

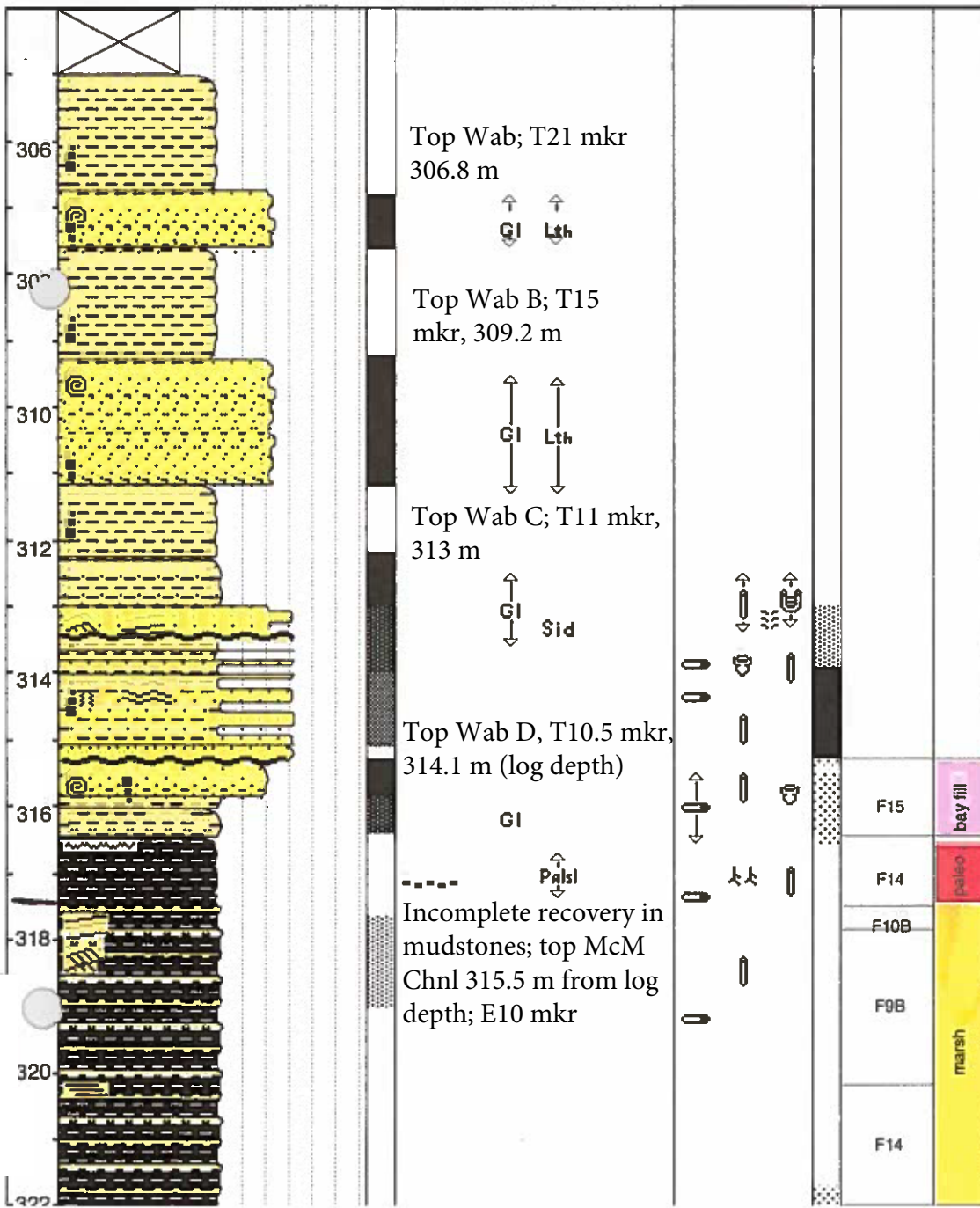
Date Logged: December 2, 2003

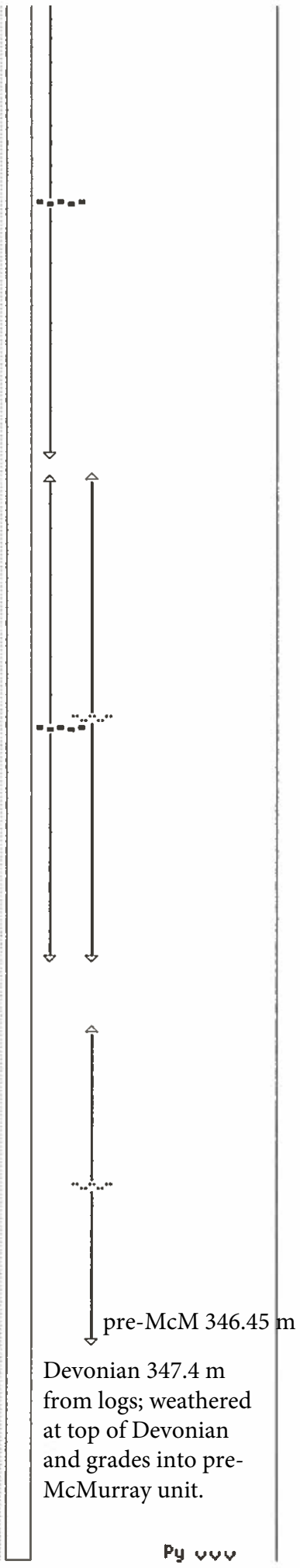
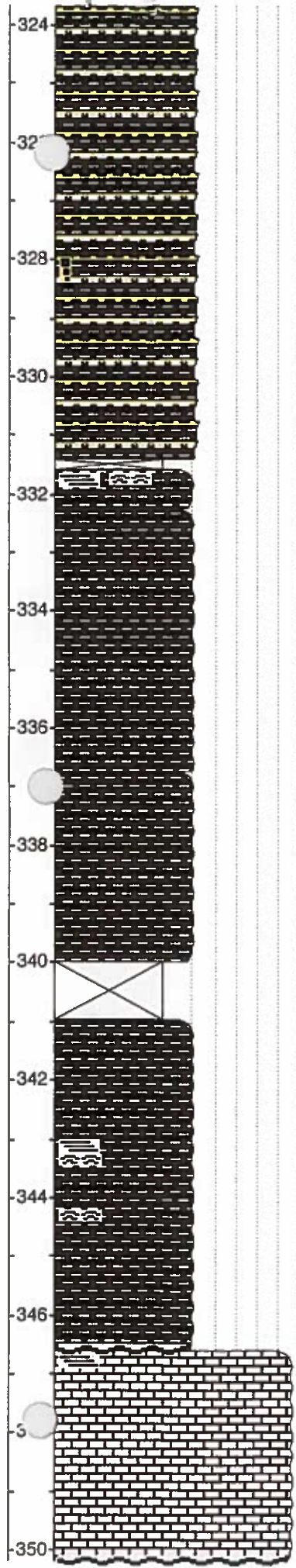
Logged by: F. J. Hein

Done for omnibus Gas over Bitumen  
Hearing; original not available; scanned  
marked image from SSG records.

Remarks: Core description for mapping/facies analysis in Gulf Surmont Pilot area.

