden.
5.44-21.04 (7.70-29.88)	<p>Interlake Group:</p> <p>5.44-11.76 (7.70-16.70): Moose Lake Fm: light brown tan variable textured unit with grainstone, packstone, some mudstone, some conglomeratic or intraformational breccia beds, massive; porosity is 2%, mainly vuggy and pinpoint; very broken and rubbly core, upper 4.24m (6.00) is very poorly preserved.</p> <p>11.76-12.74 (16.70-18.10): U₁-marker: brown to light brown mudstone, laminated to brecciated; porosity is <2%, mainly pinpoint; sharp upper contact.</p> <p>12.74-21.04 (18.10-12.74): Fisher Branch Fm: light brown buff wackestone at base to mudstone at top; there are no well developed <i>Virgiana</i> beds, instead there is fossiliferous coral debris, quite abundant, very possibly some brachiopod fragments; porosity at the base is 5-8% to <3% in upper sequence; grading upwards to U₁-marker.</p>
21.02-41.07 (29.88-58.60)	<p>Stonewall Fm:</p> <p>21.04-22.53 (29.88-32.00): Upper Stonewall Marker: light brown to tan mudstone, laminated to conglomeratic, conglomeratic fragments as large as 3.00cm but mainly <1.00cm; porosity is <1%; sharp upper contact.</p> <p>22.53-23.88 (32.00-34.07): unit 7: light brown to tan mudstone, slightly wackestone, massive; not a well developed marine sequence; porosity is 2-3%, vuggy and pinpoint; upper contact not well preserved due to broken core.</p> <p>23.88-25.41 (34.07-36.26): upper T-marker: light brown-gray mudstone, slightly brecciated in places; top is sharp with distinct pyrite mineralization along bedding plane, black, as been before; porosity is <1%, pinpoint; core is very broken up and poorly preserved.</p> <p>25.41-27.13 (36.26-38.70): unit 5: light brown massive mudstone; porosity is <2%, pinpoint; upper contact not very well preserved due to broken up rubbly core.</p> <p>27.13-31.02 (38.70-44.25): unit 4: light brown to brown wackestone, massive: normal marine sequence, fossiliferous, paleofavositids fragments; porosity is 3-4%, vuggy; core is quite broken up in place with upper contact probably gradational but not well preserved.</p> <p>31.02-32.30 (44.25-46.08): lower T-marker: green-gray to brown laminated mudstone with breccia intervals, clasts are <3.00mm in size; small veinlets of pyrite mineralization, black in colour; porosity is <1%; sharp upper contact.</p> <p>32.30-35.75 (46.08-51.00): unit 2: light brown buff wackestone, no really well developed mudstone beds; normal marine sequence, scattered favositids fossils; chalky coating, clayey coating on broken fragments; porosity upwards 5% to 10% to places; very broken and rubbly core.</p> <p>35.75-41.07 (51.00-59.60): Williams Mbr: brown to dark brown massive laminated mudstone with distinct diagenetic lamination coloration; porosity is <1%, pinpoint; upper contact not preserved due to broken core.</p>

41.07-64.66 (58.60-92.25)	Stony Mountain: brown to tan wackestone, mottled to nodular, massive; rare chert nodules, dark brown; gradational upper contact.
64.66-72.89 (92.25-104.00)	Upper Red River Fm (Fort Garry Mbr): green to olive green to brown mudstone with unique purple to red diagenetic coloration, massive, mottled, minor breccia beds, slightly brecciated at top; porosity is low to negligible, <1-2%; sharp upper contact.
72.89-105.66 (104.00-146.88)	Lower Red River Fm: light brown wackestone, mottled, massive with scattered white and tripolized chert nodules; porosity is 2-5%, vuggy; upper contact not well preserved but probably gradational.
105.66-109.36 (146.88-152.03)	Winnipeg Fm: white to light grey sandstone, fine to medium grained, essentially unconsolidated, massive, quite dense; there's not a distinct shale horizon as seen in previous holes; from the base to 108.62m (151.00) the sand is intensely mineralized (pyrite ?), the same mineralization occurs below into the Precambrian, very distinctive, this was also sampled by Falconbridge, similar knots of mineralization still occur upwards; lower contact to Precambrian appears to be sharp but not well preserved; upper contact appears to be sharp but not preserved.
109.36 (152.03)	Precambrian.

WL-92-55
FALCONBRIDGE - WILLIAM LAKE
3-2-57-14W
5971087N
471597E

Ground Elevation: 281.6m

m	Az	Dip
0	40	45
50	30	46
100	10	44/46
200	28	46

Map: 63J/14

Logged by R. Bezys June 8, 1993

TRUE DEPTH (m)
(measured depth)

DESCRIPTION

0.0-0.85
(0.0-1.20)

Overburden

0.85-26.62
(1.20-38.40)

Interlake Group:

0.85-5.66 (1.20-8.00): **East Arm Fm:** brown to orange to green-grey mudstone with some wackestone; very poor core - broken and rubbly; scattered clay, sandy zones (i.e. zones of floating sand grains); one zone of conglomerate grains at 3.89m (5.50); lower contact not preserved.

5.66-12.34 (8.00-17.30): **Atikameg Fm:** orange-yellow to tan packstone to floatstone debris; reefal, fragments of stromatoporoids around 5-6 cm large, can not distinguish any other fossil material; porosity is 5-6% pin point to minor vuggy; very broken and rubbly in places; gradational lower contact.

12.34-12.34 (14.54-17.30): **Marker Bed:** light brown mudstone, laminated with intraformational breccia beds; gradational lower contact.

12.34-17.34 (17.3-24.25): **Moose Lake Fm:** predominantly light brown mudstone, minor wackestone intervals, massive; no normal well developed marine sequences; porosity negligible; minor conglomeratic/breccia beds in center of unit; minor lamination; very broken and fractured; lower contact not well preserved. 17.34-18.60 (24.25-26.08): **U₁-marker:** slightly brecciated mudstone, laminated in places; gradational lower contact.

18.60-26.62 (26.08-38.40): **Fisher Branch Fm:** wackestone/packstone/rudstone with some mudstone at the top; at base is a 70 cm bed of *Virgiana decussata*, very well preserved, mainly all whole specimens, no other fossils; gradational lower contact.

26.62-48.50?
(38.40-68.00?)

Stonewall Fm:

27.62-30.77 (38.40-42.78): **Upper Stonewall Marker (unit 7):** light brown to grey, some portions are more wackestone than mudstone at base; very laminated to massive with fine conglomeratic beds; gradational lower contact.

30.77-31.32 (42.78-43.54): **upper T-marker:** mudstone marker bed, slightly silty, red with distinct fine breccia beds becomes more grey at top, finely laminated; gradational upper contact to massive mudstone.

31.32-34.79 (43.54-48.36): **unit 5:** brown to grey mudstone, massive, fine laminations (horsetail stylolites? or bituminous partings); negligible porosity.

34.79-38.46 (48.36-53.46): **unit 4:** buff brown with very slight red tinge; vuggy porosity <5%; scattered white tripolized chert; gradational lower contact.

38.46-39.16 (53.46-54.44): **upper T-marker:** very dark red to grey mudstone, distinctly laminated with bloody-red texture.

39.16-43.14 (54.44-59.97): **unit 2:** buff yellow to brown wackestone, massive; paleofavositids; very broken up in pieces; sharp lower contact.

43.14-48.50? (59.97-68.00?): **Williams Mbr:** light brown to grey mudstone with slight laminations in places, essentially massive; at 1.07m (1.50) from top there's finely laminated red layers (bloody texture) (diagenetic?); gradational lower contact.

48.50?-73.16 (68.00?-103.47)	Stony Mountain Fm: lower 3.00-4.00m is a wackestone, brown with scattered hardground surfaces, becoming burrow mottled to nodular upwards, some zones have darker argillaceous matrix, becoming slightly more argillaceous towards top at 54.92m (77.00m), especially in interstitial material; no well preserved fossil material but does appear slightly granular (crinoids?); upper 4.32m (6.00) a distinct change to a massive light brown, slightly mottled mudstone (could be partly Williams Mbr?); sharp and erosional lower contact.
73.16-83.79 (103.47-118.50)	Upper Red River Fm (Fort Garry Mbr): various colours of grey to brown mudstone, quite massive with low porosity; dark brown argillaceous, bituminous marker bed at 83.35m (117.88); at base there are some rehealed fractures with a bloody red colouration; at 74.80m (117.88m) is a 2.8cm (40.0 cm), blue-grey coloured breccia bed, predominantly monomict, possibly intraformational; at 80.95m (112.54) is a 0.7-1.4cm (1.0-2.0) blue-grey shale bed grading upward to a mudstone (3.6-4.3cm (5.0-6.0) thick) (possibly a marker bed); at 78.84m (111.50) is a 0.7cm (1.0) black-brown shale mud bed, could be mud injected along joint fracture?; upper 0.71-0.85m (1.00-1.20) is brecciated, intraformational, cataclastic; gradational lower contact.
83.79-118.42 (118.50-166.03)	Lower Red River Fm: grey to brown wackestone, bioturbated, slight lamination; grains present appear to be fossiliferous (crinoids); cavernous porosity, lower 2.12-3.54m (3.00-5.00) has scattered porosity up to 2.12-3.54cm (3.00-5.00) large; faint nodular development with argillaceous partings; scattered white tripolized chert nodules 2.8cm (4.0) large; lower contact not completely present, not well preserved.
118.42-129.60 (166.02-174.40)	Winnipeg Fm: 118.42-128.86 (166.02-173.40): upper unit: white to off-white very fine sandstone, massive bedded quartz sandstone, quite consolidated; 0.51m missing core due to unconsolidated zones. 128.86-129.60 (173.40-174.40): lower unit: dark grey, brown argillaceous siltstone with sandstone blebs, sand lighter in colour; numerous pyrite mineralization as small nodules and layers; contact to Precambrian is somewhat irregular, very well preserved, not flat-lying.
129.60 (174.40)	Precambrian.

