

# MAR 20050004: LIMESTONE MOUNTAIN

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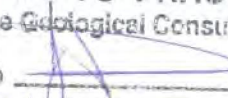
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Date	Feb 28, 2005
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The Association of Professional Engineers, Geologists and Geophysicists of Alberta	

**GRAYMONT WESTERN CANADA INC.**

**2004 EXPLORATION AND FIELDWORK  
AT THE LIMESTONE MOUNTAIN  
METALLIC AND INDUSTRIAL MINERALS PERMIT,  
WEST-CENTRAL ALBERTA**

Metallic and Industrial Mineral Permit  
9398100125

Geographic Coordinates

51°53' to 51°59' N  
115°11' to 115°30' W

NTS Sheet 82O/14

2005 02 28

by

J. R. Dahrouge, B.Sc., P.Geol  
R. Wolbaum, B.Sc., Geo. I.T

Dahrouge Geological Consulting Ltd.  
18, 10509 - 81 Avenue  
Edmonton, AB T6E 1X7

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1.

## SUMMARY

During September, 2004, parts of Limestone and Clearwater ranges, within Metallic and Industrial Minerals (MAIM) Permit 9398100125 were explored for Paleozoic carbonate rocks. High-quality carbonate rocks were examined at more than 15 locations at and near Limestone Mountain and Marble Mountain. The 2004 exploration was conducted as a follow-up to previous exploration during the summers of 1999 and 2001.

Carbonate units within the Carboniferous Banff and Rundle assemblages were examined and their stratigraphic thicknesses recorded. About 244½ m of the Rundle Assemblage were examined, 178 m at Marble Mountain and 66½ m at Limestone Mountain. In addition, approximately 22 m of the Banff Assemblage were examined at Marble Mountain. In total, about 266¾ m of strata was examined from more than 318¼ m normal thickness measured.

At Limestone Mountain, examined intervals of the Rundle Assemblage are typically composed of lime mudstone and wackestone with crinoids and peloids, and a few interbeds of packstone.

At Marble Mountain, investigated carbonate units within the Banff Assemblage are generally composed of dolomitic mudstone. High-quality carbonate units within the Rundle Assemblage varied in composition from lime mudstone to grainstone. Most intervals were composed of fine-grained lime mudstone and crinoidal wackestone; however, thick intervals of coarse-grained packstone and crumbly grainstone are not uncommon.

Throughout this report attitudes of bedding and other planar features are given as A°/B° SW, where A° is the azimuth of the strike and B° is the amount of dip in the direction indicated. A magnetic declination of 18½° east was used. Where bedding has been obscured by structure, stratigraphic thicknesses were calculated using orientations from adjacent units. Where more than one bedding orientation was measured, the mean orientation is used.

2.

## INTRODUCTION

During the fall of 2004, Dahrouge Geological Consulting Ltd. conducted exploration, on behalf of Graymont Western Canada Inc., for high-quality carbonate lithotypes within west-central Alberta. This assessment report describes the exploration conducted within MAIM Permit 9398100125, which includes Limestone Mountain and Marble Mountain of the Alberta Foothills. Limestone Mountain is located within Limestone Range and Marble Mountain encompasses the southern portion of Clearwater Range. This report includes information on the geology and structure of 15 stratigraphic sections examined in 2004; as well as, an interpretation of the results. This work was authorized by Bob Robison, Manager of Geologic Services for Graymont Western U.S. Inc.

### **3. GEOGRAPHIC SETTING**

MAIM Permit 9398100125 encompasses the central and southern parts of Limestone Range and the southern portions of Clearwater Range, west of Caroline, Alberta (Figs. 3.1 and 3.2). Caroline is approximately 40 km south of Rocky Mountain House.

Access to the permit is from Caroline, about 30 km west via secondary highway 591 to a southerly branch of Forestry Trunk Road. The branch of Forestry Trunk Road is approximately 4 km east of the Limeco Quarry and roughly parallels Marble Mountain 3 km to the east. Access to Marble Mountain is provided by cut lines running perpendicular to Clearwater Range. Access to Limestone Mountain is along Forestry Trunk Road via the westerly branch and across Seven Mile Creek. Approximately 3 km northwest of where Forestry Trunk Road crosses Seven Mile Creek, an oilfield service road branches west, and a south spur off this road crosses Clearwater River leading up the valley of Limestone Creek towards Limestone Mountain. Limestone Mountain is accessed by all-terrain vehicle trails and cut lines south of Clearwater River.

### **4. PROPERTY, EXPLORATION AND EXPENDITURES**

#### **4.1 MAIM PERMIT 9398100125**

In 1998, Graymont (nee: Continental Lime Ltd.) acquired MAIM Permit 9398100125 to cover Paleozoic limestones near Caroline, Alberta (Table 4.1 and Fig 3.2). The permit covers the central and southern part of Limestone Range, and the southernmost portions of Clearwater Range. The permit has been reduced from an original area of 8,592 hectares to its current size of 2,416 hectares. Given the 2004 exploration expenditures of \$23,796.91, the entirety of MAIM Permit 9398100125 will be maintained (Table 4.1).

