



## **GEOLOGICAL SURVEY OF CANADA**

**OPEN FILE 5536**

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### **Paskapoo Groundwater Study Part V: Detailed outcrop measured sections of the Scollard, Porcupine Hills and Paskapoo Formations in the Calgary region, Alberta**

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A.P. Hamblin

2007



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**Hamblin, A.P.**

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Open files are products that have not gone through the GSC formal publication process.

## **Tertiary Strata in the Calgary Region**

Strata of Tertiary (Paleocene) age, including the Porcupine Hills, Scollard and Paskapoo formations, represent an important emerging interval of bedrock strata with significant resource potential in western Alberta, where population, agricultural and industrial pressures are mounting. In the early part of the 20<sup>th</sup> Century, these rocks supplied much of the building stone to create the gracious structures of a young province; for decades, it has provided much of the groundwater for the western part of the province; and with the dawn of a new century, these strata are now an exploration target for the shallow gas and coal-bed methane industry. Hamblin (2004) provided a review of the state of knowledge of these rocks, their stratigraphy, sedimentology, paleontology and resource potential, as a launchpad for further studies.

Because the Paleocene rocks represent the bedrock at surface over their area of occurrence, and have not previously been a major hydrocarbon target, there has been little study of outcrop or subsurface data. This report briefly summarizes outcrop field work, primarily detailed measured sections, in the Bow River corridor, in an east-west transect, both within and westward of the city of Calgary, where Porcupine Hills (Paskapoo) rocks are intermittently exposed (Fig. 1 and Table 1). It is meant to be complementary to two other Open Files on outcrop sections of the Paskapoo Formation on the Red Deer River (Hamblin, 2007a), and on drillcore sections of Paskapoo rocks in central Alberta (Hamblin, 2007b). The material is presented as 15 standard measured sections (with text descriptions of units) (Fig. 2), and measured paleocurrent data (Fig. 3), which approximate a continuous succession of the strata represented in this region.

In this region, the upper portion of the Scollard Formation, the lower and upper portions of the Porcupine Hills Formation and the lower portion of the Paskapoo Formation are all present around the city of Calgary. Detailed magneto- and biostratigraphic study of these rocks by Lerbekmo and Sweet (2000) has concluded that the regionally-important “mid-Paleocene hiatus”, known from the Red Deer River valley, is also present in the Calgary region. This disconformity (~ 62-63 my) separates lower Porcupine Hills/upper Scollard strata below (and to the south and east), from upper Porcupine Hills/Paskapoo strata above (and to the north and west). From a lithologic point of view at the outcrop, this disconformity is extremely cryptic, and assigning specific outcrops to units above or below it is currently very tentative, and requires further work.

Facies present include stacked, multi-storied fluvial channel units up to 12 m thick, composed of fine to medium grained sandstone, for which paleocurrent data indicate sediment dispersal was variable, toward the east-northeast, southeast and west-northwest (Fig. 3). Erosive bases commonly carry lags of siltstone rip-ups, wood fragments, freshwater mollusc shells and resedimented calcrete nodules. Also present are greenish, pedogenically-altered overbank siltstones, with very thin fine grained sandstone interbeds, discontinuous horizons of calcrete nodules interpreted as poorly-developed paleosols and very minor carbonaceous mudstones. In addition, numerous fine grained sandstone beds, up to 1.5 m thick, of overbank splay origin, are present, with sediment dispersal primarily toward the southeast and southwest.

## **Acknowledgements**

This report has benefited from discussions with Art Sweet who provided suggestions for improvement. The manuscript was reviewed by Steve Grasby. Trin Nguyen, Paul Wozniak and Matt Pine compiled and drafted the figures. Final production of the Open File was handled by Paul Wozniak and Sylvia Leong.

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  2. Measured outcrop sections.
  3. Summary of paleocurrent data from outcrops.
- Table 1. Locations of measured sections.

## **References**

Hamblin, A.P. 2004. Paskapoo-Porcupine Hills Formations in western Alberta: Synthesis of regional geology and resource potential. Geological Survey of Canada, Open File 4679, 30p., 1 CD.

Hamblin, A.P., 2007a. Paskapoo Groundwater Study Part IV: Detailed outcrop measured sections of the Paskapoo Formation in the Red Deer Region, Alberta. Geological Survey of Canada Open File 5535, 20 p., 1CD.

Hamblin, A.P., 2007b. Paskapoo Groundwater Study Part III: Detailed core measured sections of the Paskapoo Formation in Central Alberta. Geological Survey of Canada Open File 5537, 13 p., 1CD.

Lerbekmo, J.F. and Sweet, A.R., 2000. Magnetostratigraphy and biostratigraphy of the continental Paleocene in the Calgary area, southwestern Alberta. Bulletin of Canadian Petroleum Geology, v. 48, p. 285-306.



<b>SECTION</b>	<b>SURVEY MAP GRID</b>	<b>NTS MAP</b>	<b>LAT/LONG</b>
Glenmore Reservoir	039534 (NAD 27)	Priddis 82-J/16	50°59'50"/114°05'40"
Raven Rocks	036465 (NAD 27)	Priddis 82-J/16	50°55'50"/114°05'50"
Singer's Driveway	983601 (NAD 27)	Calgary 82-O/1	51°03'30"/114°10'10"
Bearspaw Dam	902645 (NAD 27)	Calgary 82-O/1	51°05'40"/114°17'10"
The Slump	003597 (NAD 27)	Calgary 82-O/1	51°03'10"/114°08'40"
Old Quarry	990598 (NAD 27)	Calgary 82-O/1	51°03'20"/114°09'40"
Sacred Cliffs	897646 (NAD 27)	Calgary 82-O/1	51°06'20"/114°17'30"
Two Owl Coulee	883669 (NAD 27)	Calgary 82-O/1	51°07'40"/114°18'40"
Cochrane RR Cut	788733 (NAD 27)	Calgary 82-O/1	51°11'20"/114°26'20"
Cochrane Ranche	765754 (NAD 27)	Calgary 82-O/1	51°12'20"/114°28'20"
Big Hill	791747 (NAD 27)	Calgary 82-O/1	51°11'50"/114°26'10"
Priddis	883407 (NAD 27)	Priddis 82-J/16	50°53'30"/114°19'40"
Big Hill Springs Prov. Pk.	829805 (NAD 27)	Calgary 82-O/1	51°14'55"/114°22'50"
Beddington	031707 (NAD 27)	Calgary 82-O/1	51°09'20"/114°05'30"
Simon's Valley	989749 (NAD 27)	Calgary 82-O/1	51°11'40"/114°09'10"

Table 1. Location of Measured Outcrop Sections.