WL-92-56
FALCONBRIDGE - WILLIAM LAKE
11-13-56-14W
5965832N
473112E

Ground elevation: 278.1m

m	Az.	Deg.
0	240°	45°00'
50	244°	47°30'
100	244°	48°00'
203	246°	49°00'

Map: 63G/14

Logged by R. Bezys June 11, 1993

TRUE DEPTH (m)
(measured depth)

DESCRIPTION

0.00-1.41
(0.00-2.00)
1.41-16.79
(2.00-24.28)

Overburden.

Interlake Group:

1.41-7.35 (2.00-10.40): **Moose Lake Fm:** light brown to brown mudstone, variable textures from grainstone to packstone; some discolouration from near bedrock surface; porosity is 2-3%, mainly vuggy to pinpoint; very broken and rubbly core, not well preserved; sharp lower contact.

7.35-8.33 (10.40-11.78): **U₁-marker:** olive green to grey laminated mudstone, slightly arenaceous beds, some conglomeratic beds; porosity is <1-2%, mainly pinpoint, minor small vugs; sharp lower contact.

8.33-16.79 (11.78-23.25): **Fisher Branch Fm:** light brown to tan at base, more mudstone-rich at top, fossiliferous wackestone; no well developed *Virgiana* beds, predominantly favositids; porosity up to 5-10%, vuggy, and as low as 1-2% in mudstone, pinpoint; sharp lower contact.

16.79-39.08
(23.25-53.00)

Stonewall Fm:

16.79-17.54 (23.25-24.28): **Upper Stonewall Marker:** grey to dark grey mudstone, massive, slightly conglomeratic; porosity 1-2%, pinpoint; gradational lower contact. 17.54-19.53 (24.28-27.04): **unit 7:** light brown massive mudstone, slightly wackestone; porosity is 1-2%, pinpoint and vuggy; sharp lower contact.

19.53-21.38 (27.04-29.60): **upper T-marker:** light grey to grey to red mudstone, laminated with some conglomeratic intervals; some clay infill material, probably from above; scattered pyrite mineralization, black, along bedding planes; porosity is <1%, pinpoint; sharp lower contact; very broken core.

21.28-24.11 (32.70-29.60): **unit 5:** light brown mudstone, faintly laminated, massive; porosity is <1-2%, pinpoint; gradational lower contact.

24.11-28.69 (32.70-38.92): **unit 4:** light brown tan wackestone, normal marine sequence; no distinct fossil matter; chert content is 10%, white and tripolized, primarily along bedding planes; porosity increases towards base 5-10%; sharp lower contact.

28.69-29.49 (38.92-40.00): **lower T-marker:** blue-grey to grey laminated mudstone; a 7.0cm infill bed occurs towards the base; some pyrite mineralization, rare; porosity is <1%, pinpoint; sharp lower contact.

29.49-33.01 (40.00-44.77): **unit 3:** light brown to brown mudstone to wackestone, quite massive; scattered small tripolized white chert nodules; no distinct fossil material; porosity is 2%, vuggy; sharp lower contact.

33.01-39.08 (44.77-53.00): **Williams Mbr:** light brown to brown to olive brown, massive mudstone, laminated in places, quite dense; clay infill from 38.34-38.52m (52.00-52.25); porosity is <1%, pinpoint; gradational lower contact.

39.08-63.52 (53.00-85.81)	Stony Mountain Fm: brown wackestone, distinctly mottled to nodular, massive; at 42.65-42.95m (57.85-58.25) occurs a fracture that is filled with clay sediment (1.0cm) and is near vertical to bedding; porosity is 3-5%, vugs; sharp lower contact.
63.52-73.13 (85.81-98.40)	Upper Red River Fm (Fort Garry Mbr): blue-grey to brown mudstone, massive, some zones slightly conglomeratic, some minor lamination; rare pyrite mineralization along cracks; porosity is <2-3%, pinpoint; gradational lower contact.
73.13-106.60 (98.40-142.33)	Lower Red River Fm: brown to tan wackestone, distinctly mottled, massive; scattered chert nodules, predominantly white and tripolized, rare dark chert; porosity is 3-5%, mainly vuggy to pinpoint; lower contact appears ground, not well preserved.
106.60-111.79 (142.33-149.26)	Winnipeg Fm: light brown to tan quartz sandstone, massive, fine to medium grained, larger grain size at base; no shale beds; but the sand has an overall argillaceous appearance; primarily fragmented throughout; missing 2.90m (3.87) of core; lower contact may be sharp but not well preserved.
111.79 (149.26)	Precambrian.

WL-92-57
FALCONBRIDGE - WILLIAM LAKE
2-23-56-14W
5966548N
471882E
Ground elevation: 283.5m

m	Az.	Deg.
0	240	45°00'
50	38	49°30'
101	248	49°00'
152	240	49°30'
203	246	49°30'

Map: 63G/14

Logged by R.Bezys June 9, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-0.85 (0.00-1.20)	Overburden.
0.85-26.95 (1.20-36.70)	<p>Interlake Group:</p> <p>1.63-3.61 (2.3-5.1): Atikameg Fm: buff yellow grainstone; porosity 5-10%; core is very broken up.</p> <p>3.61-4.81 (5.10-6.80): Marker Bed: olive green mudstone, massive but broken up; porosity very low, <1-2%; sharp lower contact.</p> <p>4.81-17.36 (6.8-23.64): Moose Lake Fm: buff yellow to brown wackestone to grainstone, mixed textures, some mudstone; some zones are quite conglomeratic with fossil material; core is very broken up from base of Moose Lake Fm to top of core hole and at top of the Moose Lake Fm fragments, of core are very fossiliferous, containing abundant brachiopod and coral debris (may be <i>Virgiana</i> ?); porosity is 7-19%, vuggy; gradational lower contact.</p> <p>17.36-18.06 (23.64-24.6): U₁-marker: grey to brown disrupted brecciated mudstone to wackestone, some argillaceous intervals in matrix and some minor lamination; porosity is very low, 1%; lower contact not very well preserved.</p> <p>18.06-26.95 (24.6-36.7): Fisher Branch Fm: light brown to brown to buff predominantly wackestone with some mudstone intervals; fossiliferous in place with distinct 0.37-0.55m (0.50-0.75) of some <i>Virgiana</i> but mainly coral debris at the base; porosity is 10-12% in places, very vuggy, vugs open to about 5.0cm; top of core is very broken and rubbly; sharp lower contact.</p>
26.95-51.15 (36.70-68.00)	<p>Stonewall Fm:</p> <p>26.95-27.89 (36.7-37.98): Upper Stonewall Marker: blue-grey mudstone, slight conglomeratic fragments at base (minor at top); porosity is very low, tight; gradational lower contact.</p> <p>27.89-30.86 (37.98-40.58): unit 8: buff coloured, slightly more normal marine wackestone; porosity is up to 5-7%, vuggy to pinpoint, scattered; gradational lower contact.</p> <p>30.86-32.30 (40.58-42.48): upper T-marker: blue-grey to olive orange mudstone, distinctly laminated, some granular breccia material (very minor); porosity very low; gradational lower contact.</p> <p>32.30-36.75 (42.48-48.33): unit 6: light brown to brown mudstone, in places massive to laminated; mineralization (probably pyrite) along veinlets; porosity <2%, mainly pinpoint; gradational lower contact.</p> <p>36.75-40.04 (48.33-52.66): unit 5: some blue-grey colouration, dominantly tan-buff, normal marine wackestone; porosity is 5-10%, quite vuggy; scattered white and tripolized chert; rare fossiliferous debris (coral); sharp lower contact.</p> <p>40.04-41.31 (52.66-54.33): lower T-marker: extremely brecciated mudstone with blue-grey matrix and brown mudstone clasts with interstitial material filled with carbonaceous matter; at top grades into typical lower T-marker lithology (massive green mudstone); sharp lower contact.</p>

41.31-42.97 (54.33-56.51): **unit 3:** tan brown mudstone-wackestone, slightly conglomeratic at base; minor fossiliferous debris; porosity is 3%, pinpoint; lower contact not well preserved.
 42.97-45.36 (56.51-59.66): **unit 2:** brown to light brown buff wackestone, irregularly mottled; appears to be more normal marine; coral debris and maybe small ostracods (?); porosity is towards 5%, more vuggy.
 45.36-51.51 (59.66-68.00): **Williams Mbr:** predominantly brown to blue-grey mudstone, massive, containing distinct diagenetic colour mottling along bedding planes and fractures; porosity is <1-2%, pinpoint; gradational lower contact.

51.51-77.64
 (68.00-102.88) **Stony Mountain Fm:** light brown to grey wackestone, mottled, massive, getting slightly more argillaceous upwards; minor fossiliferous material, corals; porosity is 2-3%, some vugs, some pinpoint; sharp lower contact.

77.64-88.45
 (102.88-116.76) **Upper Red River Fm (Fort Garry Mbr):** predominantly blue-grey to some brown mudstone, massive with some minor bioturbation and minor brecciation; scattered clay seams, becoming very brecciated from 77.96m (103.3) to top; porosity is <2%, pinpoint, some vuggy.

88.45-116.76
 (123.55-162.48) **Lower Red River Fm:** light brown to brown wackestone, bioturbated; scattered white, tripolized chert nodules towards top, up to 5.0cm large; from 90.02-90.32m (119.28-119.68) is present a 4.0-5.0cm thick, infilled joint fracture -- fracture consists of very highly angular fragments of carbonate material, clay and abundant pyrite, not sure if pyrite was mineralized *in situ* or emplaced later, very similar to fracture infill found in Red River Fm in hole M-12-90, appears to be near vertical; porosity is 3-5%, some vugs, some pinpoint; sample 88-09-93 is of the fracture infill material; sharp lower contact.

123.55-133.83
 (162.48-176.00) **Winnipeg Fm:**
 123.55-130.04 (162.48-171.02): **upper unit:** white to off-white massive quartz sandstone with consolidated and unconsolidated intervals, distinctly mottled with possibly black pyrite mineralization, at top is present a very distinct yellow (limonite) stain with black pyrite mineralization; sharp lower contact.
 130.04-133.83 (171.02-176.00): **lower unit:** lower portion is light brown to brown unconsolidated sand, slightly argillaceous; rounded quartz grains, very fine to fine grained; consolidated intervals consist of siltstone with minor lamination and bioturbation; scattered pyrite mineralization in solid blebs, dark black, quite abundantly mineralized; some shaley zones (good mudstone); 1.73m (2.28) of core is missing.