#### **4.2 2004 EXPLORATION**

From September 8 to 16, 2004 parts of Limestone and Marble mountains within MAIM Permit 9398100125 were examined by Dahrouge Geological Consulting Ltd., on behalf of Graymont Western Canada Inc., for high-quality carbonate rocks. Carbonate outcrops were examined at more than 15 locations (Appendices 2A and 2B; Figs.6.1 and 6.2; Table 4.2). A total of 98 intervals representing about 266¾ m of strata were examined from more than 318¾ m normal thickness investigated.

TABLE 4.1 DESCRIPTION OF MAIM PERMIT 9398100125

Comm. Date	Expiry Date	Land Description (Tp-RW5)	Size (Ha)
		<b>Original Permit Area</b>	
Oct. 30, 1998	Oct. 30, 2002	34-9W5 (Sections 3S,NE,L11,L14; 4; 9; 10N,SE,L3, L5,L6; 15SW; 16; 17; 19E; 20; 21; 29-32) 34-10W5 (Sections 7L8,L9,L16; 8N,SW,L2,L7,L8; 9N,L5-L8; 16W,L1,L2; 17; 18N,L1,L5-L8; 19; 20; 21W; 25NE,L13,L14; 26L13-L16; 27L13-L16; 28L4,L5,L12-L16; 29-31; 32W; 36SE) 35-10W5 (Sections 6L1-L3,L8,L9,L13-L16) 34-11W5 (Sections 13N; 14L15,L16; 23-26; 28N; 33; 34W; 35E; 36) 35-11W5 (Sections 1NW,L9,L15,L16)	8,592
		<b>Current Permit Area</b>	
Oct. 30, 2002	Oct. 30, 2004	34-9W5 (Sections 3L6,L7,L10,L11,L14,L15; 9NE; 10L3,L5,L6,L12,L13; 16SE,NW,L3,L6,L10,L15; 20NE,L1,L8; 21W; 29SE,NW,L6,L10,L15; 30L10, L14,L15; 31SE,L3,L4,L6,L9,L10; 32SW,L11,L12) 34-10W5 (Sections 18L9-L11,L14,L15; 19SW; 29NW, L5-L7,L10,L15; 30NE,L1,L8,L12,L13; 31SE,NW, L4-L6,L9,L10,L15; 32L3-L5; 36L1) 35-10W5 (Sections 6L1-L3) 34-11W5 (Sections 23NE,L8,L14; 25NE,L11,L14; 26SW; 33L15,L16; 34L13,L14; 36E,L3,L4,L6) 35-11W5 (Sections 1L9,L15,L16)	2,416

#### 4.3 EXPLORATION EXPENDITURES

During 2004, exploration expenditures for MAIM Permit 9398100125 totalled \$23,796.91. Combined with \$1,306.82 carried over from a prior assessment report for the period 'Years 3 and 4', total available exploration credits for 'Years 5 and 6' are \$25,003.73. This results in an excess credit of \$843.73 allocated to the assessment period 'Years 7 and 8', which is as follows:

Assessment Period	Expiry Date	Required Expenditures	Assigned Expenditures
Years 5 and 6	2004-10-30	\$24,160.00	\$24,160.00
Years 7 and 8	2006-10-30	\$36,240.00	\$ 843.73
		<b>Total:</b>	\$25,003.73

TABLE 4.2 LOCATIONS EXAMINED AND MEASURED IN 2004

Section Number	Location	Measured Intervals	Strat. Thick. (m)*	Measured Thick. (m)°
<b>LIMESTONE MOUNTAIN</b> (Fig. 6.1)				
LM2004-01	2 km SE of Limestone Creek	14	36%	40%
LM2004-02	2 km SE of Limestone Creek	2	5%	5%
LM2004-03	3 km SE of Limestone Creek	5	14	14
LM2004-04	3 km SE of Limestone Creek	3	10	10
SUBTOTALS:		24	66½	70%
<b>MARBLE MOUNTAIN</b> (Fig. 6.2)				
MM2004-01	Along Clearwater River	5	11%	11%
MM2004-02	Along Clearwater River	4	9½	14
MM2004-03	Along Clearwater River	17	48%	58%
MM2004-04	500 m SE of Clearwater River	9	28%	31%
MM2004-05	600 m SE of Clearwater River	5	11%	13
MM2004-06	1.1 km SE of Clearwater River	4	11	11
MM2004-07	1.3 km N of peak of Marble Mountain	8	20%	34%
MM2004-08	1.1 km NE of peak of Marble Mountain	9	22	33
MM2004-09	1.0 km NE of peak of Marble Mountain	4	10%	10%
MM2004-10	650 m NE of peak of Marble Mountain	5	15½	18%
MM2004-11	750 m N of peak of Marble Mountain	4	11%	11%
SUBTOTALS:		74	200%	247%
TOTALS:		98	266%	318%

\* Stratigraphic thicknesses are examined thicknesses.

° Measured thicknesses are total investigated thicknesses, including covered and inaccessible intervals.