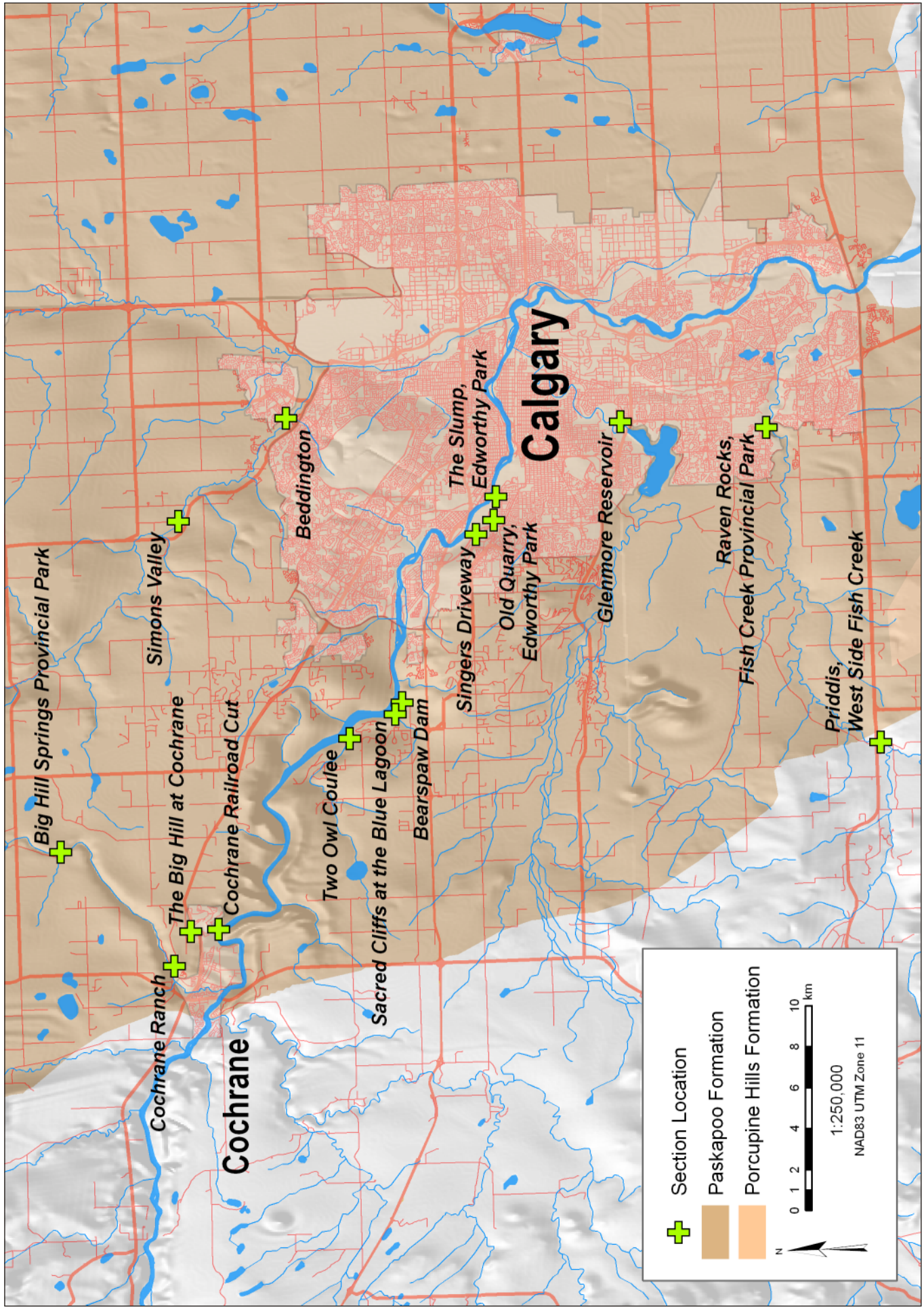


Figure 1. Location map for outcrop sections in Bow River corridor and adjacent areas.

## LEGEND

Conglomerate.....	
Limestone / Dolomitic limestone.....	
Carbonaceous shale.....	
Coal.....	
Siderite concretion bed or calcrete concretions.....	
Bentonite bed.....	
Oolitic bed.....	
Stromatolite bed or individual stromatolites.....	
Lens-shaped bed.....	
Discontinuous scour / gutter fills.....	
Fault.....	
Fractures with slickensides (either structural or pedogenic).....	
Fining-upward Trend.....	
Coarsening-upward Trend.....	
Paleocurrent Indicators.....	
Sampled for Palynology Dating .....	
Sampled for Paleomagnetic Dating .....	
Permeameter Reading .....	
Copper Sulfide Mineralization.....	
Erosive base with rip-ups and granules.....	
Scoured Base.....	
Ball and Pillow.....	
Rip-up Interclasts.....	
Breccia / Flat Pebble Conglomerate.....	
Trough Cross bedding.....	
Ripple Cross Lamination.....	
Climbing Ripples.....	
Low Angle Lamination.....	
Planar Tabular Crossbedding.....	
Inclined Bedding Surfaces (IBS) or Lateral Accretion Surfaces (LA).....	
Inclined Heterolithic Stratification (IHS).....	
Contorted Lamination.....	
Hummocky Cross Stratification (HCS).....	
Water Escape Structure.....	
Roots.....	
Bioturbation / Burrowing.....	
Vertical Burrows (eg. Skolithos).....	
Desiccation Cracks.....	
Fossil shells (pelecypod, gastropod, brachiopod).....	
Dinosaur bone fragments.....	
Carbonized wood fragments.....	
Gypsum nodule bed.....	
Evaporite crystal molds.....	

Figure 2. Legend for Figures 2a-o. The legend is common to Open Files 5535, 5536, and 5537.  
All symbols might not appear in the accompanying figures of this Open File.

Figure 2a.

## GLENMORE RESEVOIR (3500')

(East of Dam)