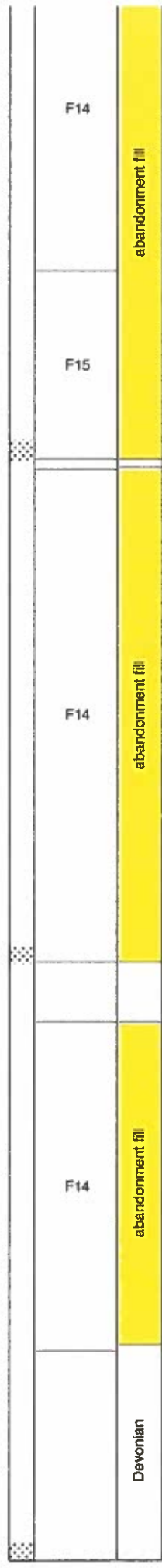
METERS	GRAIN SIZE sand silt clay	BIOTURBATION INTENSITY v f m c v	Picks: Top Wabiskaw (T21) = 306.8 m; Top Wab B-equiv (T15) = 309.2 m; Top Wab C (T11) = 313 m; Top Wab D (T10.5) = 314.1 m; Top McM Chnl Seq (E10) = 315.5 m; Top pre-McMurray clastics, marl and karst = 346.45 m; Top Paleozoic (Pz) = 347.4 m.	ACCESSORIES	ICHOFOSSILS	STAIN	FACIES	DEPOSITIONAL ENVIRONMENT





Devonian 347.4 m  
from logs; weathered  
at top of Devonian  
and grades into pre-  
McMurray unit.