## 5. REGIONAL GEOLOGY

Clearwater and Limestone Ranges of the Alberta Foothills were previously mapped according to NTS map sheets by the following officers of the Geological Survey of Canada:

<u>NTS Map Sheet</u>	<u>Reference</u>
82 O/14 W½	Ollerenshaw (1968)
82 O/14 E½	Ollerenshaw (1965)

At Clearwater and Limestone ranges, carbonate lithologies are known to occur within both Paleozoic and Mesozoic sequences. Paleozoic limestones occur within the Upper Devonian Palliser Formation, Upper Devonian to Lower Carboniferous Banff Formation and the Lower Carboniferous Rundle Assemblage. Limited quantities of limestone are produced from the upper part of the Banff Formation and the lower part of the Rundle Assemblage at the Limeco Quarry at the south end of Corkscrew Mountain. Mesozoic carbonate rocks are known to occur in the Nordegg Member of the Fernie Group.

Descriptions of the stratigraphy of the Banff and Rundle assemblages, in Section 5.1 herein, are from a prior assessment report by Pana and Dahrouge (1998). Detailed accounts of regional stratigraphy are available in Stott and Aitken (1993), Mossop and Shetsen (1994), Halbertsma (1994), and Richards et al. (1994).

## **5.1 STRATIGRAPHY**

### **5.1.1 Banff Assemblage**

In west-central Alberta, the Exshaw, Banff and Yohin formations comprise the Banff Assemblage (Richards et al. 1994). The Upper Famennian to Lowermost Tournaisian Exshaw Formation is dominated by fine-grained siliciclastics deposited in an euxinic basin to shallow-neritic environment. In general, it is unconformably overlain by the Lower to Upper Tournaisian Banff Formation, which is a heterogeneous association of carbonates and fine-grained siliciclastics deposited on poorly differentiated carbonate platforms. Westward, the uppermost Banff Formation grades laterally into the Rundle Assemblage.

### **5.1.2 Rundle Assemblage**

The Lower Carboniferous Rundle Assemblage extends from MacKenzie Mountains in the Arctic south through the Peace River Embayment to southeastern British Columbia. In west-central Alberta, it comprises shallow-marine platform and ramp carbonates which prograded westward over deeper water shales and carbonates of the Banff Assemblage. The lower Rundle Assemblage is subdivided into the transgressive carbonate Pekisko Formation, and two regressive successions of restricted-marine carbonates and subordinate anhydrite assigned to the Shunda and Turner Valley formations (Richards et al. 1994). In southern Alberta, the Pekisko grades laterally into the uppermost Banff Formation. The Turner Valley Formation extends from east-central British Columbia to southwest Alberta. According to Richards et al. (1994), the Turner Valley Formation thickens to the southwest and for most of its length is 50 m to 120 m thick. The type section near Turner Valley is 152 m thick and divisible into four beds.

Earlier work by Douglas (1958), and MacQueen and Bamber (1968) indicate that the eastern peritidal sequences of the uppermost Pekisko, Shunda and lower Turner Valley grade south and southwestward into the more open-marine sequence of the Livingstone Formation (Table 5.1). The upper Rundle Assemblage includes the transgressive Mount Head Formation.

## 5.2 STRUCTURE

According to Dahrouge (2000):

"The main structural elements within the region include, from southwest to northeast, McConnell Thrust, Burnt Timber Thrust and Fallentimber Thrust (Fig. 4.1). Displacements on these faults are interpreted to be tens of kilometres to the northeast. Within Clearwater River basin, Fallentimber Thrust is apparent as a series of minor splays that converge several kilometres to the northwest, west of Baseline Ridge. Fallentimber thrust-sheet is divided into three structural units, from southwest to northeast these are: Limestone Mountain Anticlinorium, Bread Creek Synclinorium and Marble Mountain Anticlinorium (Ollerenshaw, 1968). Fold axes within these structures are arranged en echelon and fold profiles vary from symmetrical to asymmetrical, and overturned."

**TABLE 5.1 GENERALIZED PALEOZOIC STRATIGRAPHY OF FOOTHILLS AND FRONT RANGES, WEST-CENTRAL ALBERTA\***

System or Subsystem	Stratigraphic Unit	
	Assemblage Group	Formation
Lower Carboniferous	Rundle Assemblage	Mount Head
		† Livingstone
		Turner Valley
		Shunda
		Pekisko
Upper Devonian	Banff Assemblage	Banff
		Exshaw
		† Palliser
		Alexo
Cambrian	Fairholme Group <sup>o</sup>	Southesk
		Cairn
Cambrian		Pika
		Eldon
		Stephen
		Cathedral

\*Compiled from MacKenzie 1969, Richards et al. 1994, Switzer et al., 1994., and Holter, 1994.

<sup>o</sup> Fairholme Group of MacKenzie (1969) is partly equivalent to the Woodbend Group (Switzer et al., 1994).

<sup>†</sup> Current limestone production (from Holter, 1994)

## 6. PERMIT GEOLOGY

### 6.1 MEASURED SECTIONS

In September, 2004, carbonate lithologies of the Banff Assemblage and Rundle Assemblage were examined and measured at Clearwater and Limestone ranges (Fig's. 6.1 and 6.2). During 2004, 98 discrete intervals were examined at the locations listed in Table 4.2, by chipping outcrops perpendicular to bedding. Where bedding could not be identified, chips were taken in directions appropriate to topography with stratigraphic thickness deduced from other measurements where possible (Appendices 2A and 2B). A solution of 5% HCl was used to assess quality in the field. The 98 intervals represent a stratigraphic thickness of about 266¾ m and were collected from an investigated stratigraphic thickness that exceeds 318¾ m.