Priddis 82 J/16 038534, Sec.32 Twp.23 Rge.1W5

51°00' N / 114°06' W

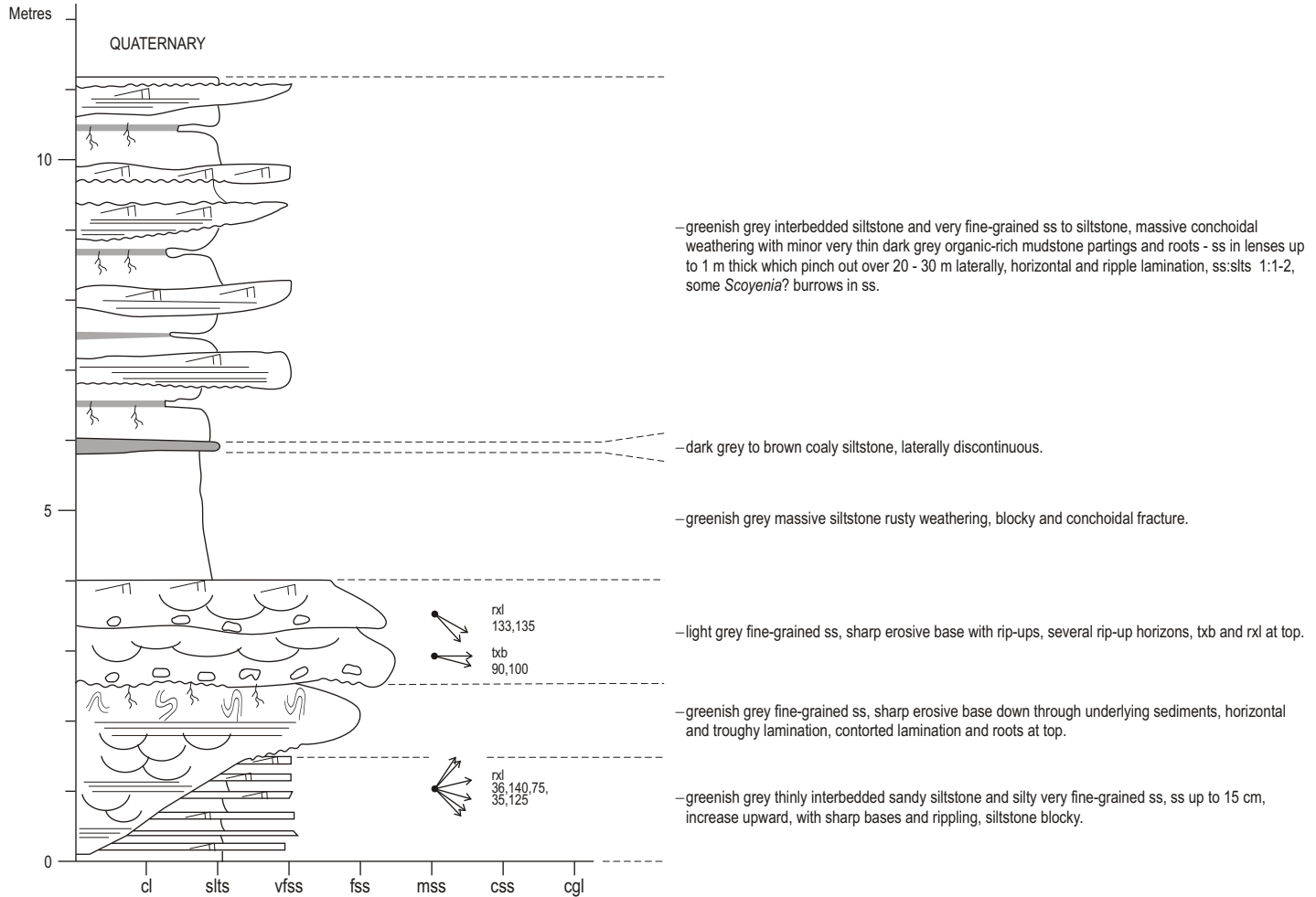


Figure 2b.

RAVEN ROCKS (3500')  
Fish Creek Provincial Park W of Hwy 2  
Priddis 82 J/16 037465, Sec. 8 Twp.23 Rge 1W5  
50°56' N / 114° 06' W

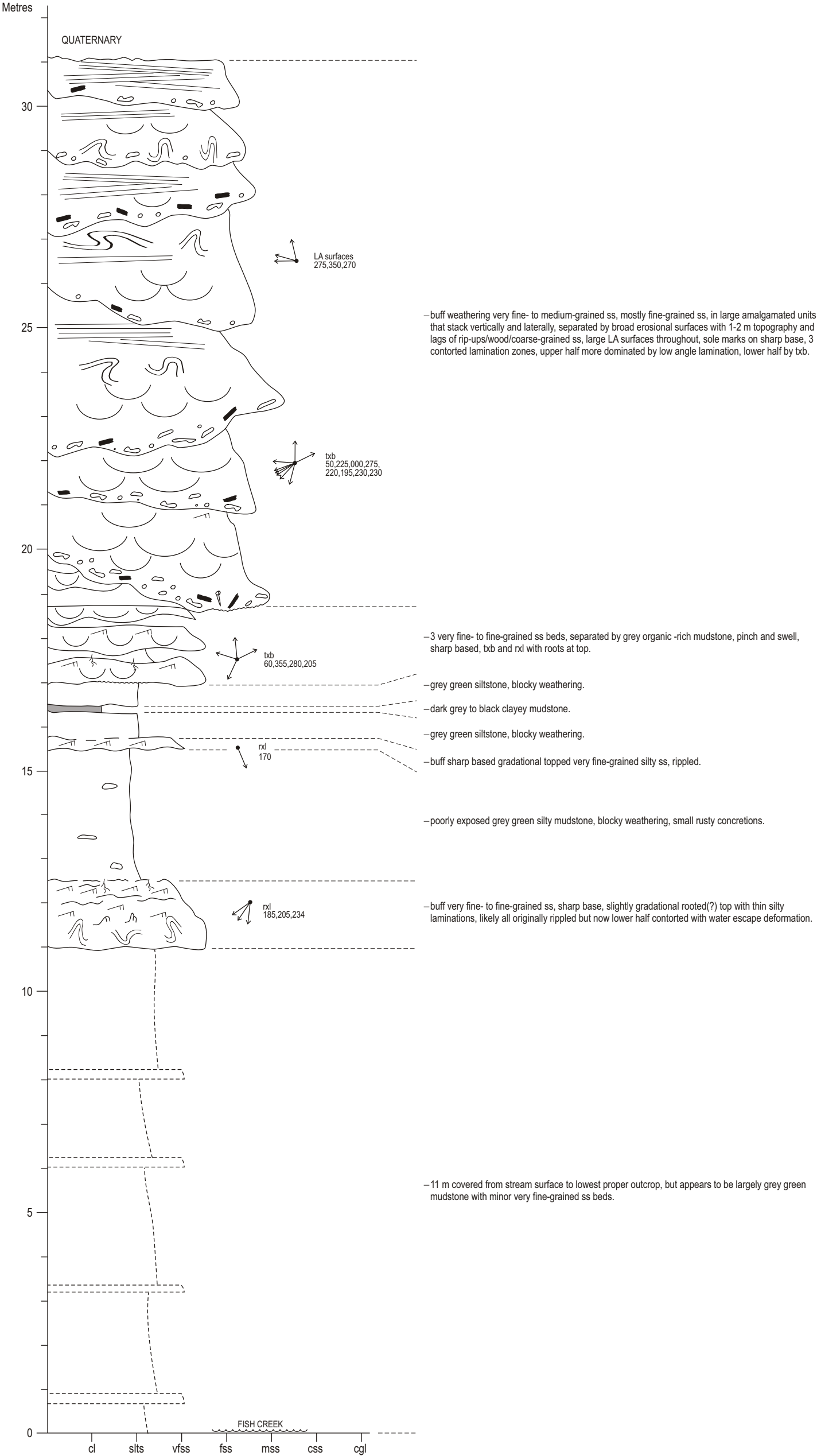






Figure 2e.

"THE SLUMP" EDWORTHY PARK (3625')  
South side Bow River, Spruce cliff area  
Calgary 82 O/1 004597, Sec. 19 Twp. 24 Rge 1W5  
51°03'N / 114°08'W