Py vvv



# Gulf Resdeln

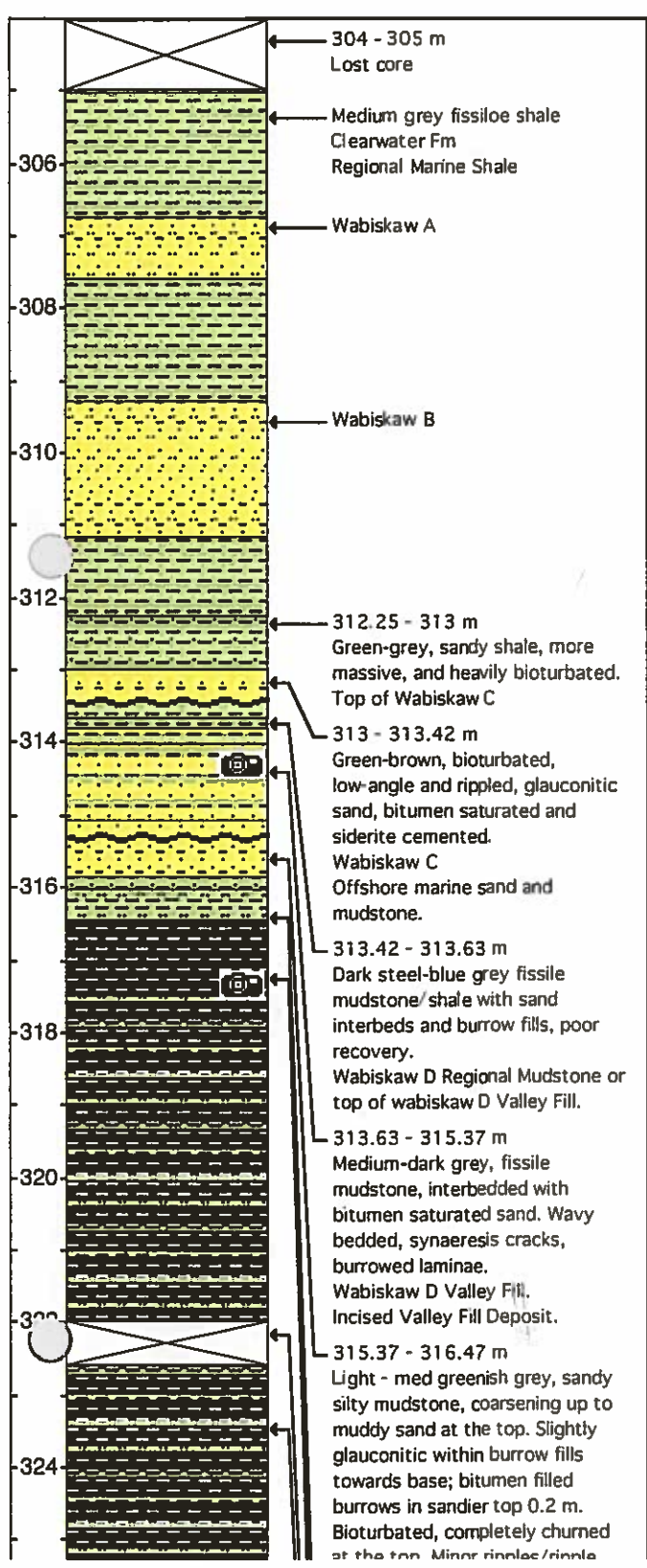
05-17-083-06w4 AA

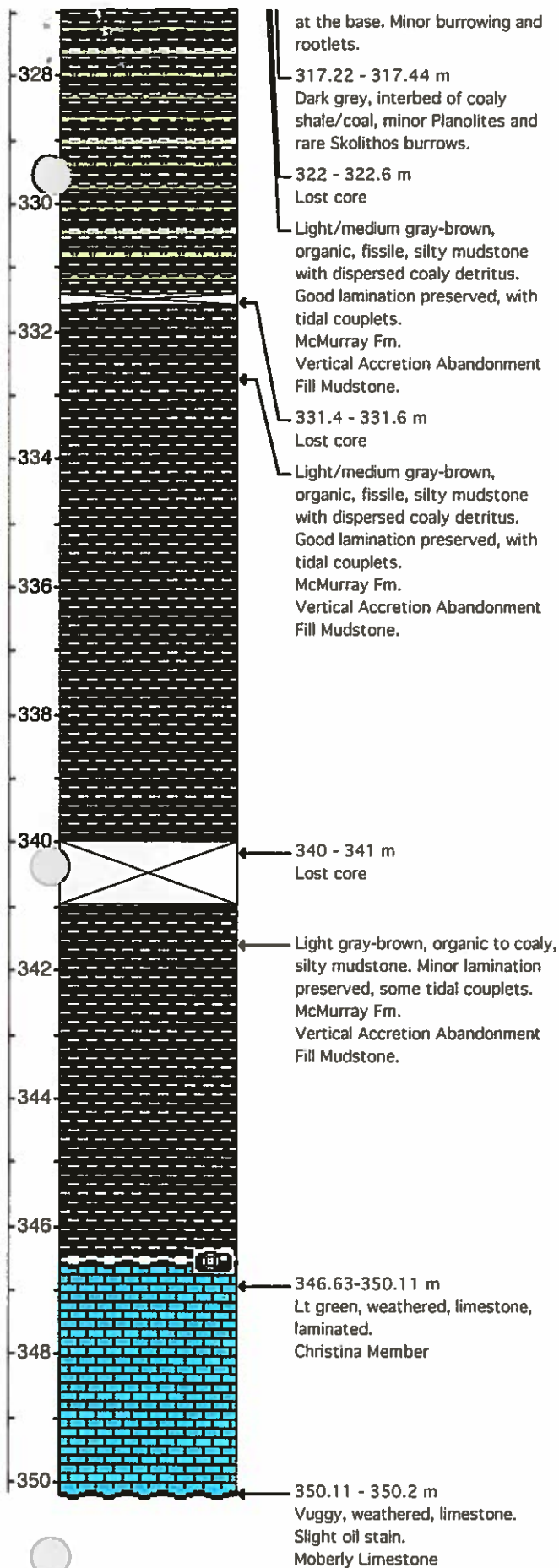
Date Logged: December 2, 2003

Logged by: F. J. Hein

Remarks: Core description for mapping/facies analysis in Gulf Surmont Pilot area.