### 6.2 STRATIGRAPHY

In 2004, the Rundle Assemblage was examined southeast of Limestone Creek, within the core of Pineneedle Creek Anticline (Fig. 6.1). The lowermost 16 m is composed of light-grey to grey-brown, fractured wackestone containing crinoids, peloids and corals. This is overlain by approximately 10 m of grey to grey-brown lime mudstone and wackestone. Laminations are visible in places and fracturing is common. Units observed further southeast are similar to the lowermost portions examined within the core of Pineneedle Creek Anticline. Measured sections generally comprised medium-grained, grey wackestone with crinoids. Sections examined at Pineneedle Creek Anticline in prior years identified moderate- to good-quality units of Rundle Assemblage over intervals of up to 38 m (Dahrouge, 2002).

Along Clearwater River, at Marble Mountain, the Banff Assemblage generally consists of dolomitic limestone (Fig.6.2). The lowermost 16 m of the Rundle Assemblage are composed of medium- to coarse-grained, grey crinoidal wackestone, with intervals of lime mudstone and grainstone. The overlying 7 m are comprised of medium- to coarse-grained, grey packstone with crinoids, peloids and occasional brachiopods and gastropods.

North of the peak of Marble Mountain, the lower part of the Rundle Assemblage generally consists of medium- to coarse-grained wackestone with peloids and crinoids. Interbeds of lime mudstone and coarse-grained packstone and grainstone containing crinoids, peloids and occasional brachiopods are up to 12 m thick. In the Moose Creek Area, up to 18 m of high-quality Rundle Assemblage was sampled in 2001 (Dahrouge, 2002).

### 6.3 STRUCTURE

Locally, relevant structural elements at Limestone Range, south of Clearwater River include the Pineneedle Creek Anticline. Along the eastern flank of Limestone Mountain, Paleozoic strata are exposed along both flanks of this northwest trending anticline. At Marble Mountain, the main structural elements from west to east include: Corkscrew Mountain Anticline, Corkscrew Mountain Syncline and Marble Mountain Anticline. Marble Mountain Anticline exposes Paleozoic strata for about 11 km along both flanks of Marble Mountain. The approximately symmetrical Marble Mountain Anticline generally dips between 55° and 70° with dips shallowing to between 15° and 40° at Teepee Pole Creek in the south. Paleozoic strata are exposed along the axial trace of the Corkscrew Mountain Anticline directly south of Clearwater River and near the headwaters of Moose Creek.

## 7. CONCLUSIONS

Within MAIM Permit 9398100125, exposures of the Banff and Rundle assemblages were examined along the southern part of Clearwater Range and along the central and southern portions of Limestone Range. A total of 98 discrete intervals were measured and described in detail, representing approximately 266¾ m of stratigraphy out of a total investigated thickness of more than 318¾ m.

At Limestone Mountain, high-quality intervals of the Rundle Assemblage are generally made up of finer-grained, fossiliferous wackestone to lime mudstone with infrequent packstone intervals.

Examined portions of the Banff Assemblage at Marble Mountain are generally of poor quality and were not examined in detail. Carbonate intervals within the Rundle Assemblage generally consist of fossiliferous, medium- to coarse-grained, wackestone or fine-grained lime mudstone. High-quality units of crumbly, coarse-grained grainstone up to 6 m thick, and packstone up to 12 m thick were examined between Clearwater River south to the peak of Marble Mountain.

Edmonton, Alberta  
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R. Wolbaum, B.Sc., Geol. I.T.



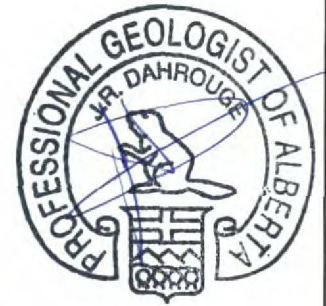


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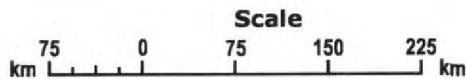
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Location of  
MAIM Permit  
9398100125

- LEGEND**
- Provincial capital
  - Other populated places
  - Trans-Canada Highway
  - Major road
  - International boundary
  - Provincial boundary