133.83 (176.00) **Precambrian.**

WL-92-58
FALCONBRIDGE - WILLIAM LAKE
8-2-57-14W
5971635N
472218E

Ground elevation: 275.8m

m	Az.	Deg.
0	230°	45°00'
50	232°	45°30'
100	232°	46°30'
150	230°	48°00'
200	230°	48°00'

Map: 63G/14

Logged by R. Bezys June 9, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-0.85 (0.00-1.20)	Overburden.
0.85-22.29 (1.20-31.25)	<p>Interlake Group:</p> <p>0.85-5.60 (1.20-7.92): Atikameg Fm: light yellow to buff grainstone to packstone; reefal; porosity is 5-15%, vuggy; lower contact not preserved.</p> <p>5.60-5.95 (7.92-8.42): Marker Bed: light green-grey laminated mudstone; appears to be gradational change at lower contact.</p> <p>5.95-12.16 (8.42-17.20): Moose Lake Fm: tan to buff with various textures ranging from mudstone to grainstone, scattered conglomeratic layers; no really well developed normal marine sequences; possible stromatolite fragments at top (?); core is very broken and fractured, not very well preserved; porosity is around 3%, pinpoint; appears to be gradational change at upper contact; gradational lower contact.</p> <p>12.16-13.05 (17.20-18.45): U₁-marker: brown to tan brecciated mudstone, slightly arenaceous, laminated; sharp lower contact.</p> <p>13.04-22.29 (18.45-31.25): Fisher Branch Fm: at the base there is a 28.28cm (40) of well developed <i>Virgiana decussata</i> debris (whole fragments) (packstone), the rest of the unit is a light brown wackestone to mudstone; porosity is 3-5%, small vugs and pinpoint; scattered coral fragment debris (very minor); sharp lower contact.</p>
22.29-42.94 (31.25-60.20)	<p>Stonewall Fm:</p> <p>22.29-23.02 (31.25-32.55): unit 7: light grey to grey mudstone; brecciated in places; slight lamination; porosity is negligible (<2%); gradational lower contact.</p> <p>23.04-25.19 (32.55-35.32): unit 6: light brown to tan wackestone at base with increasing mudstone to top; slightly more normal marine; porosity is 3-5%, small vugs and pinpoint; gradational lower contact.</p> <p>25.19-25.61 (35.32-35.91): upper T-marker: distinctly red siltstone with fine granular material scattered throughout, faintly laminated; sharp lower contact.</p> <p>28.84-34.49 (40.43-48.36): lower T-marker: varied dark blue to red mudstone with distinct laminations; minor bioturbation with odd diagenetic coloring; sharp lower contact.</p> <p>34.49-38.33 (48.36-53.74): unit 2: slightly more marine mudstone, some mottling, massive; scattered brown coloured tripolized chert; porosity is 3-5%, vuggy; some bioturbation; becoming more argillaceous towards the top; sharp lower contact.</p> <p>38.33-42.94 (53.74-60.20): Williams Mbr: various colours from olive green to blue-brown mudstone, very finely laminated with very dark brown carbonaceous laminae, distinct red bleedy pattern along lamination; porosity is negligible (<2%); gradational lower contact.</p>

42.94-71.62 (60.20-98.74)	Stony Mountain Fm: light brown to dark brown wackestone, mottled with distinct hard ground development near base (3.5-7.13m (5-10)); lower 0.71m (1.00) containing an extremely vuggy brown mottled zone; becomes slightly more argillaceous towards top with increasing bituminous partings; porosity is 3-5%, vuggy and pinpoint; gradational lower contact.
71.62-81.37 (98.74-112.18)	Upper Red River Fm (Fort Garry Mbr): variously coloured brown-green mudstone; thin argillaceous/carbonaceous laminae at 81.42m (112.25); scattered rehealed fractures with redbleedy texture; at 74.75m (103.05) is a 2.0cm clay seam; at top there's a 8.7-10.16cm (12-14) intraformational breccia interval; gradational lower contact.
81.37-118.98 (112.18-160.10)	Lower Red River Fm: tan to dark brown wackestone, massive with decreasing bioturbation towards the top; scattered crinoidal material; pervasively burrow mottled; white tripolized chert nodules present from 91.06m (124.00) to the base, up to 2.9-3.7cm (4.0-5.0), following bedding planes; porosity is <3%, small vugs; no well developed Hecla Beds; gradational upper contact.
118.98-127.02 (160.10-170.92)	Winnipeg Fm: 118.98-124.79 (160.10-167.92): upper unit: white to off-white quartz sandstone, clean, massive, fine to medium grained, quite consolidated, becomes more argillaceous toward base, contact becomes siltier and argillaceous, gradational; upper contact appears to be sharp to Red River Fm but not well preserved. 124.79-127.02 (167.92-170.92): lower unit: red to orange to grey argillaceous mudstone to siltstone, definitely more clay content; contact to Precambrian not preserved; completely sampled by Falconbridge.
127.02 (170.92)	Precambrian.

WL-92-59
FALCONBRIDGE - WILLIAM LAKE
13-2-57-13W
5972298N
471076E

Ground elevation: 271.3 m

m	Az.	Deg.
0	220°00'	45°00'
50	220°00'	47°30'
152	220°30'	47°30'

Map: 63G/14

Logged by R. Bezys June 11, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.0-1.36 (0.0-1.92)	Overburden.
1.36-24.42 (1.92-33.14)	<p>Interlake Group:</p> <p>1.36-2.06 (1.92-2.92): East Arm Fm (?): brown to tan mudstone/wackestone; faintly laminated; porosity is 2-3% small vugs and pinpoint; very poor broken core; lower contact not well defined, appears gradational.</p> <p>2.06-8.27 (2.92-10.68): Atikameg: light brown buff grainstone/packstone; reefal like unit; porosity is 5-10%, vuggy; lower contact not well defined, appears sharp.</p> <p>7.55-8.27 (10.68-11.70): Marker Bed: light brown tan mudstone, massive with some arenaceous floating sand; porosity is <1%, pinpoint; lower contact not well preserved, appears sharp.</p> <p>8.27-13.65 (11.70-18.89): Moose Lake Fm: variable textures of light brown to brown grainstone to packstone with some mudstone; porosity is <2%, mainly pinpoint and some vuggy; sharp lower contact.</p> <p>13.65-14.99 (18.89-20.75): U₁-marker: light green to brown brecciated mudstone; slightly arenaceous in places; laminated; porosity is <2%; sharp lower contact.</p> <p>14.99-24.42 (20.75-33.12): Fisher Branch Fm: light brown tan wackestone to mudstone at top, massive; extremely fossiliferous in the lower 0.18m (0.25) to 0.72m (1.00) containing abundant <i>Virgiana decussata</i> debris and some coral debris; porosity is 5% in lower half and decreases to 3% at the top; sharp lower contact; sample 88-12-93 is of <i>Virgiana decussata</i> debris taken at 23.56m (32.62).</p>
24.42-45.32 (33.12-61.67)	<p>Stonewall Fm:</p> <p>24.42-25.10 (33.14-34.05): Upper Stonewall Marker: grey-brown laminated mudstone, some conglomeratic beds; porosity is <2%; gradational lower contact.</p> <p>25.10-27.70 (34.05-37.57): unit 7: light brown tan mudstone with some wackestone at base, massive; porosity is 3%, vuggy; sharp lower contact.</p> <p>27.70-29.11 (37.57-39.48): upper T-marker: olive green to blue-green mudstone with abundant pyrite mineralization along cracks; porosity is <2%; core not well preserved; sharp lower contact.</p> <p>29.11-32.00 (39.48-43.40): unit 5: tan to brown mudstone, massive; porosity is <2%; gradational lower contact.</p> <p>32.00-36.02 (43.40-48.85): unit 4: light brown buff, good normal marine sequence wackestone; mottled; scattered favositids coral debris; minor tripolized white chert; porosity is 5-8%; gradational lower contact.</p> <p>36.02-36.86 (48.85-50.00): lower T-marker: green to red mudstone, massive with red bleeding pattern, probably hematite stain; the lower 18.4cm (25.0) is conglomeratic; porosity is <1-2%, pinpoint; sharp lower contact.</p> <p>36.86-40.92 (50.00-55.50): unit 2: light brown tan wackestone, becomes more mudstone-rich towards the top; a near normal marine sequence; porosity is 5-10%; sharp lower contact.</p> <p>40.92-45.32 (55.50-61.47): Williams Mbr: brown to dark brown tan mudstone; massive with slight lamination; porosity is <1-2%, pinpoint; gradational lower contact.</p>

45.32-74.54 (61.47-101.10)	Stony Mountain Fm: light brown to brown wackestone, becoming more mudstone-rich at the top; massive; nodular; extensive hard ground development towards base; very argillaceous interstitial material around nodules; porosity is <3%, pinpoint; sharp lower contact.
74.54-86.33 (101.10-117.09)	Upper Red River Fm (Fort Garry Mbr): blue-grey to brown mudstone; massive; laminated with distinct red bleedy colouration, probably hematitic; some beds of slight brecciation, brecciation becoming more intense in the upper 0.74m (1.00); porosity is <1-2%; gradational lower contact.
86.33-120.73 (117.09-163.82)	Lower Red River Fm: brown to light brown wackestone; massive; burrow mottled to mottled; scattered white and tripolized chert nodules; porosity is 3-5%, vuggy and pinpoint, some open vugs up to 3.00cm in diameter, very rare; lower contact not preserved.
120.73-129.01 (163.82-174.98)	Winnipeg Fm: 120.73-125.15 (163.82-169.75): upper unit: white consolidated massive quartz sandstone, fine to medium grained; some zones with unconsolidated cementation; lower contact not preserved. 125.15-129.01 (169.75-174.98): lower unit: brown to grey slightly argillaceous quartz sandstone; zones of unconsolidation; massive; fine to medium grained; with large quartzite grains at the base; lower contact not well preserved but appears sharp.
129.01 (174.98)	Precambrian.