METERS	LITHOLOGY	REMARKS
--------	-----------	---------





Picks: Top Wabiskaw (T21) = 306.8 m; Top Wabiskaw B (T15) = 309.2 m; Top Wabiskaw C (T11) = 313 m; Top Wabiskaw D (T10.5) = 314.1 m; Top McMurray Chnl Sequence (E10)= 315.5 m; Top pre-McMurray clastics, marl and/or karast unit = 346.45 m; sub-Cretaceous unconformity/Top Paleozoic (Pz) = 347.4 m

## AppleCore colour legend

### LITHOLOGY

	SAND/SANDSTONE		SHALEMUDSTONE		organic shale		LIMESTONE
	silty sand		silty shale		coal		Calcareous shale
	shaly sand		sandy shale		breccia		Lost Core
	sandy silt		clay/claystone				

### CONTACTS

	Sharp		Erosional
---	-------	---	-----------


### PHYSICAL STRUCTURES

	Current Ripples		Trough Cross-strat.		Oscillatory Ripples		Planar Tabular Bedding
	High Angle Tabular Bedding		Low Angle Tabular Bedding		Wavy Parallel Bedding		Synaeresis Cracks

### LITHOLOGIC ACCESSORIES

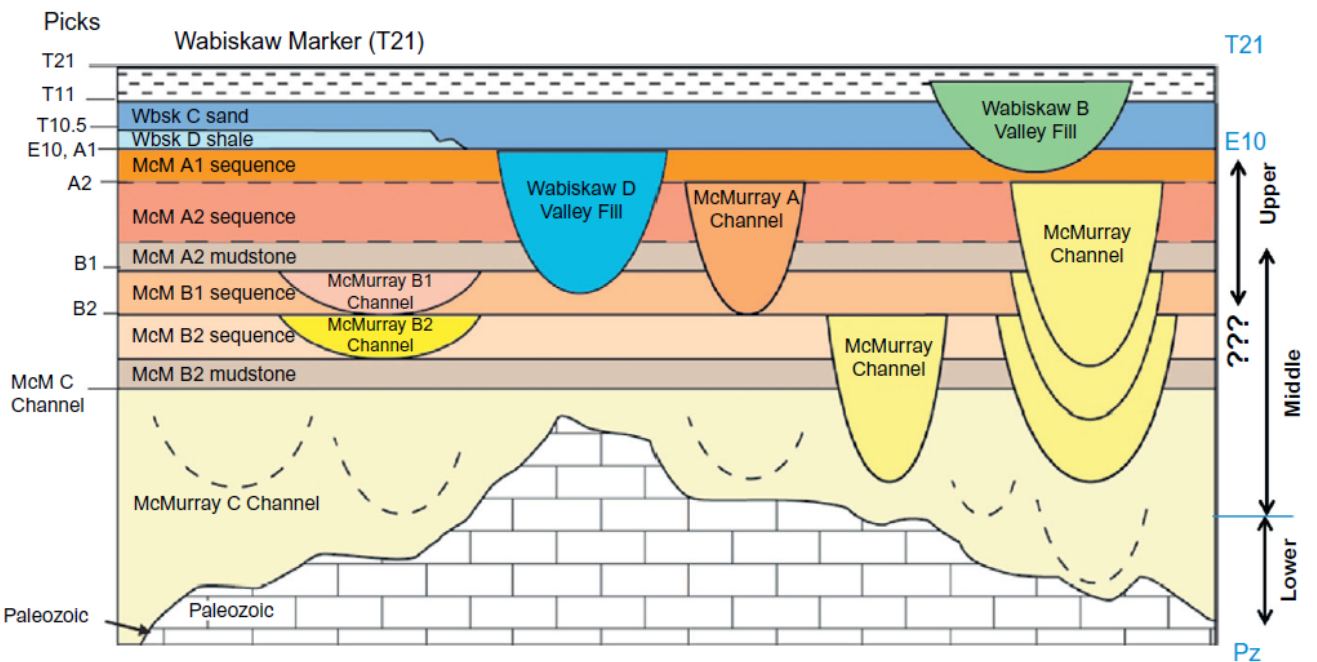
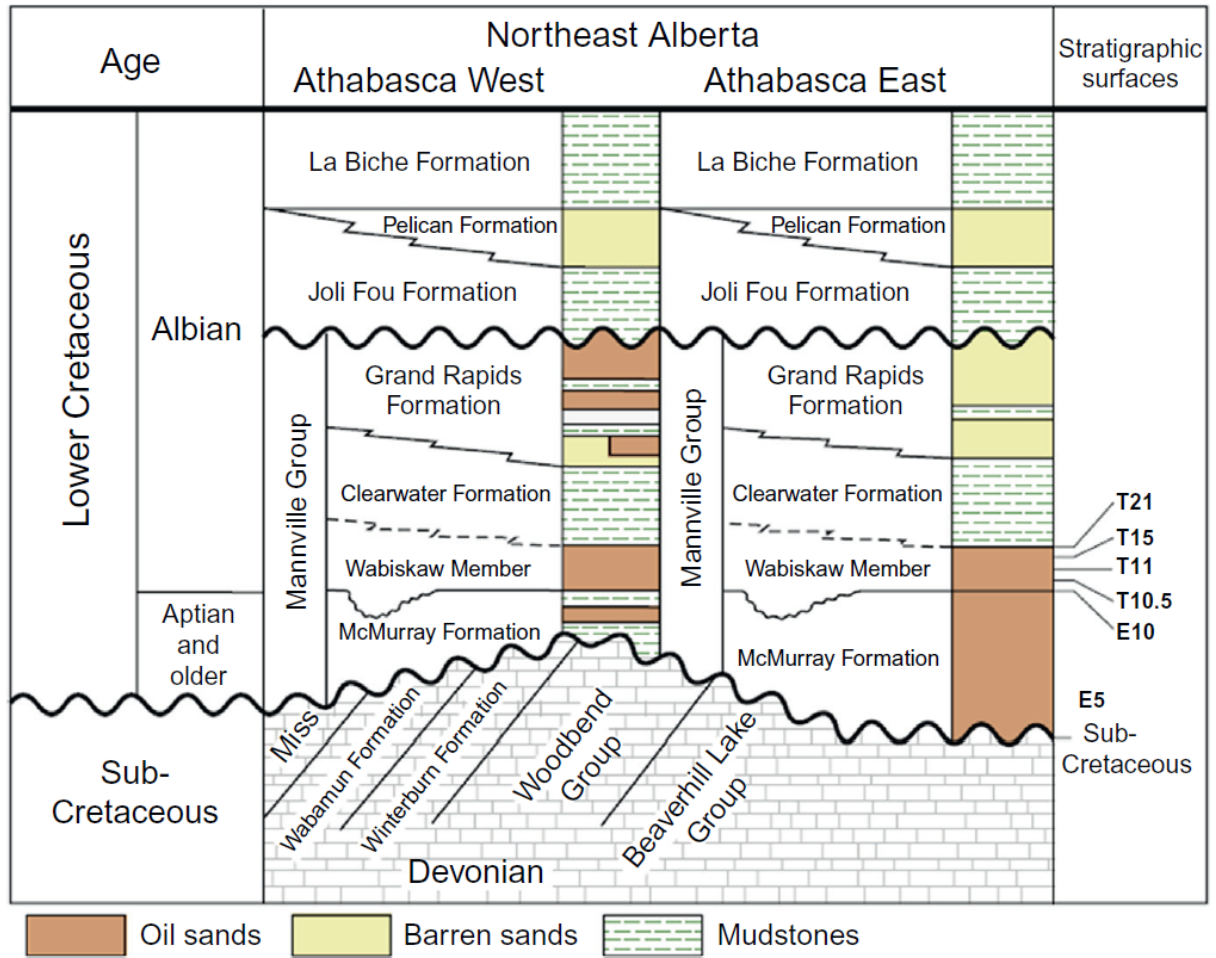
	Silt Lamina		Shale Lamina		Pebbles/Granules		Glauconitic
	Feldspathic		Lithic		Rip Up Clasts		Coal Fragments
	Wood Fragments		Salt & Pepper				