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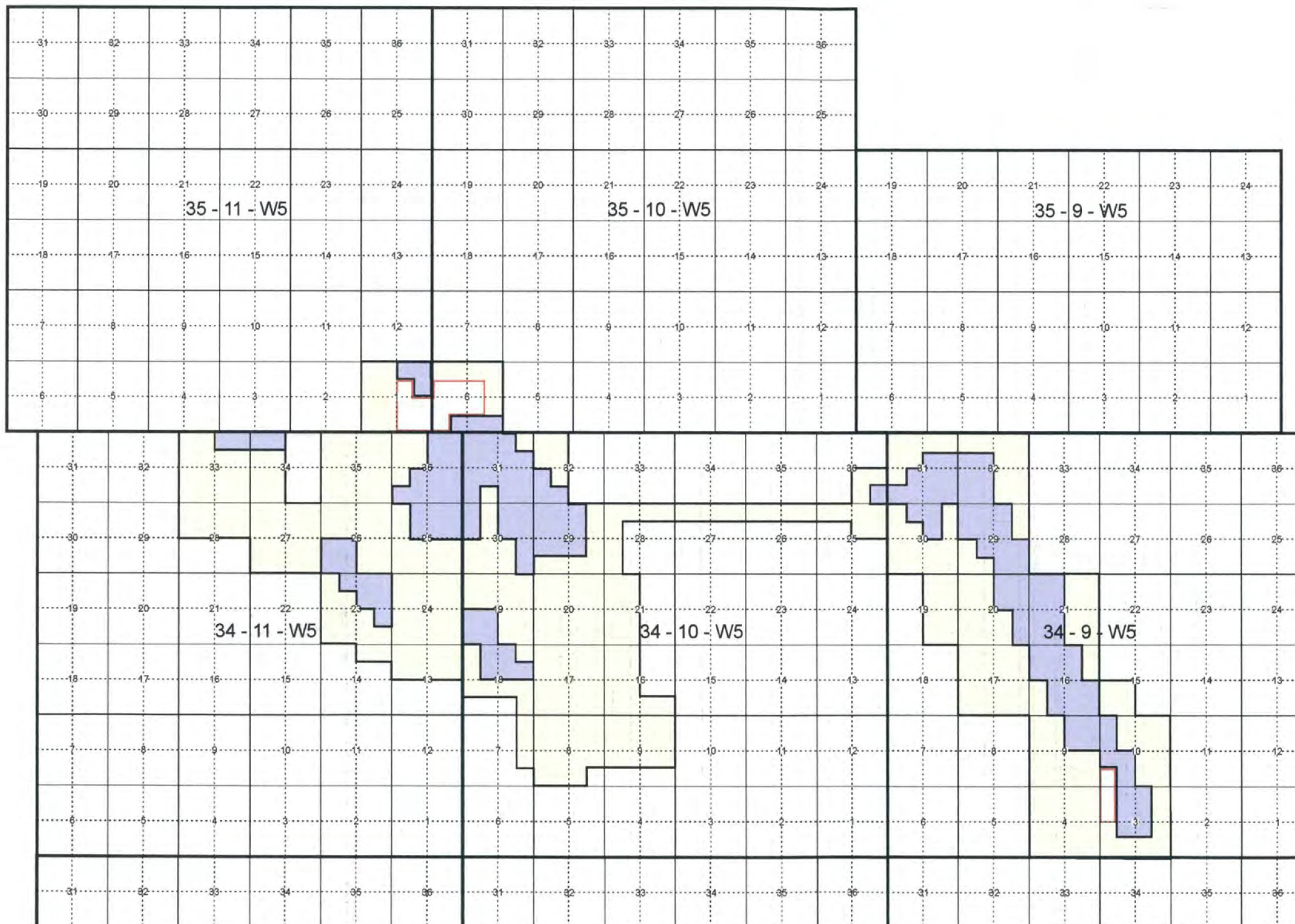
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LIMESTONE MOUNTAIN,  
WEST-CENTRAL ALBERTA

Fig. 3.1 Location Map





**SYMBOLS**

- Original Area, (8,592 Ha)  
MAIM Permit 9398100125
- Current Area, (2,416 Ha)  
MAIM Permit 9398100125
- Other MAIM Permits  
or Leases



**GRAYMONT WESTERN CANADA INC.**  
 DAHROUGE GEOLOGICAL CONSULTING LTD.  
 Edmonton, Alberta

LIMESTONE MOUNTAIN,  
 WEST-CENTRAL ALBERTA

Fig. 3.2 MAIM Permit 9398100125

**APPENDIX 1: STATEMENT OF EXPENDITURES  
FOR METALLIC AND INDUSTRIAL MINERALS PERMIT 9398100125  
OF GRAYMONT WESTERN CANADA INC.**

**a) Personnel**

J. Dahrouge, B.Sc., P.Geol. (Geologist)			
2.8	days	supervision, preparing report	
2.8	days	@ \$ [REDACTED]	\$ [REDACTED]
W. McGuire, (Draftsman, Field Assistant)			
5.4	days	compile field data; drafting; prepare base maps, figures and other	
5.4	days	@ \$ [REDACTED]	\$ [REDACTED]
R. Wolbaum, B.Sc. (Geologist)			
9.0	days	field work and travel between Sept. 8-16, 2004	
7.2	days	prepare for field work; compile field data and prepare assessment report	
16.2	days	@ \$ [REDACTED]	\$ [REDACTED]
N. McCallum, B.Sc. (Geologist)			
9.0	days	field work and travel between Sept. 8-16, 2004	
0.5	days	prepare for field work; compile field data and prepare assessment report	
9.5	days	@ \$ [REDACTED]	\$ [REDACTED]
J. Gokiert (Field Assistant)			
9.0	days	field work and travel between Sept. 8-16, 2004	
9.0	days	@ \$ [REDACTED]	\$ [REDACTED]
B. Perlitz (Field Assistant)			
9.0	days	field work and travel between Sept. 8-16, 2004	
9.0	days	@ \$ [REDACTED]	\$ [REDACTED]
			\$ 17,086.30

**b) Food and Accommodation**

36.0	man-days	accommodations (motel)	\$ 1,272.19
36.0	man-days	groceries and meals	\$ 998.54
			\$ 2,270.73