WL-92-60
FALCONBRIDGE - WILLIAM LAKE
15-23-56-14W
5967344N
471909E

Ground Elevation: 278.10m

m	Az.	Deg.
0	103°48'	46°29'
24.22	102°50'	47°33'
48.44	102°02'	48°29'
50.00	102°02'	46°00'
75.68	100°55'	48°40'
99.90	100°19'	48°47'
100.00	100°19'	47°30'
124.12	100°17'	48°57'
148.39	99°57'	49°02'

Map: 63G/14

Logged by R. Bezys June 10, 1993

TRUE DEPTH (m)
(measured depth)

DESCRIPTION

0.00-1.96
(0.00-2.70)

Overburden.

1.96-27.28
(2.70-36.43)

Interlake Group:

1.96-4.28 (2.70-3.10): **Atikameg Fm:** buff orange grainstone to packstone; reefal unit; no discernable fossils; porosity is 10-15%, vuggy, difficult to discern; lower contact not preserved.

3.12-4.28 (4.30-5.90): **Marker Bed:** light green to grey-green, massive mudstone with abundant floating sand grains; some lamination; core is very broken up; porosity is <1-2%; sharp lower contact.

4.28-16.53 (5.90-22.90): **Moose Lake Fm:** light brown to brown with orange tinge, various textures of mudstone, packstone to grainstone; porosity varies <5% to 10-15%, pinpoint, increases towards the top of unit; sharp lower contact.

16.53-17.64 (22.40-23.90): **U₁-marker:** light brown to brown mudstone; laminated; extremely brecciated at base with fragments as large as 18.45 cm (25.00); porosity is 1-2%; sharp lower contact. 17.64-27.28 (23.90-36.43): **Fisher Branch Fm:** light brown tan wackestone at base to mudstone at top; massive; fossiliferous fragments in lower half, mainly colonial coral, no distinct *Virgiana decussata* zones present; at 25.97m (35.2) is a brachiopod fragment, possibly *Virgiana?*; porosity is 5-8%, vuggy; sharp lower contact.

27.28-51.06
(36.43-68.00)

Stonewall Fm:

27.28-28.25 (36.43-37.60): **Upper Stonewall Marker:** grey to brown mudstone; laminated; slight brecciation; dense; porosity is <1-2%; sharp lower contact.

28.15-30.23 (37.60-40.37): **unit 7:** light tan mudstone/wackestone, massive; no discernable fossils; porosity is <1-2%, mainly pinpoint; sharp lower contact.

30.23-30.92 (40.37-41.30): **upper T-marker:** very distinctly red mudstone/siltstone with green colouration on top and base; finely laminated; top containing abundant pyrite mineralization along bedding planes and joint faces; porosity is 2%, pinpoint; sample 88-11-93 is from 30.71-30.86, showing colouration and clastic content; sharp lower contact.

30.92-35.12 (41.30-46.90): **unit 5:** light brown to tan mudstone, massive, very minor lamination; porosity is <2%; sharp lower contact.

35.12-38.13 (46.90-53.00): **unit 4:** light brown to tan normal marine sequence, wackestone; slightly fossiliferous material, hard to distinguish; porosity is 5-10%, very vuggy; between 35.46-36.47m (49.30-50.70) is an extremely cavernous and porous unit with silt infill between broken pieces of rock, possible cavern infill (?); lower contact not preserved.

38.13-39.35 (53.00-54.70): **lower T-marker:** grey to light grey mudstone, distinctly coloured; massive; dense; in upper 50.35cm (70.00) the core is very broken with abundant white clay

infill; porosity is <2%; lower contact not preserved.

39.35-43.66 (54.70-60.70): **unit 2**: light brown tan wackestone, slightly normal marine sequence; nodular; becomes more mudstone-rich towards the top; scattered tripolized white chert throughout; no fossiliferous material; at 38.34-39.35m (53.30-54.70) is a clay infill sequence that caps the unit; porosity is 2-3%, pinpoint; lower contact not preserved. 43.66-51.06 (60.70-68.00): **Williams Mbr**: light brown to brown massive mudstone; finely laminated; quite dense; at 47.62m (63.42) is a 3.00cm (4.00) white clay bed; porosity is <2%, pinpoint; gradational lower contact.

51.06-74.63
(68.00-101.23)

Stony Mountain Fm: light brown to brown wackestone, distinctly nodular and mottled, extensive hard ground development in lower 3.75-7.51m (5.00-10.00); massive; porosity is 3-5%, pinpoint; becoming slightly more argillaceous towards top; sharp lower contact.

74.63-91.03
(101.23-120.71)

Upper Red River Fm (Fort Garry Mbr): light brown, tan to grey mudstone; finely laminated in places with slight breccia at base and top; 7.4cm (10.0) white clay infill at top from 74.63-81.40m (101.23-110.40); porosity is <1-2%; gradational lower contact.

91.03-118.09
(120.71-167.00)

Lower Red River Fm: light brown to brown tan wackestone; massive; bioturbated; scattered tripolized white nodular chert, becomes more abundant towards top; porosity is 1-3%, pinpoint; lower contact not preserved.

118.09-127.69
(167.00-180.58)

Winnipeg Fm: (missing 3.44m (4.86) of core)

118.09-123.25 (167.00-174.30): **upper unit**: white to brown quartz sandstone, fine to medium grained; very broken up and extremely ground core; sharp lower contact.

123.25-126.14 (174.30-178.39): **middle unit**: dark brown to grey siltstone with sand lenses, laminated; abundant pyrite mineralization associated with burrows; lower contact not preserved.

126.14-127.69 (178.39-180.58): **lower unit**: white, essentially unconsolidated, very fine to medium grained sand; lower contact not preserved.

127.69 (180.58)

Precambrian.

WL-92-61
FALCONBRIDGE - WILLIAM LAKE
16-23-56-14W
5967573N
472391E

Ground elevation: 274.3m

m	Az.	Deg.
0.00	57°53'	46°29'
26.73	57°06'	46°14'
50.00	0	46°00'
74.24	57°33'	46°35'
100.96	57°22'	46°49'
101.00	0	45°00'
124.72	46°00'	46°57'
151.45	58°23'	47°04'

Map: 63G/14

Logged by R. Bezys June 10, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.00-3.05 (0.00-4.20)	Overburden.
3.05-18.11 (4.02-25.08)	<p>Interlake Group:</p> <p>3.05-7.99 (4.20-11.20): Moose Lake Fm: variably textured unit ranging from minor mudstone to packstone and grainstone; porosity is variable from <1-2% to 5-8%, vuggy; very poorly preserved and broken up core; sharp lower contact.</p> <p>7.99-9.64 (11.20-13.30): U₁-marker: brown to tan massive laminated mudstone with zones of brecciation; porosity is negligible; sharp lower contact.</p> <p>9.64-18.11 (13.30-25.08): Fisher Branch Fm: light brown to tan wackestone to grainstone with increasing mudstone at top; lower 21.66-28.9cm (30.0-40.0) contains abundant paleofavositids debris and minor brachiopods, possibly <i>Virgiana</i> ?; porosity is 5-10% in places, very vuggy; sharp lower contact.</p>
18.11-36.72 (25.08-51.05)	<p>Stonewall Fm:</p> <p>18.11-19.02 (25.08-26.34): Upper Stonewall Marker: dark grey to grey mudstone, laminated with extreme brecciation in upper 18.0cm (25.0), highly angular clasts, up to 1.4-2.9cm (2.0-4.0); porosity is 2%, pinpoint and small vugs; sharp lower contact.</p> <p>19.02-20.94 (26.34-29.00): unit 7: brown to tan wackestone with some mudstone, massive, a normal marine sequence; no specific fossiliferous remains; porosity is 3-5%, vuggy and pinpoint.</p> <p>20.94-22.49 (29.00-31.14): upper T-marker: brown to grey-green, hardly any material remaining of T-marker, very poorly preserved core, does not appear to be homogeneous due to broken character of rock; abundant clay infill; porosity difficult to determine; lower contact not preserved.</p> <p>22.49-24.52 (31.14-33.95): unit 5: brown to tan mudstone, laminated, very minor breccia laminae; porosity is 2-3%, very low, pinpoint; sharp lower contact; all broken core.</p> <p>24.52-27.87 (33.95-38.75): unit 4: light brown to tan normal marine wackestone; fossiliferous with scattered paleofavositids fragments; rare chert, tripolized and dark brown-black, all in lenses and nodules; porosity is 5-8%; gradational lower contact.</p> <p>27.87-28.63 (38.75-39.80): lower T-marker: grey to dark grey mudstone, massive, some bioturbation; porosity is <1-2%, very tight, pinpoint; core is very poorly preserved and broken; lower contact not well preserved.</p> <p>28.63-30.32 (39.80-42.15): unit 2: light brown to tan wackestone, normal marine sequence, mudstone-rich at top; some coral debris (paleofavositids); porosity 5-7%, vuggy; sharp lower contact.</p> <p>30.32-36.72 (42.15-51.05): Williams Mbr: dark brown mudstone, finely laminated, massive, dense with some carbonaceous partings; porosity <2%; sharp lower contact.</p>

36.72-62.51 (51.05-86.20)	Stony Mountain Fm: light brown nodular wackestone, massive, good hard ground development towards base (basal 3.60-7.19m (5.00-10.00)), becoming slightly more argillaceous towards the top; porosity is 3-5%, vuggy; lower contact not well preserved.
62.51-67.27 (86.20-92.25)	Upper Red River Fm (Fort Garry Mbr): blue-grey to tan mudstone, massive; at 63.81-64.39m (87.51-88.31) is a brown unconsolidated clay infill, possibly cavern infill ?; brecciation along bedding planes that may be a tectonic ?, nodules formed from shearing ?; minor pyrite mineralization in vugs, porosity is 5%, vuggy; very poor core, broken up and rubbly; gradational lower contact.
67.27-102.00 (92.25-139.31)	Lower Red River Fm: light brown to tan wackestone, massive, burrow mottled; scattered white tripolized chert throughout, 1.0-4.0cm long; scattered crinoidal fossiliferous material and coral debris; porosity is 3-4%, vuggy; gradational upper contact; core is very broken up in the lower 2.91m (4.00); lower contact not well preserved.
102.00- 109.92/110.65 (139.31- 150.12/151.12)	Winnipeg Fm: overall white to grey-white quartz sandstone with minor brown colouration, predominantly consolidated with pockets of unconsolidated material, massive, some burrow mottling; scattered pyrite mineralization as knots and blebs; in the middle from 107.78-108.11m (147.20-147.65) is a green shale bed, slightly silty and fissile, at 109.92-110.65m (150.12-151.12) is a weathered interval of Precambrian, very white and clayey (kaolin), also looks like Winnipeg ??; the lower contact is sharp to ultramafics; at top of Winnipeg is a 7.3-14.6cm (10.0-20.0) dirty clay infill; missing 0.72m (0.98) of core.
109/110.65 (150.12/151.12)	Precambrian.