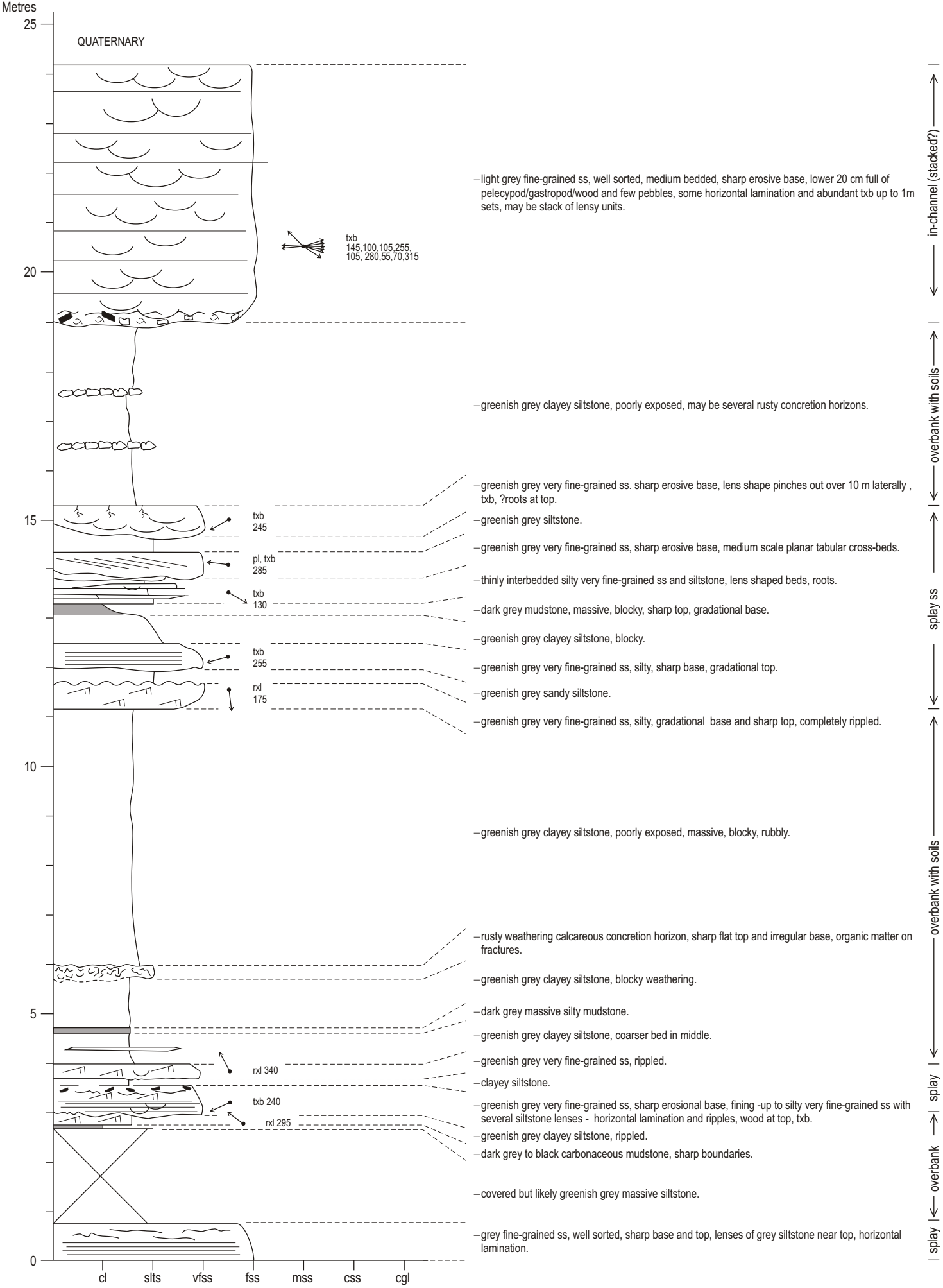


Figure 2f.

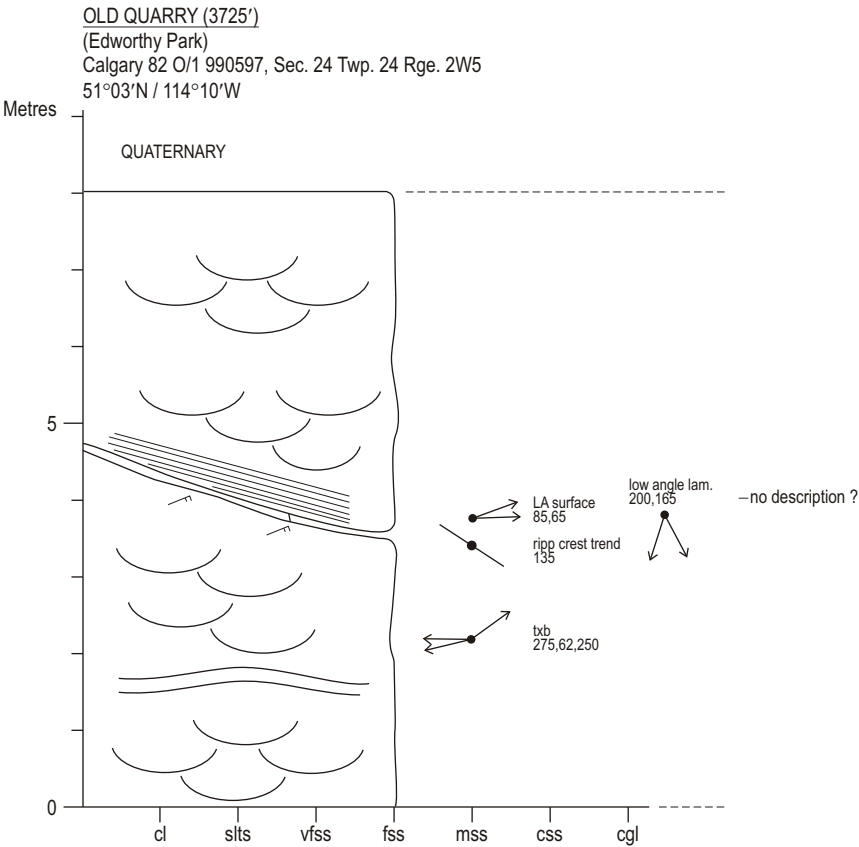


Figure 2g.

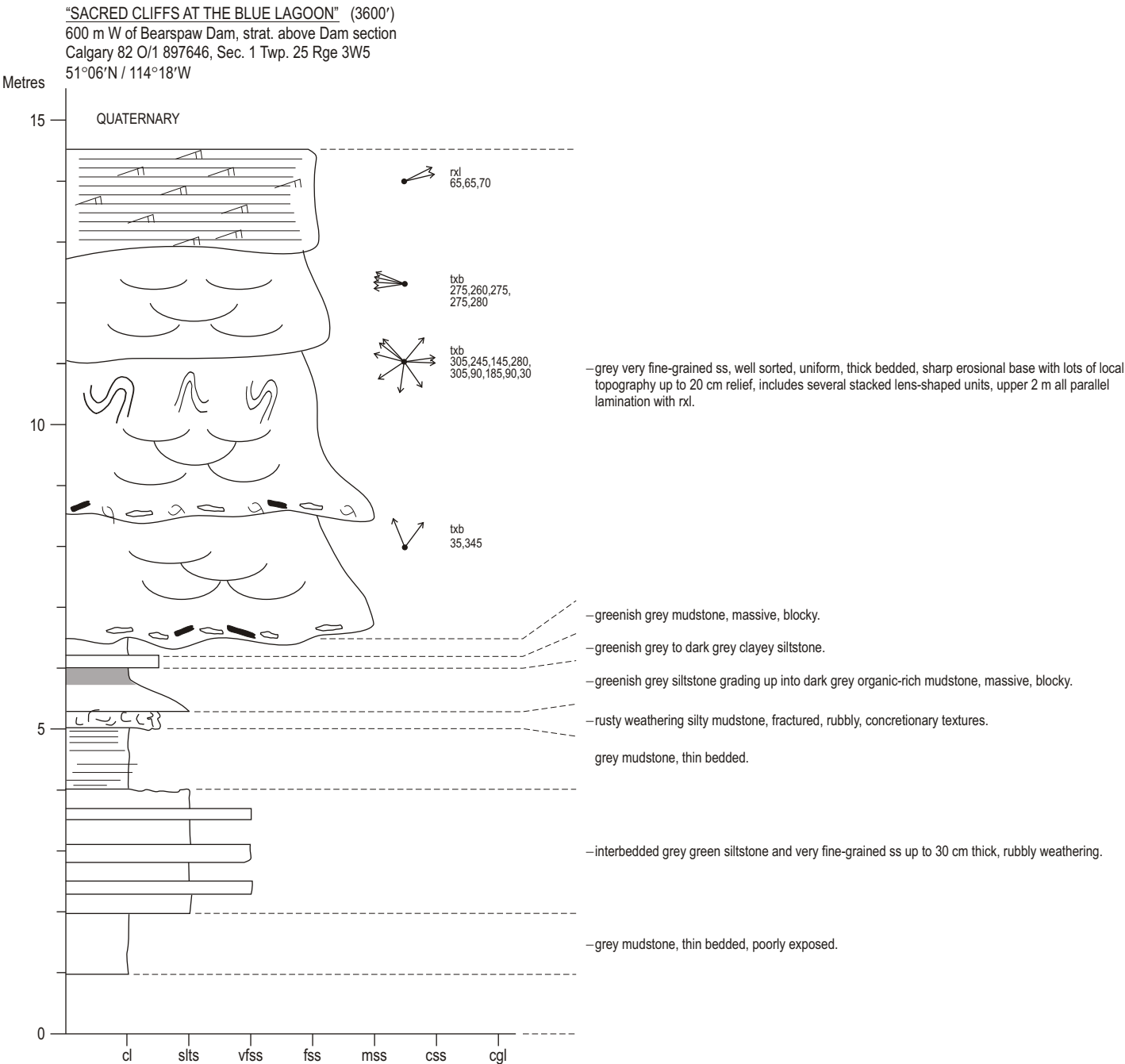
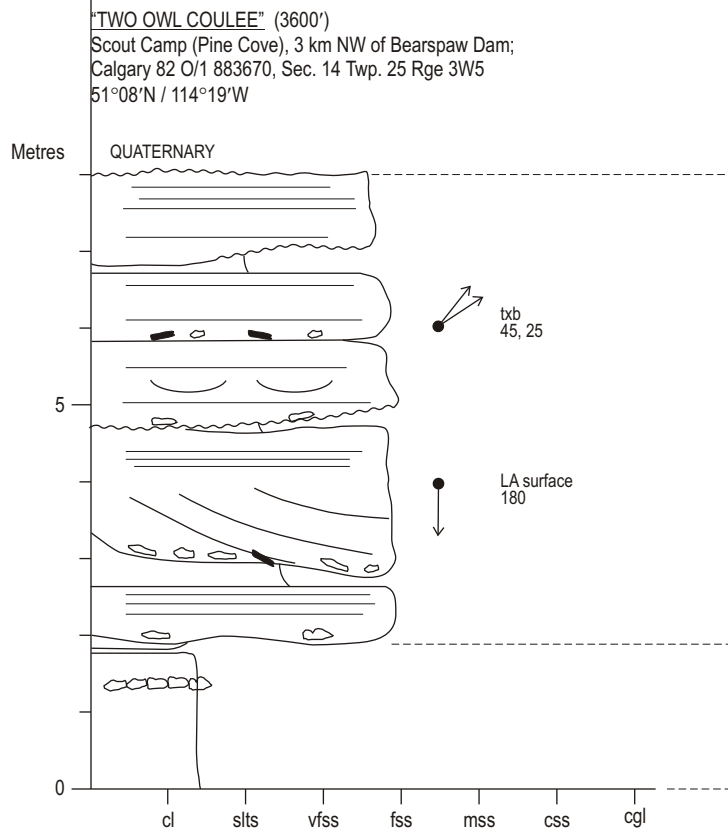