**c) Transportation**


ATV:	ATV Rental (Sept. 8 to 16, 2004)	\$ 812.13
	ATV and Trailer Rental (Sept. 8 to 16, 2004)	\$ 1,186.42
Vehicles:	Truck Rental (Sept. 8 to 16, 2004)	\$ 1,709.66
	Fuel	\$ 335.38
		\$ 4,043.59

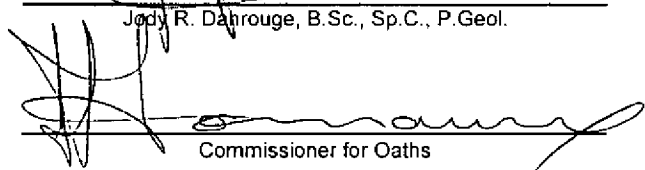
**d) Instrument Rental** n/a**e) Drilling** n/a

APPENDIX 1: CONTINUED

f) <u>Analyses</u>	n/a		
g) <u>Report</u>	Reproduction and assembly	\$ 52.25	\$ 52.25
h) <u>Other</u>			
	Base map(s) and map reproductions	\$ 165.00	
	Courier, postage and shipping	\$ 24.75	
	Field supplies	\$ 154.24	
	Long distance telephone	\$ 0.04	
			\$ 344.04
<u>Total</u>			<u>\$ 23,796.91</u>

I, Jody R. Dahrouge, hereby certify that the costs outlined above were expended for the assessment of metallic and industrial minerals permits 9398100125.

  
\_\_\_\_\_  
Jody R. Dahrouge, B.Sc., Sp.C., P.Geol.

  
\_\_\_\_\_  
Commissioner for Oaths

JACK LAMOUREUX  
COMMISSIONER FOR OATHS  
COMMISSION EXPIRES  
MAY 21, 2005

**APPENDIX 2A: DESCRIPTIONS OF THE 2004 STRATIGRAPHIC SECTIONS  
FROM MAIM PERMIT 9398100125, LIMESTONE MOUNTAIN**

Note: Stratigraphic thicknesses are based on measured attitudes of bedding, as listed below, with appropriate interpolations. Attitudes are strike and dip. UTM coordinates are NAD83. Examined intervals are listed in order from stratigraphic top to bottom.

Abbreviations: Banff - Banff Assemblage; and RA - Rundle Assemblage

Sample	Unit	Strat. Thick. (m)	Description
<b>Section LM2004-01: 2.0 km Southeast of Limestone Creek</b>			
19479	RA	3	<u>Lime Mudstone</u> , grey weathered, brown-grey fresh, micritic, laminated in places, blocky, very good reaction to HCl
19480	RA	3	<u>Wackestone</u> , grey weathered, grey-brown fresh, medium-grained, crinoids, peloids, laminations, blocky, vertical fractures, near core of anticline
19481	RA	2½	<u>Wackestone</u> , as per 19480, attitude of beds 153°/09° E
19482	RA	2½	<u>Lime Mudstone</u> , grey weathered, brown-grey fresh, micritic, occasional peloid, very fractured, massive
-	-	4	covered
19483	RA	1½	<u>Lime Mudstone</u> , as per 19482
19484	RA	3	<u>Lime Mudstone</u> , as per 19482, occasional peloid, calcite nodules
19485	RA	3	<u>Lime Mudstone</u> , as per 19482, some secondary calcite
19486	RA	2	<u>Lime Mudstone</u> , as per 19482
19487	RA	3	<u>Wackestone</u> , light-grey weathered, dark-grey-brown fresh, micritic to medium-grained, peloids, occasional crinoid, some secondary calcite, massive, smooth weathered faces
19488	RA	2	<u>Wackestone</u> , light-grey weathered, grey-brown fresh, micritic to medium-grained, beds ¼m, massive, fractures prominent, crinoids, peloids, corals
19489	RA	3	<u>Wackestone</u> , as per 19488, vuggy in places
19490	RA	3¼	<u>Wackestone</u> , as per 19488
19491	RA	2½	<u>Wackestone</u> , as per 19488
19492	RA	2½	<u>Wackestone</u> , light-grey weathered, grey-brown fresh, micritic to medium-grained, crinoids, peloids, coral, fractures at multiple angles
<b>Section LM2004-02: 2.3 km Southeast of Limestone Creek</b>			
19424	RA	2¾	<u>Lime Mudstone</u> , light- to medium-grey weathered, dark-grey fresh, calcite nodules, beds less than ¼m
19425	RA	3	<u>Lime Mudstone</u> , as per 19424
<b>Section LM2004-03: 2.9 km Southeast of Limestone Creek</b>			
19423	RA	2	<u>Wackestone</u> , light- to medium-grey weathered, grey-tan fresh, fine- to medium-grained, crinoids, rugose corals, massive
19422	RA	3	<u>Wackestone</u> , as per 19420, rugose corals
19421	RA	3	<u>Wackestone</u> , as per 19420
19420	RA	3	<u>Wackestone</u> , light-grey weathered, grey-brown fresh, medium-grained, crinoids, massive
19419	RA	3	<u>Wackestone - Packstone</u> , light-grey weathered, grey-brown fresh, medium- to coarse-grained, crinoids, massive