**FALCONBRIDGE - WL-93-62
WILLIAM LAKE**

152°Az
0.0 m---43°
14.0 m---43.5°
50.0 m---44°
100.0 m---45°
150.0 m---44°
200.0 m---47°

Paleozoic interval logged by R. Bezys (in field) Oct. 15th, 1993

TRUE DEPTH (m) (measured depth)	DESCRIPTION
0.0-2.74 (0.0-4.0)	Overburden
2.74-10.33 (4.0-15.0)	Interlake Group - Cedar Lake Fm: light tan to orange grainstone/wackestone; some coral-algal intervals; very broken-up core; red clay infill in places; marker beds at 4.11-4.80 (6.0-7.0 m) and 7.19 (10.5) m, grey mudstones.
10.33-12.45 (15.0-18.0)	V-marker: light brown grey, brecciated mudstone; sandy; sharp lower and upper contacts.
12.45-16.32 (18.0-23.6)	East Arm Fm: light brown tan mudstone; faintly laminated; some sand.
16.32-17.29 (23.6-25.0)	U₂-marker: light brown grey mudstone; brecciated/conglomeratic; minor green grey clay seams; sandy (quartzose) at top; marker top very well preserved.
17.29-22.13 (25.0-32.0)	Atikameg Fm: slightly laminated coral-algal wackestone to grainstone; very porous; no distinct fossils; minor tripolized chert; sugary texture; appears washed out; green-grey clay laminations (at the base); at 50 cm lower mudstone marker bed; sharp top and base.
22.13-29.0 (32.0-41.9)	Moose Lake Fm: light tan brown wackestone to grainstone; medial breccia marker bed at 26.14-26.55 (37.8-38.4 m) - grey laminated mudstone.
29.0-31.0 (41.9-44.8)	U₁-marker: light brown tan mudstone; brecciated and conglomeratic; some fossil fragments (stromatoporoids?); minor sand as laminations and blebs.
31.0-40.04 (44.8-57.13)	Fisher Branch Fm: wackestone to grainstone; minor fossiliferous matrix; tan brown; coral-algal laminations at the base; minor <i>Virginia</i> at the base 39.71 (56.66 m).
40.04-63.91 (57.13-92.0)	<p>Stonewall Fm</p> <p>Upper Stonewall Marker: 40.04-43.95 (57.13-62.7 m): light brown tan mudstone; sharp top; conglomeratic at 43.11 (61.5 m).</p> <p>T-marker: 43.95-45.63 (62.7-65.1): dark grey; slightly bioturbated mudstone.</p> <p>45.63-46.57 (65.10-66.44): light brown wackestone; mottled; rare bituminous partings; upper contact is sharp, but not well preserved.</p> <p>46.57-46.80 (66.44-66.77): dark grey black mudstone marker bed; possibly diagenetic; sharp contacts.</p> <p>46.80-52.57 (66.77-75.0): light brown tan mudstone to wackestone; extremely broken up - lots of lost core - only 6.72 m of core; gradational base; fossiliferous - stromatoporoids and <i>Paleofavosites</i> (sample to G.Young).</p> <p>52.57-53.06 (75.0-75.7 m): grey mudstone marker.</p> <p>53.06-58.65 (75.7-83.68): brown mudstone; minor wackestone with scattered bituminous partings and laminations; very broken core (lost core at top); sharp lower contact.</p> <p>Williams Mbr: 58.65-63.91 (83.68-92.0): light brown to grey laminated mudstone; core is very broken and rubbly.</p>

63.91-91.26 (92.0-130.2)	Stony Mountain Fm: grey to grey-white wackestone; becoming distinctly nodular at top; hardground surfaces at the base; fossiliferous - solitary corals and crinoids; gradational top; minor bioturbation; minor pyrite.
91.26-104.50 (130.2-150.44)	Upper Red River Fm (Fort Garry Mbr): light grey to brown, laminated to massive mudstone; some brecciated intervals; very broken up core; sharp top; pyrite lens at 103.37 (148.8 m); clay seam at 97.95 (141.0 m).
104.50-153.69 (150.44-210.14)	Lower Red River Fm: grey white to brown wackestone; massive; scattered tripolized chert nodules throughout; bioturbated at 104.50-109.41 (150.44-157.5 m) - <i>Chondrites</i> and <i>Planolites</i> ; gradational top. 153.24-153.69 (209.53-210.14): transitional zone (Hecla Beds): dolomitic sand; pyrite nodules throughout; some pyrite along bedding planes; minor brachiopods at the top.
153.69-161.72 (210.14-221.12)	Winnipeg Fm: 153.69-156.67 (210.14-214.22): light green-grey to brown mudstone with good sand infilled burrows (lighter colour); mudstone (shale) bed at 154.02-154.21 (210.60-210.85); <i>Chondrites</i> burrows; 156.67-161.72 (214.22-221.12): white to off white fine to coarse grained siltstone to sandstone; sharp base to Precambrian with a medium to coarse grained quartzose sand at the base; some clay - kaolin; quite consolidated.
161.72 (221.12)	Precambrian

FALCONBRIDGE - WL-93-63
WILLIAM LAKE

Logged by R. Bezys, October 27th, 1993

Measured Depth (m)	Description
0.0-3.0	Overburden
3.0-4.5	U₂-marker: slightly sandy argillaceous mudstone.
4.5-14.05	Atikameg Fm: orange-yellow, vuggy grainstone; no discernable fossils; very broken up at top. 12.0-14.05: lower Atikameg Fm marker.
14.05-21.5	Moose Lake Fm: grainstone to packstone; light tan to orange brown; medial marker at 17.0-17.5.
21.5-23.7	U₁-marker: (very faint), minor sandy, mudstone.
23.7-35.8	Fisher Branch Fm: light tan grainstone; porcelaneous; no <i>Virgiana</i> present.
35.8-71.7	Stonewall Fm 35.8-40.6: Upper Stonewall; marker present at 35.8-37.0. 40.6-41.4: T-marker: grey, sandy, laminated mudstone; slightly pyritized at top. 41.1-42.2: mottled wackestone. 42.2-44.4: Lower T-marker?: grey mudstone marker bed. 44.4-51.5: light tan buff, mottled wackestone to grainstone; argillaceous at top. 51.5-53.0: grey argillaceous mudstone marker bed. 53.0-58.5: (see 44.4-51.5 for description); good <i>paleofavosites</i> head. 58.5-71.7: Williams Mbr: light tan to light grey mudstone; massive; sharp top.
71.7-102.1	Stony Mountain Fm: light brown, mottled wackestone; sharp top.
102.1-115.3	Upper Red River Fm (Fort Garry Mbr): light grey to dark grey (some olive grey) mudstone; minor breccia; very broken up; sharp top.
115.3-163.06	Lower Red River Fm: light brown tan wackestone; no well developed Hecla Beds at the base; mottled; scattered tripolized white chert nodules; sharp top and base; at base there is minor interbedded sand; bioturbated at top.
163.06-174.15	Winnipeg Fm: (12.47 m of core measured) 163.06-168.5: fine to medium grained, light tan-white sandstone; slightly more consolidated than unit below; very broken up. 168.5-170.0: light brown, broken up sandstone; fine grained. 170.0-172.15: light brown to brown siltstone; sandy; laminated; lower contact appears sharp; very broken and rubbly; minor bioturbation. 172.15-174.15: pyritized sandstone; medium grained; sharp lower contact; off white to white; pyrite throughout entire core - quite spectacular; grades to clots and blebs at top.
174.15-?	Precambrian.

APPENDIX B
CORE PHOTOGRAPHS

The following is a detailed description of the units intersected in the William Lake core. The accompanying photos are from two drillholes from the William Lake area. The top of the hole in each photo is left of the photo. The wooden tags in the boxes indicate measurement in metres. Scale is indicated in each photo.

SILURIAN

Interlake Group

Cedar Lake Formation: yellow to brown packstone to grainstone with mudstone interbeds; stromatolitic; broken and rubbly core (karst surface); lower contact sharp to the v-marker (argillaceous marker bed); found in cores 27 and 29; averages 8.4 m thick - eroded top; see Photo 1a.

East Arm Formation: light to dark brown to grey wackestone; laminated; stromatolitic; sharp lower contact to the U₂-marker (approximately 1.0 m thick); the formation (including the U₂-marker) averages 4.7 m in thickness; see Photo 1a.

Atikameg Formation: brown to orange wackestone, packstone, to grainstone; massive; fossiliferous; high vuggy porosity (15-20%); argillaceous marker bed at base (approximately 50 cm thick); sharp lower contact; the formation averages 5.2 m thick; see Photo 1b.

Moose Lake Formation: light brown, tan to grey packstone to grainstone (minor mudstone); laminated to minor massive intervals; medial argillaceous marker bed (approximately 15 cm thick); minor brecciated beds; U₁-marker bed at the base (approximately 1.0 m thick); sharp lower contact; the formation averages 8.2 m thick (including the U₁-marker); see Photo 1b, 2a and 7a.

Fisher Branch Formation: buff to light brown grainstone to packstone; can be very fossiliferous with distinct *Virgiana decussata* specimens at its base (up to 0.5 m thick); sharp lower contact; averages 8.6 m thick; see Photo 1b, 2a, 2b, 6b and 7a.