Figure 2h.



—grey fine-grained ss, well sorted, uniform, thin bedded near base, thick bedded in upper part, sharp erosional base with lots of local topography, several layers of leaf/clam lags at bases of stacked units, mostly horizontal lamination near base, some large scale cross stratification, more ss on East side of cove than on West side.

—greenish grey clayey siltstone, several thin rusty concretion layers.

Figure 2i.

COCHRANE RAILROAD CUT (3875')  
0.5 km E of Cochrane on CPR tracks  
Calgary 82 O/1 785734, Sec. 2 Twp. 26 Rge. 4W5  
51°11' N / 114°27' W

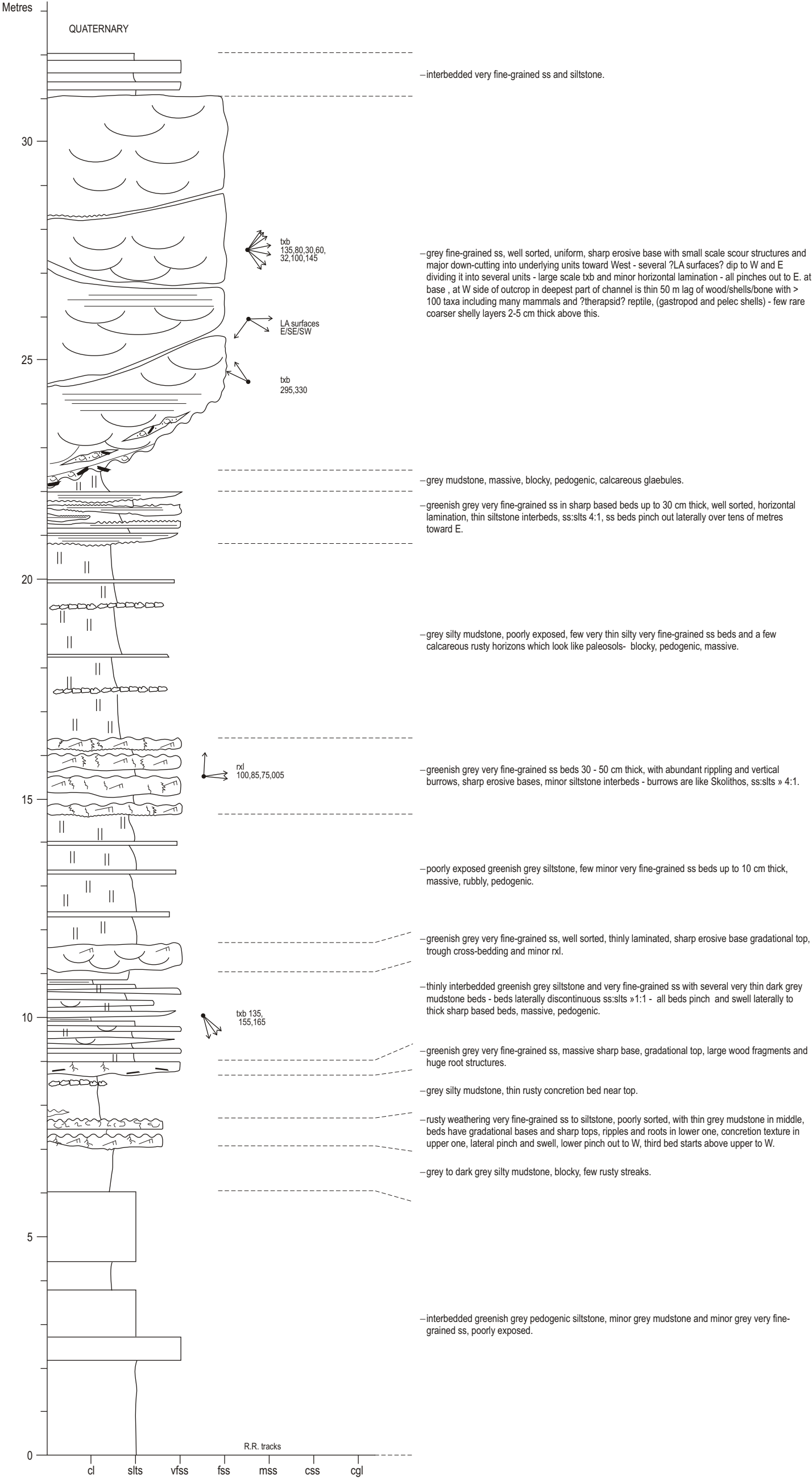


Figure 2j.