Sample	Unit	Strat. Thick. (m)	Description
<b>Section LM2004-04: 3.1 km Southeast of Limestone Creek</b>			
19478	RA	4	<u>Lime Mudstone</u> , grey weathered and fresh, fine- to medium-grained, occasional crinoid, peloid, blocky, scattered outcrop at top of section
19477	RA	3	<u>Wackestone</u> , grey weathered, grey-brown fresh, medium-grained, crinoids, fractured, vuggy, excellent reaction to HCl
19476	RA	3	<u>Wackestone</u> , grey weathered, grey-brown fresh, medium-grained, peloids, crinoids, fractured, massive, slightly mottled appearance, very good reaction to HCl



**APPENDIX 2B: DESCRIPTIONS OF THE 2004 STRATIGRAPHIC SECTIONS  
FROM MAIM PERMIT 9398100125, MARBLE MOUNTAIN**

Note: Stratigraphic thicknesses are based on measured attitudes of bedding, as listed below, with appropriate interpolations. Attitudes are strike and dip. UTM coordinates are NAD83. Examined intervals are listed in order from stratigraphic top to bottom.

Abbreviations: Banff - Banff Assemblage; and RA - Rundle Assemblage

Sample	Unit	Strat. Thick. (m)	Description
<b>Section MM2004-01: Along Clearwater River</b>			
19625	RA	1½	<u>Lime Mudstone</u> , as per 19623
19624	RA	1½	<u>Lime Mudstone</u> , as per 19623
19623	RA	2¼	<u>Wackestone</u> , grey-tan weathered, grey-brown fresh, medium- to coarse-grained, peloids, crinoids, smelly beds ¼m to massive, attitude of beds 147°/50° SW
✓ 19622	RA	3¼	<u>Lime Mudstone</u> , as per 19621
19621	RA	3¼	<u>Lime Mudstone</u> , light-grey-tan weathered, grey fresh, fine- to medium-grained, occasional crinoid, beds 1m, slightly vuggy, blebs of calcite
<b>Section MM2004-02: Along Clearwater River</b>			
19449	RA	2	<u>Lime Mudstone</u> , as per 19448
19448	RA	2½	<u>Lime Mudstone</u> , medium- to dark-grey weathered, dark-grey fresh, fine-grained, beds approximately ¼m
✓ -	-	2¾	covered
19447	RA	3	<u>Dolomitic Mudstone</u> , dark-grey-brown weathered, grey fresh, fine-grained, beds less than ¼m, attitude of beds 150°/52° E
-	-	1¾	covered
19446	RA	2	<u>Lime Mudstone</u> , dark-grey-brown weathered, dark-grey fresh, fine-grained, beds approximately ½m
<b>Section MM2004-03: Along Clearwater River</b>			
19620	RA	3	<u>Lime Mudstone</u> , grey weathered and fresh, medium-grained, occasional peloid, beds ¼ - ½m, fractured, attitude of beds 149°/65° NE
-	-	3½	covered
19619	RA	2	<u>Packstone</u> , as per 19618
19618	RA	2	<u>Packstone</u> , grey-tan weathered, light-grey fresh, medium-grained, peloids, crinoids, occasional brachiopod, gastropod, thick-bedded, blocky, vuggy
19617	RA	3	<u>Packstone - Grainstone</u> , grey-tan weathered, grey-brown fresh, coarse-grained, crinoids, peloids, occasional brachiopod, thick-bedded; transition to fine-grained <u>Lime Mudstone</u> at top
✓ -	-	6	covered
19616	RA	3½	<u>Wackestone</u> , light-grey-tan weathered, dark-grey-brown fresh, coarse-grained, peloids, crinoids, beds ¼m to massive, attitude of beds 147°/64° NE
19615	RA	1¾	<u>Wackestone</u> , dark-grey to tan weathered, grey-brown fresh, medium-grained, peloids, few crinoids, massive
19614	RA	2¾	<u>Grainstone</u> , dark-grey weathered, grey-brown fresh, coarse- to very coarse-grained, crinoids, peloids, massive, very good reaction to HCl
19613	RA	2½	<u>Lime Mudstone</u> , dark-grey to tan weathered, grey-brown fresh, fine- to medium-grained, occasional crinoid, peloid, massive, top ¾m transitional to <u>Grainstone</u> , as per 19614
19612	RA	3	<u>Wackestone</u> , light-grey-tan weathered, grey fresh, medium-grained, crinoids, occasional peloid, beds ½m to massive, attitude of beds 153°/70° NE