ORDOVICIAN/SILURIAN

Stonewall Formation: variably coloured, from yellow brown to grey to red; mudstone to floatstone; distinctly separated into 7 to 9 subunits (fossiliferous floatstone capped by argillaceous mudstone); consists of the lower Williams Member (mudstone) at its base (this member has no connection to the name William Lake); the upper and lower t-markers (or T-zone) (mudstone); Upper Stonewall Marker at the extreme top (mudstone); gradational lower contact; entire unit averages 20.3 m thick; see Photo 3a, 3b, 4a, 7b, 8a and 8b.

ORDOVICIAN

Stony Mountain Formation: brown to tan wackestone; nodular; massive; containing distinct hardground surfaces towards its base; fossiliferous - coral debris; cherty (tripolized, white nodules); burrowed; gradational to sharp lower contact; the formation averages 26.8 m thick; see Photo 4a, 8a, 8b, 9 and 12a.

Red River Formation:

Fort Garry Member: brown, grey, blue-grey to green-grey mudstone; massive to laminated with conglomeratic and brecciated intervals; minor bituminous partings; gradational to sharp lower contact; averages 10.2 m thick; see Photo 4b, 5a, 9, 10a, 10b, 11 and 12a.

Lower Red River: light to dark brown, grey tan wackestone; nodular to mottled; fossiliferous (crinoidal debris); cherty (white tripolized nodules); burrowed; typical Tyndall Stone appearance; Hecla Beds (dark sandy argillaceous beds) may be present at the base (0.5-1.0 m thick); sharp lower contact; the lower Red River averages 34.5 m thick (this unit does not have a formal status and therefore is not designated as a member); see Photo 5a, 5b, 10b, 11, 12a, 12b, 13a, 14a and 14b.

The entire Red River Formation averages 44.5 m in thickness.

Winnipeg Formation: sandy intervals are white to off-white to brown; shaly intervals are brown to olive brown to green-grey; quartz-rich sandstone, siltstone and mudstone beds; (consolidated to unconsolidated); quartz grains are rounded to subrounded, fine to medium grained; massive to laminated; sometimes kaolinitic and burrowed; abundant pyrite nodules and beds towards the base; sharp lower contact (if preserved); averages 9.0 m thick; see Photo 5b, 6a, 12b, 13a and 13b.



Photo 1a: WL-91-29: Contacts between the Cedar Lake, East Arm and Atikameg formations. The Cedar Lake Formation, present at the top of the hole, has a gradational contact to the East Arm Formation (this is a very uncertain pick). At approximately 13 m, the texture becomes a darker mudstone and probably represents the u_2 -marker (which was not identified when the photo was taken). A sharp change between the u_2 -marker and the Atikameg Formation (brown vuggy dolomite) occurs at 15.54 m.



Photo 1b: WL-91-29: Contact between the Atikameg and Moose Lake formations. Note the very vuggy/porous texture of the Atikameg Formation and its buff orange colour. The contact to the Moose Lake Formation occurs at the base of a marker bed.



Photo 2a: WL-91-29: The Moose Lake, u_1 -marker, and Fisher Branch contacts. The Moose Lake Formation is a light brown to tan, massive dolomitic mudstone to grainstone. There is a distinct change to the u_1 -marker, which is a grey mudstone.



Photo 2b: WL-91-29: The Fisher Branch, Stonewall, and t-marker contacts. The Fisher Branch Formation is a light brown to tan dolomitic wackestone to packstone with abundant brachiopods (*Virginia decussata*) at its base. The formation has a sharp contact to the Stonewall marker (arrow). The Stonewall Formation t-marker is present at 49 m and note its greenish red colour (compared to bright red in hole WL-92-51) (see Photo 7a).

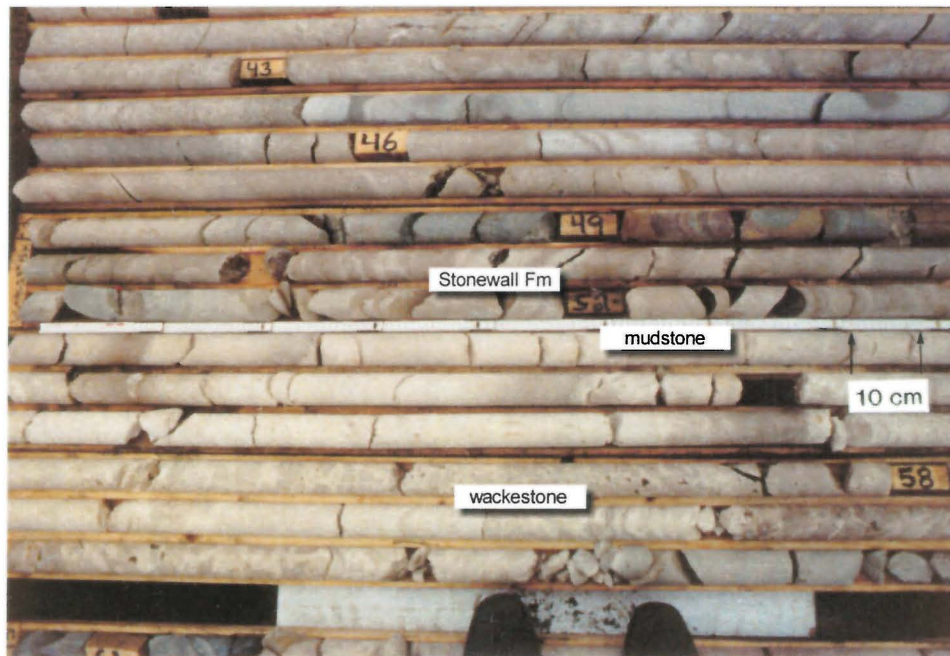


Photo 3a: WL-91-29: The Stonewall Formation indicating its different depositional textural types: mudstones to wackestones.

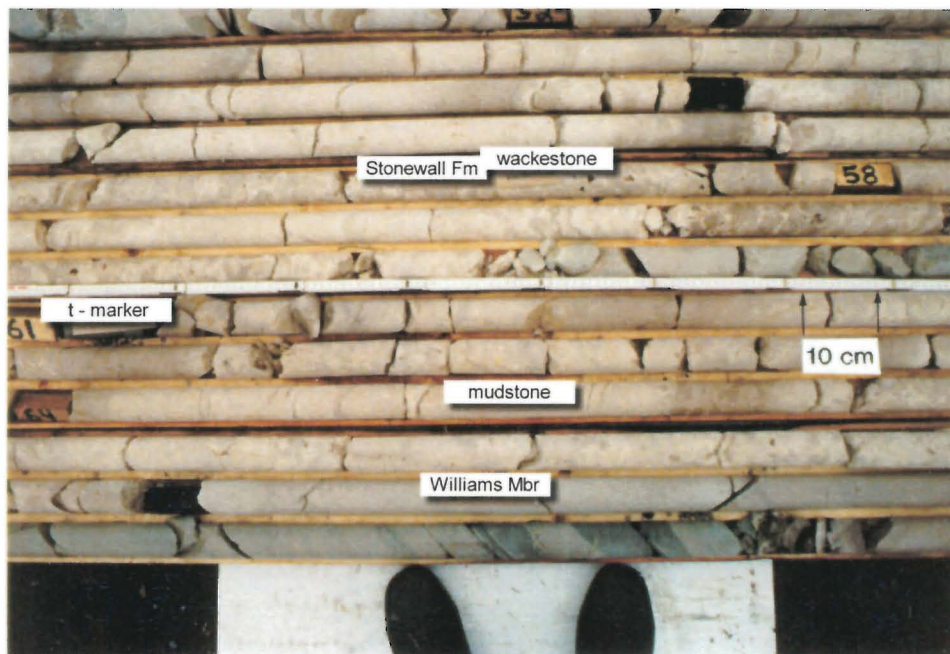


Photo 3b: WL-91-29: The upper portion of the Stonewall Formation and its contact to the Williams Member (Stonewall Formation) (grey to dark grey laminated mudstone).



Photo 4a: WL-91-29: The contact between the Williams Member and the Stony Mountain Formation (arrow). The Stony Mountain Formation is a distinctly nodular to burrow mottled wackestone.

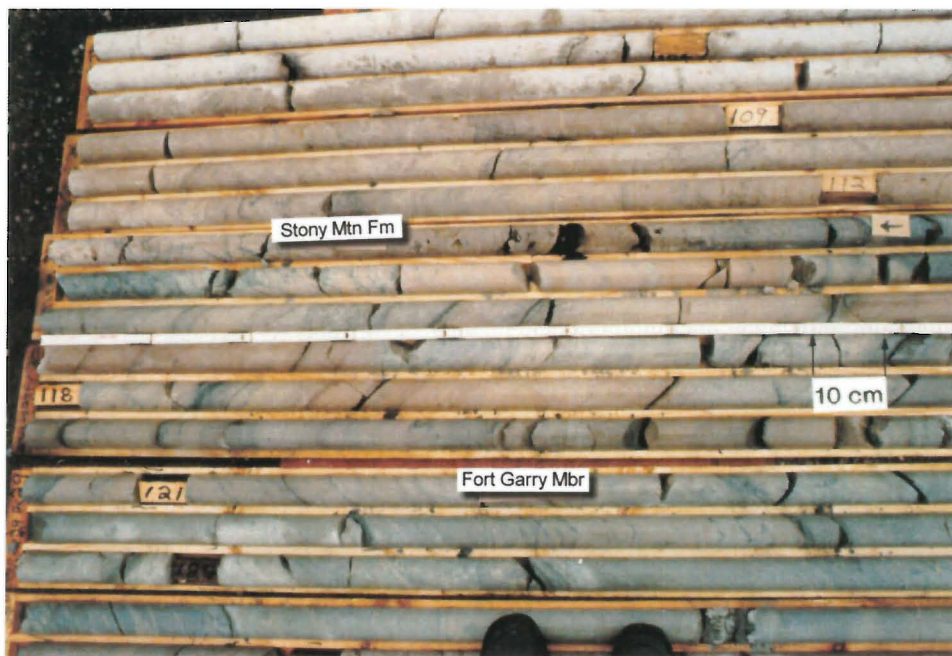


Photo 4b: WL-91-29: The contact between the Stony Mountain Formation and Fort Garry Member (upper Red River Formation) (arrow). The Fort Garry Member contains intermixed, grey to brown, laminated to massive mudstones with some brecciated intervals.