COCHRANE RANCH (3900)  
behind Western Heritage Centre  
Calgary 82 O/1 765754, Sec. 10 Twp. 26 Rge. 4W5  
51°12' N 114° 29' W

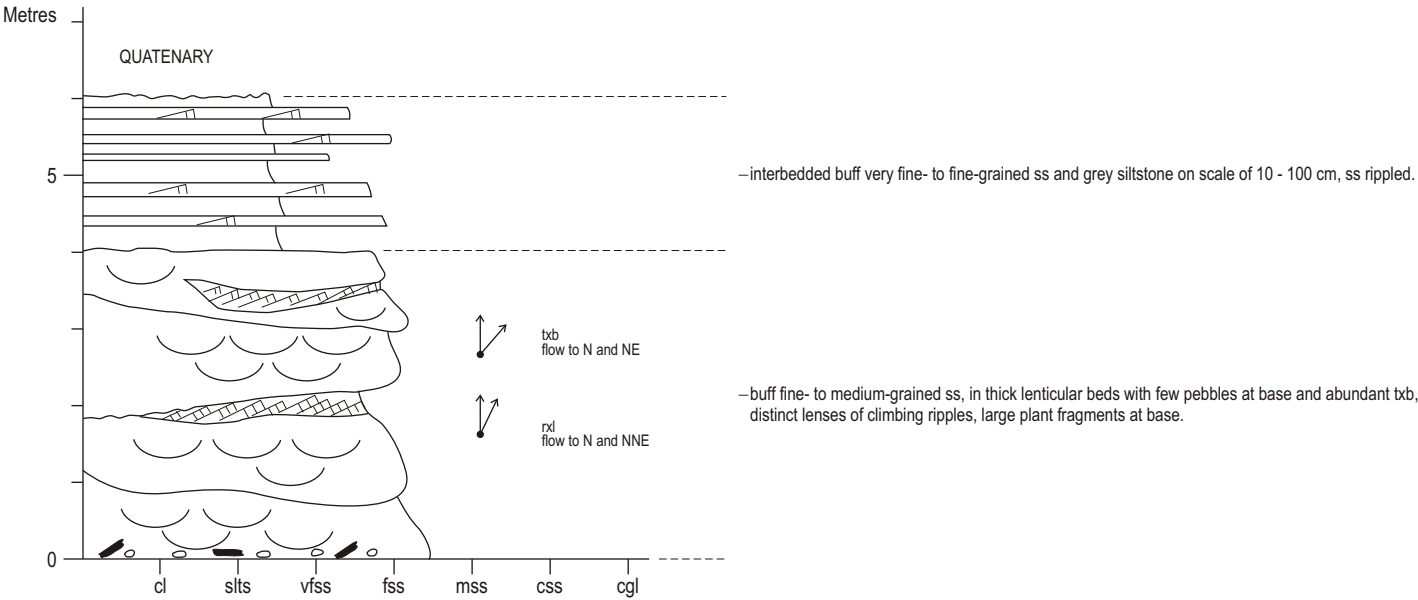


Figure 2k

THE BIG HILL at COCHRANE (4275')  
Highway 1A 1.5 km E of Cochrane  
Calgary 82 O/1 790745, Sec. 1 Twp. 26 Rge. 4W5  
51°12' N / 114° 26' W

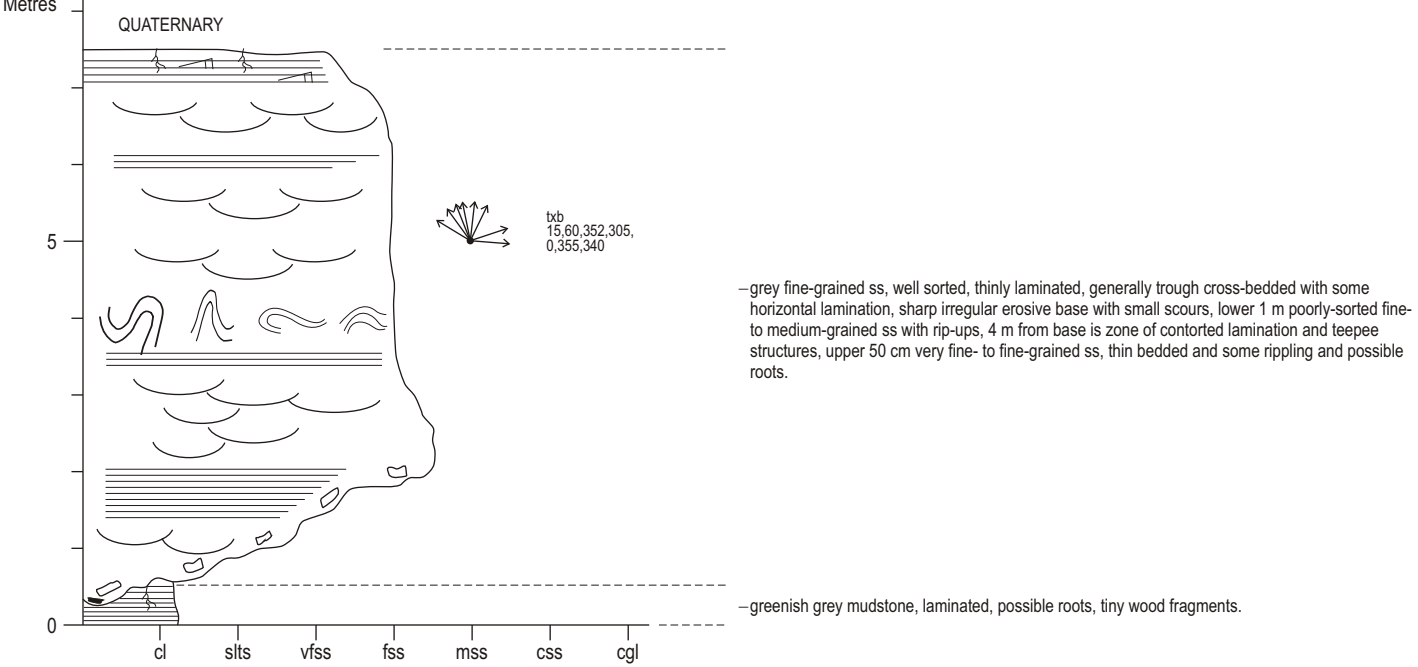


Figure 2l.

PRIDDIS (3800')  
West side Fish Creek  
Priddis 82 J/16 883406, Sec.23 Twp.22 Rge.3W5  
50°53' N / 114°19' W