### ICHTNOFOSSILS

	Rootlets		Skolithos		Planolites		Gyrolithes
	Diplocraterion		Arenicolites		Escape Trace		Cylindrichnus
	Bergaueria		Astrosoma		Thalassinoides		Chondrites
	Teichichnus		Anconichnus				



# Stratigraphic Nomenclature for Picks



## References Posted on Alberta Energy Regulator and Alberta Geological Survey websites

- Alberta Energy and Utilities Board (2003): Athabasca Wabiskaw-McMurray Regional Geological Study, Alberta Energy and Utilities Board Report, 187 p., URL < <https://www.aer.ca/documents/reports/r2003-a.pdf>. > [January 2017].
- Hein, F. J. (2000): Historical overview of the Fort McMurray area and oil sands industry in northeast Alberta (with expanded bibliographies on oil sands, surficial geology, hydrogeology, minerals and bedrock in northeast Alberta); Alberta Energy and Utilities Board, Alberta Geological Survey, Earth Sciences Report 2000-05, 26 p with appendices, URL < [http://www.ags.gov.ab.ca/publications/ESR\\_2000\\_05.html](http://www.ags.gov.ab.ca/publications/ESR_2000_05.html) > [May 2017]
- Hein, F. J., Berhane, H., and Weiss, J. A. (2007): Cold Lake oil sands area: Formation picks and correlation of associated stratigraphy; Alberta Energy and Utilities Board, Alberta Geological Survey, Geo-Note 2006-03, 17 p., URL < [http://www.ags.gov.ab.ca/publications/GEO\\_2006\\_03.html](http://www.ags.gov.ab.ca/publications/GEO_2006_03.html) > [May 2017]
- Hein, F.J. and Cotterill, D.K. (2007): Field guide: Regional sedimentology and processes of deposition of the Athabasca oil sands, northeast Alberta; Alberta Energy and Utilities Board/Alberta Geological Survey, Geo-Note 2006-04, 157 p., URL < [http://www.ags.gov.ab.ca/publications/GEO\\_2006\\_04.html](http://www.ags.gov.ab.ca/publications/GEO_2006_04.html) > [May 2017]
- Hein, F.J., Cotterill, D.K., and Berhane, H. (2000): An atlas of lithofacies of the McMurray Formation, Athabasca oil sands deposit, northeastern Alberta: Surface and subsurface; Alberta Energy and Utilities Board, Alberta Geological Survey, Earth Sciences Report 2000-07, 216 p., URL < [http://www.ags.gov.ab.ca/publications/ESR\\_2000\\_07.html](http://www.ags.gov.ab.ca/publications/ESR_2000_07.html) > [May 2017]
- Hein, F.J., Cotterill, D.K., and Rice, R. (2006a): Subsurface geology of the Athabasca Wabiskaw-McMurray succession: Lewis – Fort McMurray area, northeastern Alberta (NTS 74D/14); Alberta Energy and Utilities Board/Alberta Geological Survey, Earth Sciences Report 2006-06, 67 p., URL < [http://www.ags.gov.ab.ca/publications/ESR\\_2006\\_06.html](http://www.ags.gov.ab.ca/publications/ESR_2006_06.html) > [May 2017].
- Hein, F.J., Cotterill, D.K., Weiss, J., and Berhane, H. (2006b): Subsurface geology and facies characterization of the Athabasca Wabiskaw-McMurray succession Firebag-Sunrise area, northeastern Alberta (NTS 74D/74E); Alberta Energy and Utilities Board/Alberta Geological Survey, Earth Sciences Report 2006-08, 73 p., URL < [http://www.ags.gov.ab.ca/publications/ESR\\_2006\\_08.html](http://www.ags.gov.ab.ca/publications/ESR_2006_08.html) > [May 2017].
- Hein, F. J. and Dolby, G. (2017): Palynology, lithostratigraphy, and biostratigraphy of the Athabasca oil-sands deposit, northeastern Alberta; Alberta Energy Regulator, Alberta Geological Survey, Open File Report (2017, under review), 56 p. with digital appendices.
- Hein, F.J., Langenberg, C.W., Kidston, C., Cotterill, D.K., Berhane, H., and Berezniuk T. (2001): Comprehensive field guide for facies characterization of the Athabasca oil sands, Fort