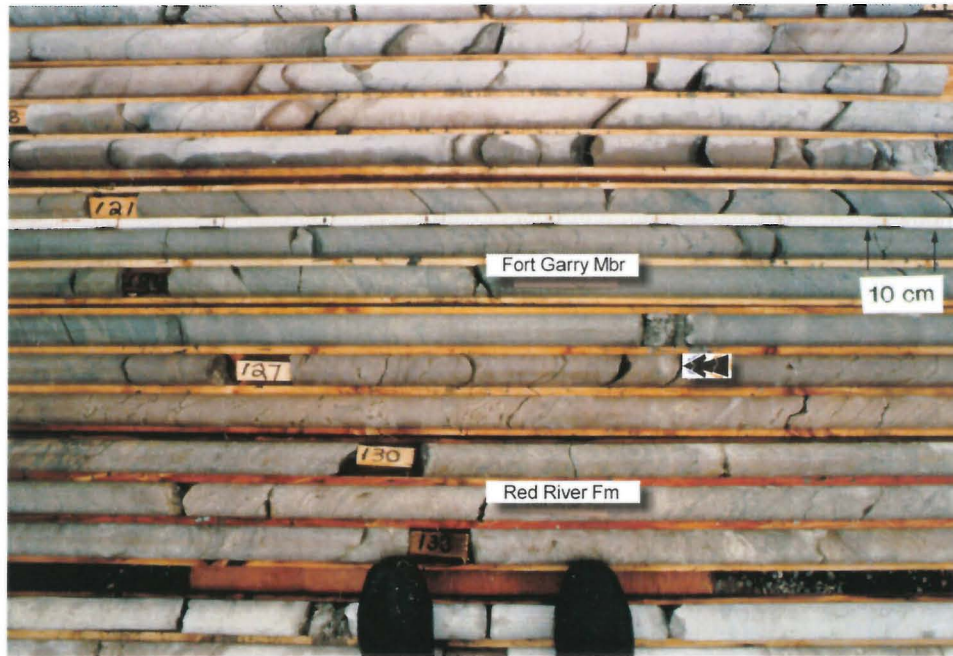


Photo 5a: WL-91-29: Contact between the Fort Garry Member (upper Red River Formation) and the lower Red River Formation (arrow). The upper Red River Formation is a burrow mottled, nodular, dolomitic wackestone.

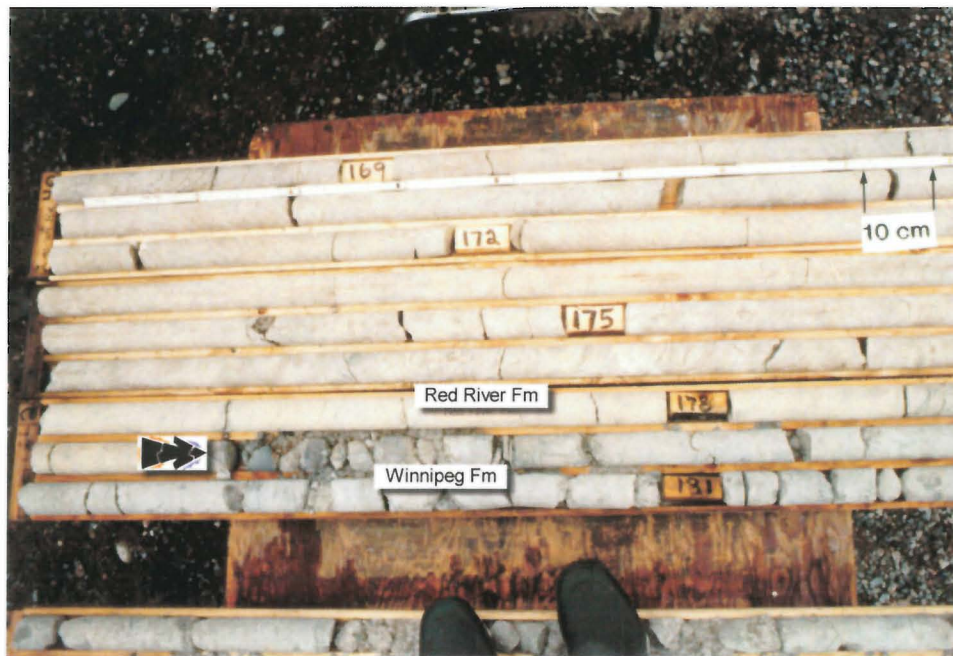


Photo 5b: WL-91-29: The lower Red River Formation, a massive nodular wackestone, and the Winnipeg Formation sandstone. The contact is present where the solid dolomite changes abruptly to friable sandstone (at arrow).



Photo 6a: WL-91-29: The Winnipeg Formation contact to the Precambrian. Intermixed lithologies of dolomitic sandstone, sandstone and siltstone (especially at the base). There is a sharp contact to weathered Precambrian at the base (just below the 190 m tag) (at arrow).

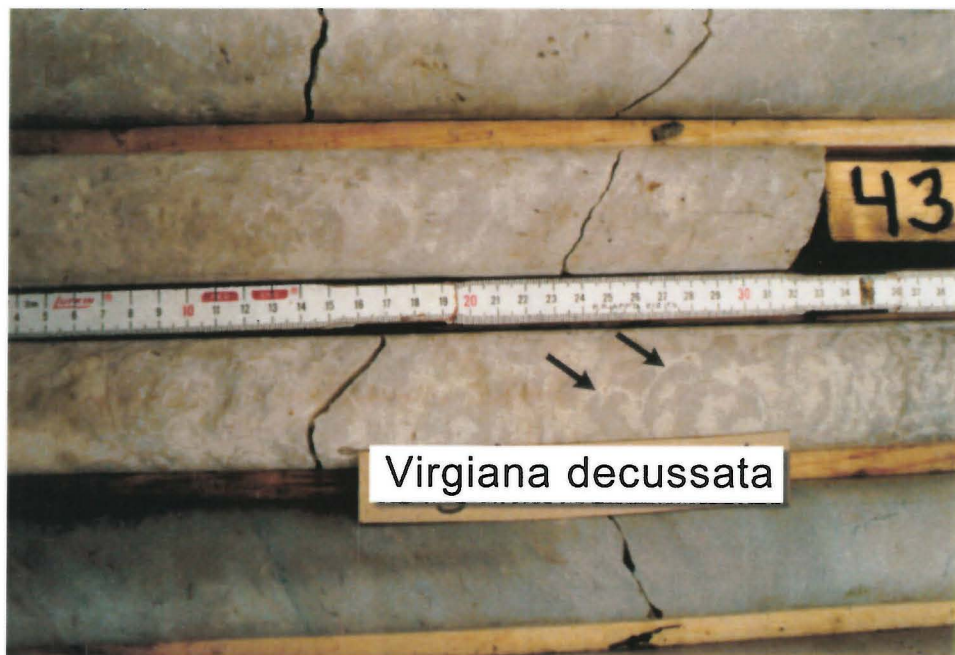


Photo 6b: WL-91-29: Close-up of *Virgiana decussata*, an indicator fossil for the base of the Silurian Interlake Group (at arrows). Scale in centimetres.

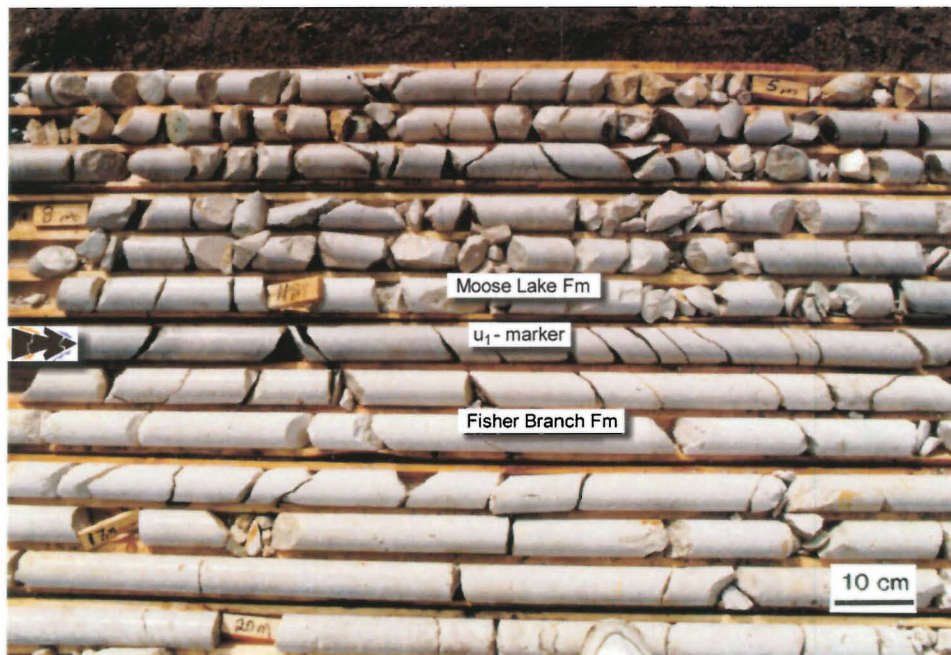


Photo 7a: WL-92-51: Contacts between the Moose Lake Formation, u_1 -marker, and Fisher Branch Formation. The u_1 -marker, a dolomitic mudstone, is distinctly darker than the surrounding units. The Fisher Branch Formation is a light brown to tan (white in photo), dolomitic wackestone (at the 20 and 23 m tags in photo).



Photo 7b: WL-92-51: Contacts between the Fisher Branch and Stonewall formations, and the t-marker. There is a very sharp break between the Fisher Branch Formation and the Stonewall marker, and is well displayed in the photo. The t-marker, which occurs above the 29 m tag, is a distinctly red, laminated mudstone. This marker is not always red and may appear green to grey in colour (see Photo 2b).