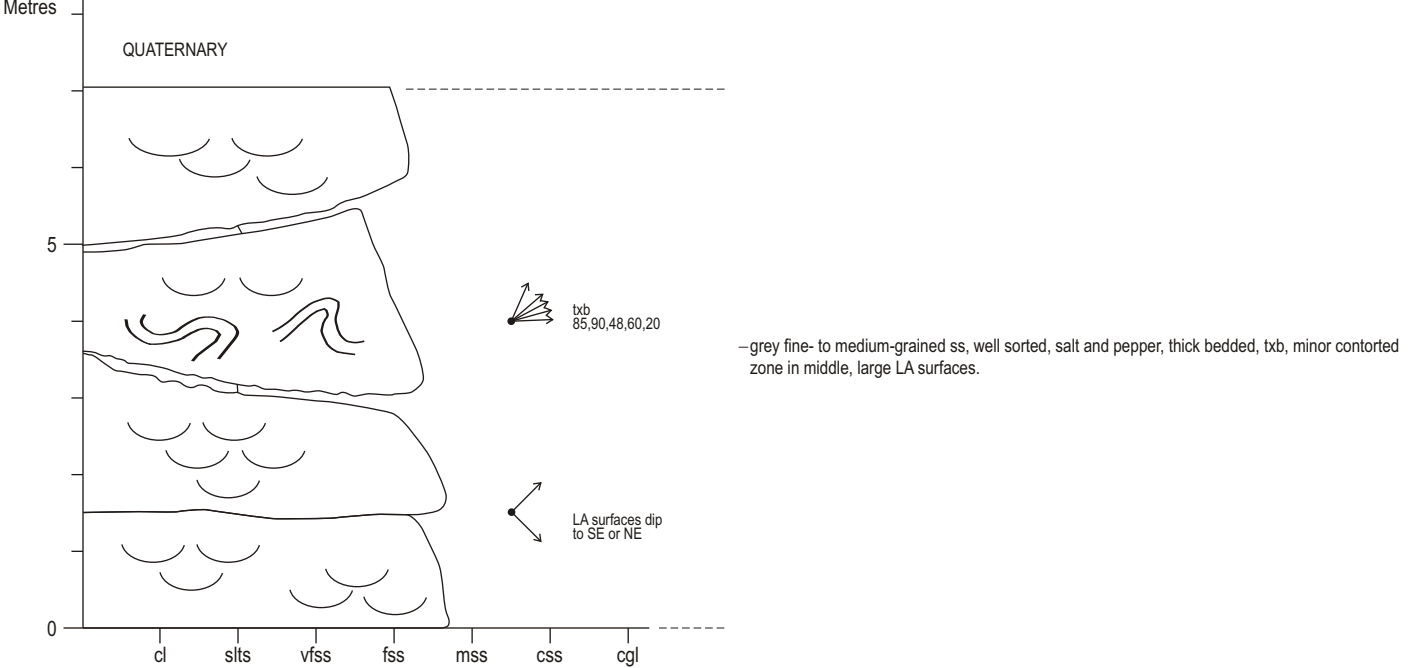


Figure 2m.

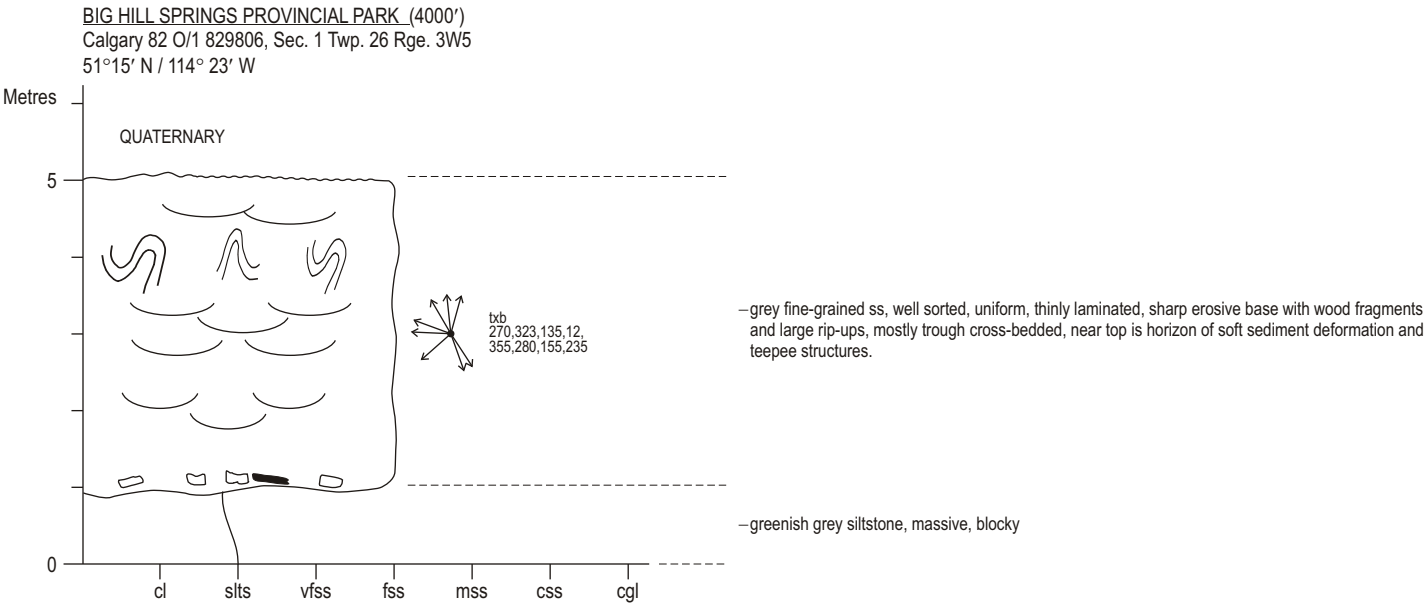


Figure 2n.