McMurray area, northeast Alberta; Energy and Utilities Board, EUB/AGS Special Report 13, 335 p., URL <  
[http://www.ags.gov.ab.ca/publications/SPE\\_013.html](http://www.ags.gov.ab.ca/publications/SPE_013.html) > [May 2017]

Wynne, D. A., Attalla, M., Berhane, H., Brulotte, M., Cotterill, D. K., Strobl, R., and Wightman, D. M. (1994): Athabasca oil sands database: McMurray/Wabiskaw deposit; Alberta Energy and Utilities Board, Alberta Geological Survey, Open File Report, 1994-14, 44 pp., URL <  
[http://www.ags.gov.ab.ca/publications/OFR\\_1994\\_14.html](http://www.ags.gov.ab.ca/publications/OFR_1994_14.html) > [May 2017]

Langenberg, C. W., Hein, F. J., and Berhane, H. (2001): Three-dimensional geometry of fluvial-estuarine oil sand deposits of the Clarke Creek area (NTS 74D), northeastern Alberta; Energy and Utilities Board, EUB/AGS Special Report 13, 35 p., URL <  
[http://ags.aer.ca/publications/ESR\\_2001\\_06.html](http://ags.aer.ca/publications/ESR_2001_06.html) > [May 2017]



**Definition of stratigraphic markers ('picks') with quality codes**  
(modified from Wynne et al., 1994 and Hein et al., 2000).\*

Pick	Type of Surface	Description	Quality Code**
T21	Transgressive	Wabiskaw Marker Top Wabiskaw Mbr. 'A'	Good - Very Good
T15	Transgressive	Top Wabiskaw Mbr. 'B'	Good - Very Good
E14	Major Erosion	Wabiskaw Internal Incision	Good - Very Good
T11	Transgressive	Base First Regional Marine Shale in the Clearwater Fm. Top Wabiskaw Mbr. 'C'	Very Good-Excellent
T10.5	Transgressive	Top Wabiskaw Mbr. 'D' Incised Valley-Fill Deposit	Excellent-Very Good
E10	Disconformity/ Unconformity	Top Upper McMurray Fm Major Erosion Surface	Excellent -Very Good
E5	Disconformity/ Unconformity	Top Lower McMurray Fm. Major Erosion Surface	Variable Very Poor -Fair
Sub-Cret. (Pal.)	Unconformity	Base of McMurray Fm Major Erosion Surface	Variable Very Good-Excellent (However this is sometimes difficult to pick in areas of significant clastic karst-infill, or where marl is above the sub- Cretaceous unconformity)

\* Abbreviations: Group, Grp.; Formation, Fm.; Member, Mbr.

\*\* Quality Codes are relative: Excellent to Very Good, can be picked on all wire-line logs and seismic; Poor to Very Poor, need to be confirmed by outcrops or core, difficult to pick on wire-line logs, somewhat easier to pick on seismic.

## References cited

Hein, F. J. Cotterill, D. K., and Berhane, H., 2000, An atlas of lithofacies of the McMurray Formation, Athabasca oil sands deposit, northeastern Alberta: Surface and Subsurface: Alberta Energy and Utilities Board/Alberta Geological Survey, Alberta Geological Survey, Edmonton, AB, Earth Sciences Report 2000-07, 216 p.

Wynne, D. A., Attalla, M., Berhane, H., Brulotte, M., Cotterill, D. K., Strobl, R., and Wightman, D. M., 1994, Athabasca oil sands database: McMurray/Wabiskaw deposit, Alberta Energy and Utilities Board, Alberta Geological Survey, Edmonton, AB, Open File Report, 1994-14, 44 p.