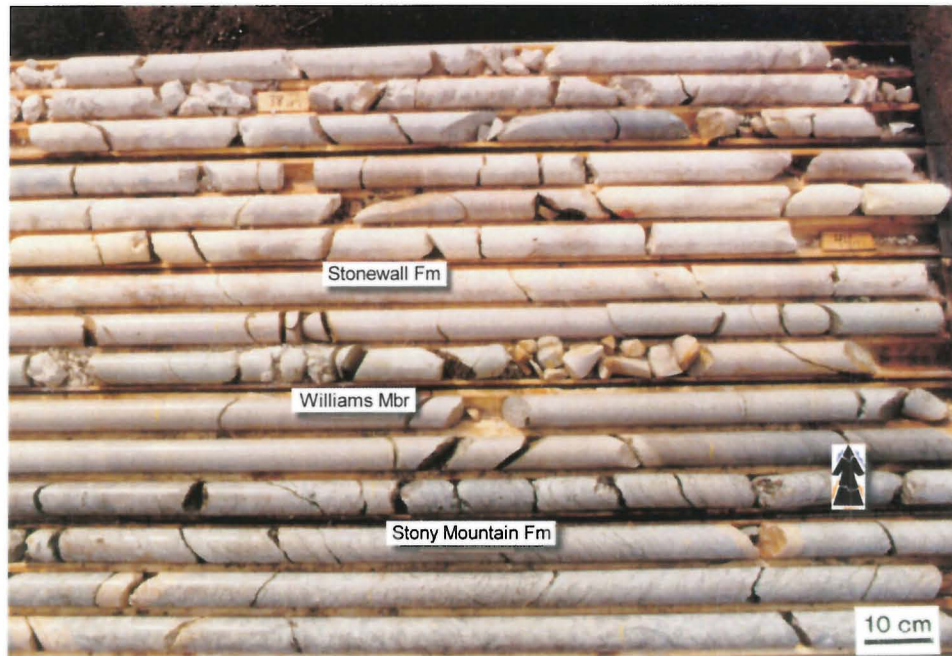


Photo 8a: WL-92-51: Contact between the Williams Member (Stonewall Formation) and the Stony Mountain Formation. There is a gradational change between the upper portion of the Stonewall Formation and the Williams Member, a change from light brown wackestone to light green-grey mudstone. A sharp break (at arrow) occurs between the Williams Member and the Stony Mountain Formation - a distinctly nodular, burrow mottled wackestone. An argillaceous marker bed (lower t-marker - grey mudstone in photo) is present just below the 38 m tag.



Photo 8b: WL-92-51: Close-up of the Williams Member and the Stony Mountain Formation contact (at arrow).



Photo 9: WL-92-51: Contact (at arrow) between the Stony Mountain Formation, a nodular wackestone, and the Fort Garry Member (upper Red River Formation), a massive to laminated mudstone.



Photo 10a: WL-92-51: Contact (at arrow) between the Stony Mountain Formation and the Fort Garry Member.

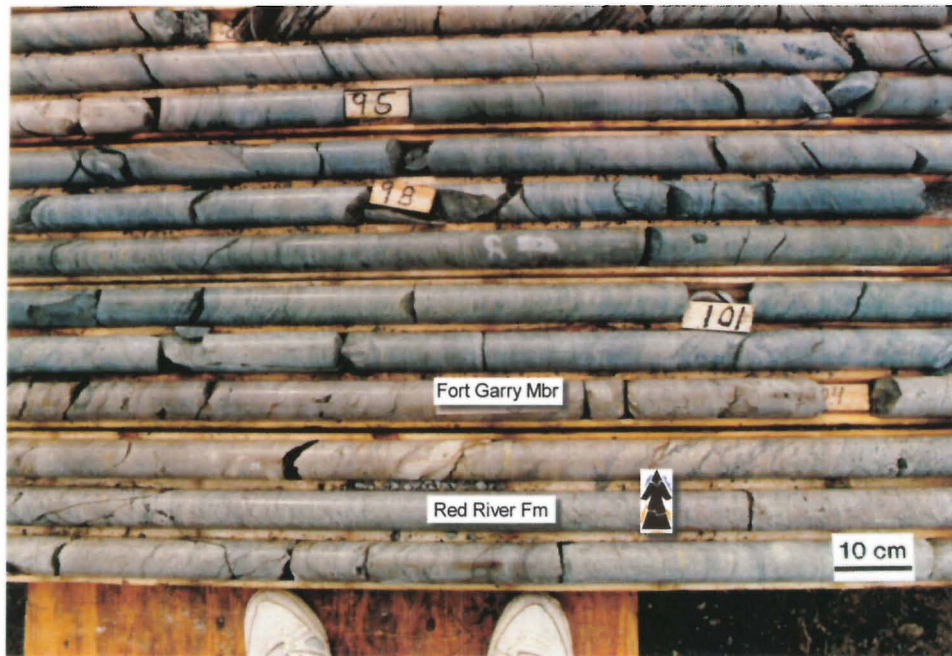


Photo 10b: WL-92-51: Contact (at arrow) between the Fort Garry Member (upper Red River Formation) and the lower Red River Formation. Note the change from dark grey to grey mudstone to light brown/light grey, burrow mottled, dolomitic wackestones (lower Red River Formation).



Photo 11: WL-92-51: Close-up of the contact between the Fort Garry Member (upper Red River Formation) and the lower Red River Formation (see Photo 10b).



Photo 12a: WL-92-51: Contact between the Fort Garry Member and the lower Red River Formation. The lower Red River Formation becomes a lighter brown, dolomitic wackestone at its base (less argillaceous content).



Photo 12b: WL-92-51: Contact between the lower Red River and Winnipeg formations (arrow).

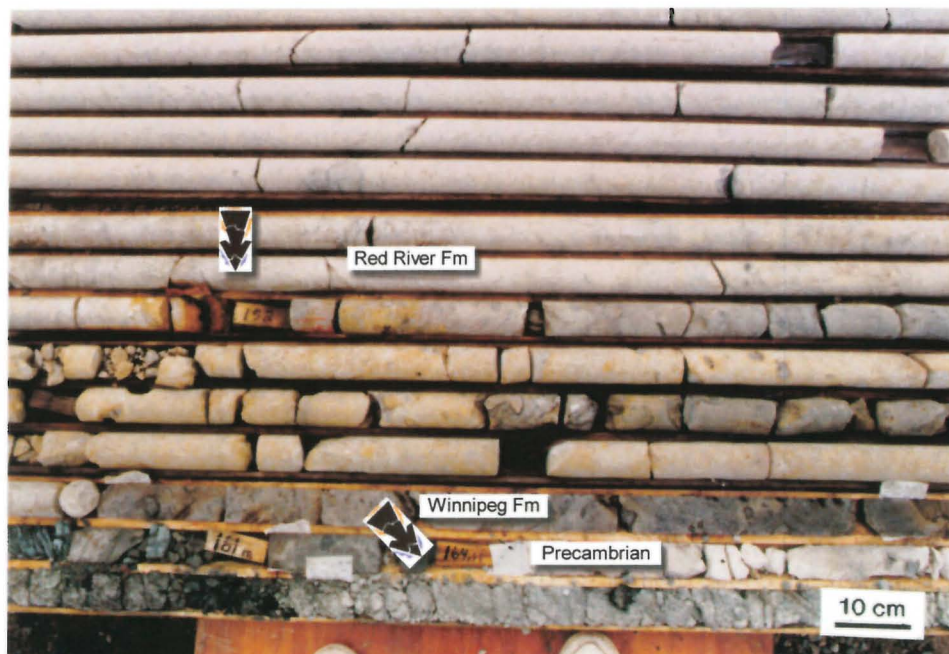


Photo 13a: WL-92-51: Close-up of the contact (at 152 m) between the Red River and Winnipeg formations and the Precambrian (at arrows). The uppermost contact of the Winnipeg Formation is stained yellow-orange due to weathering of sulphides (probably pyrite). The sandstone becomes more argillaceous towards the base (silty).

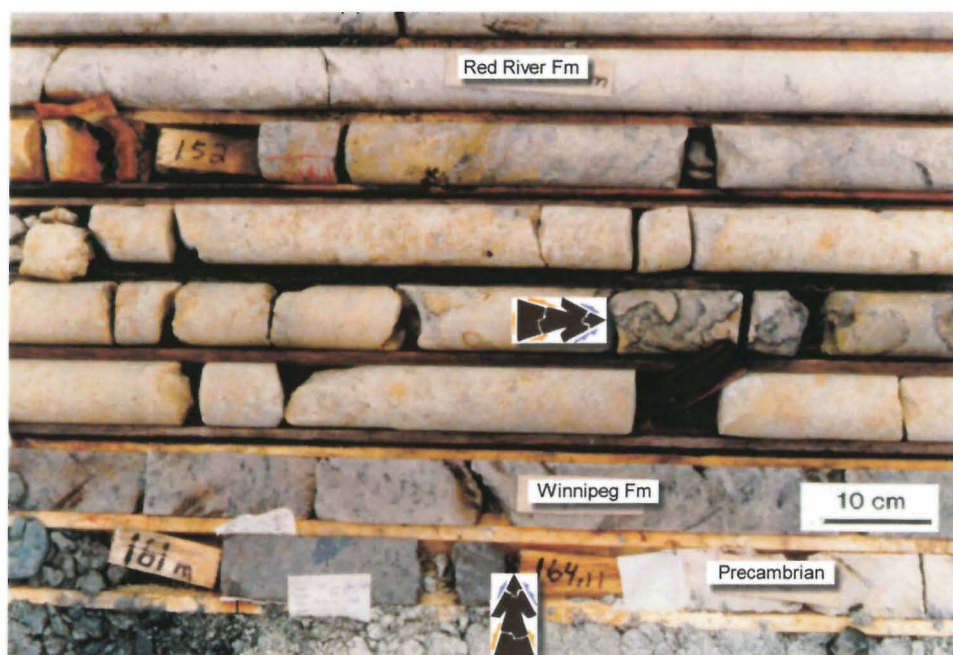


Photo 13b: WL-92-51: Close-up of Photo 13a. Note pyrite nodules and mottling at arrow (at top). Contact to the Precambrian is not very well preserved (at arrow - 164.11 m).



Photo 14a: WL-92-51: White tripolized chert nodules in the Red River Formation.



Photo 14b: WL-92-51: Clay infilled fracture (at arrow) and brittle fractures at 107 m (Red River Formation).