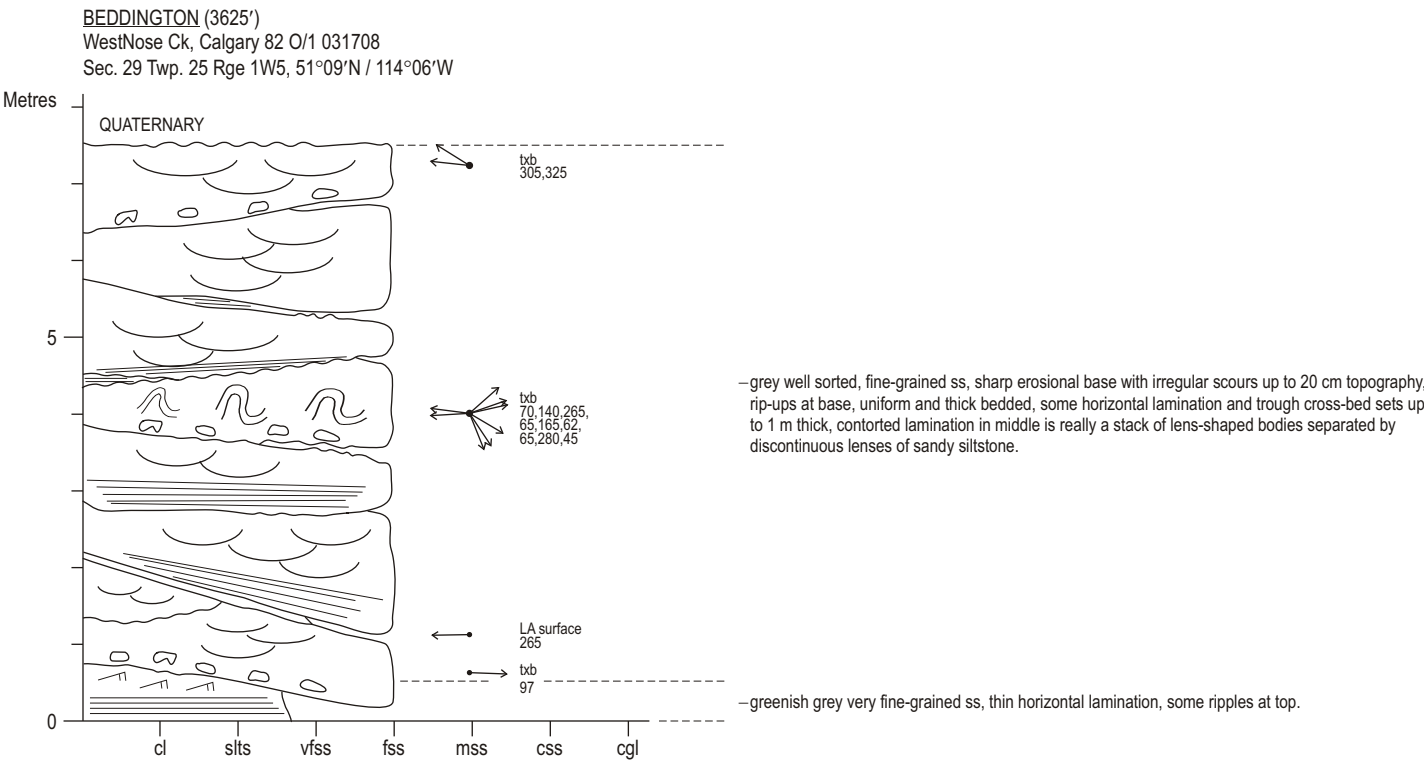
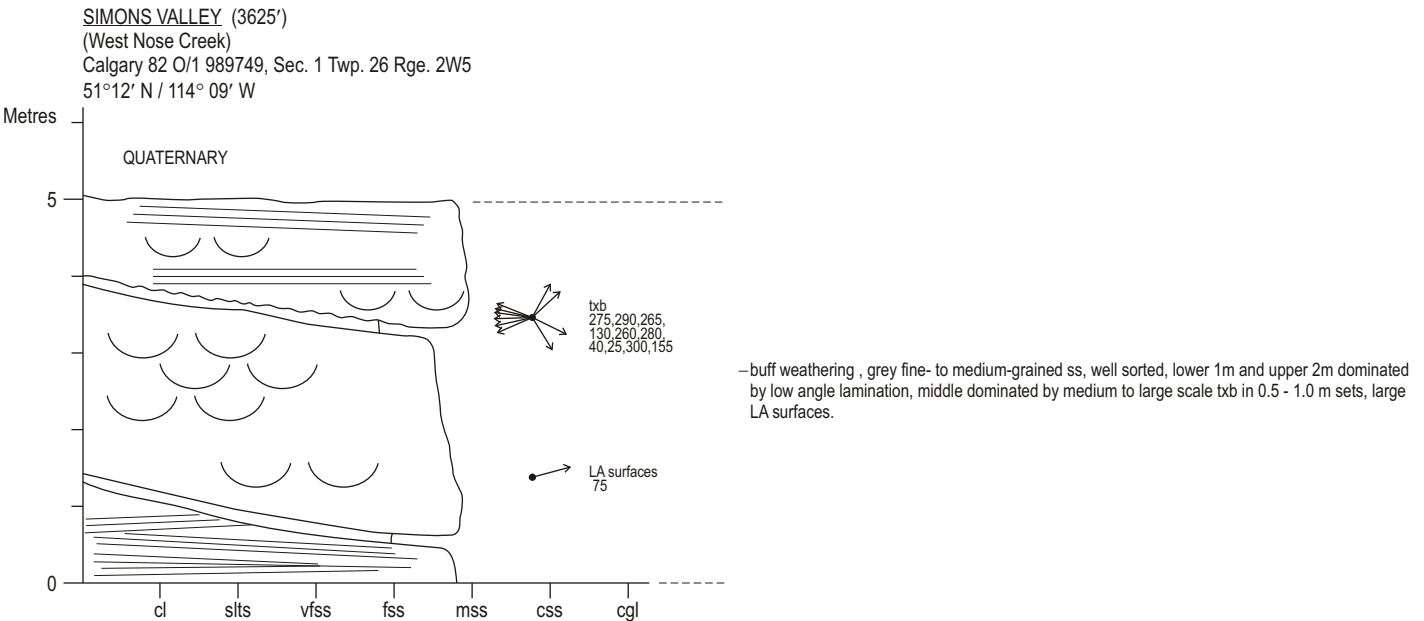


Figure 2o.



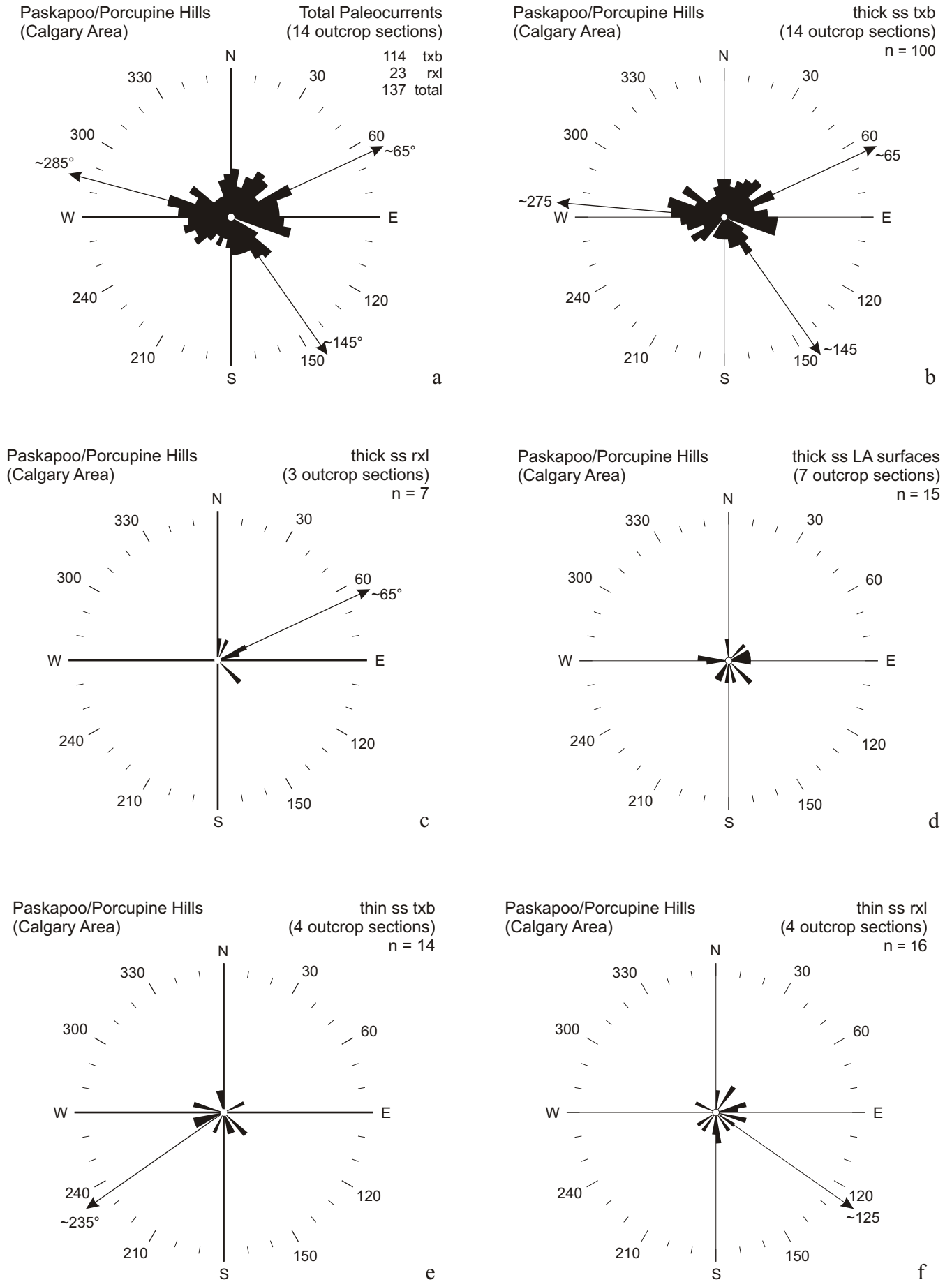


Figure 3a-f. Summary of paleocurrent data from outcrops.