Sample	Unit	Strat. Thick. (m)	Description
<b>Section MM2004-03: Continued</b>			
19611	RA	3	<u>Wackestone</u> , tan-grey weathered, grey-brown fresh, medium-grained, peloids, beds less than ½m, fractures, very good reaction to HCl, attitude of beds 169°/64° E
19610	Bff	3½	<u>Dolomitic Mudstone</u> , as per 19606
19609	Bff	3¼	<u>Dolomitic Mudstone</u> , tan-grey weathered, light-grey fresh, micritic, rusty pyrite in places, moderate reaction to HCl
19608	Bff	3¼	<u>Dolomitic Mudstone</u> , as per 19606
19607	Bff	4	<u>Dolomitic Mudstone</u> , as per 19606, attitude of beds 159°/67° NE
19606	Bff	3	<u>Dolomitic Mudstone</u> , tan-grey weathered, light- to dark-grey fresh, micritic, beds greater than 10cm, calcite nodules up to 1cm
19605	Bff	2¼	<u>Dolomitic Mudstone</u> , tan-grey weathered, dark-grey fresh, micritic, beds platy to ½m, calcite blebs, attitude of beds 155°/68° NE
19604	Bff	3	<u>Dolomitic Mudstone</u> , tan-grey weathered, dark-grey fresh, micritic, very hard, beds platy to ½m
<b>Section MM2004-04: 500m Southeast of Clearwater River</b>			
19418	RA	3¾	<u>Wackestone</u> , light-grey weathered, grey-brown fresh, medium-grained, crinoids, peloids, beds approximately ½m
19417	RA	3¾	<u>Packstone</u> , light-grey weathered, grey-brown fresh, coarse-grained, crinoids, peloids, brachiopods, massive
19416	RA	2¾	<u>Lime Mudstone - Wackestone</u> , light-grey weathered, grey-brown fresh, increase in grain size to medium-grained at top, peloids, crinoids, beds approximately ½m, sulfur smell
✓ 19415	RA	3	<u>Packstone - Grainstone</u> , light-grey weathered, grey-tan fresh, coarse-grained, peloids, crinoids, massive
19414	RA	3	<u>Packstone</u> , light-grey weathered, grey-brown fresh, coarse-grained, crinoids, peloids, massive
-	-	3	covered
19413	RA	3	<u>Packstone</u> , light-grey weathered, medium- to dark-grey fresh, medium-grained, crinoids, massive
19412	RA	3	<u>Packstone</u> , as per 19410
19411	RA	3	<u>Packstone</u> , as per 19410
19410	RA	3	<u>Packstone</u> , light-grey weathered, medium-grey fresh, coarse-grained, peloids, crinoids, beds 1m, attitude of beds 014°/20° E
<b>Section MM2004-05: 600m Southeast of Clearwater River</b>			
19405	RA	2¼	<u>Lime Mudstone</u> , light- to medium-grey weathered, dark-grey fresh, fine-grained, calcite nodules, beds less than ½m
19406	RA	2¼	<u>Lime Mudstone</u> , as per 19405
19407	RA	2	<u>Lime Mudstone</u> , grey-tan weathered, dark-grey fresh, fine-grained, beds less than ½m, attitude of beds 108°/16° E
✓ 19408	RA	2½	<u>Lime Mudstone</u> , grey weathered, light-grey-brown fresh, fine-grained, very few calcite nodules, beds less than ½m
-	-	1¾	covered
19409	RA	2¼	<u>Dolomitic Mudstone</u> , medium- to dark-grey weathered and fresh, fine-grained, beds ¼ - ½m

Sample	Unit	Strat. Thick. (m)	Description
<b>Section MM2004-06: 1.1km Southeast of Clearwater River</b>			
19404	RA	2¼	<u>Wackestone</u> , light-grey weathered, dark-grey fresh, medium- to coarse-grained, crinoids, brachiopods, beds approximately ¼m
19403	RA	3	<u>Wackestone - Packstone</u> , light-grey weathered, dark-grey fresh, coarse-grained, crinoids, thick-bedded, attitude of beds 058°/76° NW
✓ 19402	RA	2¾	<u>Packstone - Grainstone</u> , light-grey weathered, dark-grey fresh, coarse-grained, crinoids, peloids, massive
19450	RA	3	<u>Wackestone</u> , grey weathered, dark-grey fresh, medium- to coarse-grained, crinoids, peloids, massive
<b>Section MM2004-07: 1.3 km North of peak of Marble Mountain</b>			
19594	RA	2¼	<u>Wackestone</u> , as per 19593
19593	RA	2¾	<u>Wackestone</u> , light-grey weathered, brown-grey fresh, fine- to medium-grained, brachiopods, peloids, occasional crinoid, beds less than ¼m, attitude of beds 151°/64° NE
-	-	1	covered
19592	RA	3	<u>Packstone</u> , light-grey weathered, brown-grey fresh, coarse-grained, peloids to 2mm, crinoids to 1cm, beds less than 10cm, blocky
19591	RA	2¾	<u>Packstone</u> , light-grey weathered, light-grey-brown fresh, medium- to coarse-grained, crinoids to 5mm, peloids, blocky, thin beds, fractures perpendicular to bedding, attitude of beds 159°/58° NE
✓ 19590	RA	3	<u>Wackestone</u> , grey weathered, dark-grey-brown fresh, medium-grained, crinoids, peloids, massive, very good reaction to HCl
-	-	13½	
19589	RA	1½	<u>Grainstone</u> , light-grey weathered, grey-brown fresh, coarse-grained, crinoids, brachiopods, peloids, crumbly, thin platy beds, attitude of beds 150°/64° NE
19588	RA	2¼	<u>Grainstone</u> , as per 19587, slightly finer grained, attitude of beds 141°/70° NE
19587	RA	2¾	<u>Grainstone</u> , light-grey weathered, grey-brown fresh, coarse-grained, grains to 3mm, crinoids, very crumbly, beds greater than 1 m, smooth appearance
<b>Section MM2004-08: 1.1 km Northeast of peak of Marble Mountain</b>			
19603	RA	3¼	<u>Wackestone</u> , as per 19602
19602	RA	2½	<u>Wackestone</u> , grey weathered and fresh, medium- to coarse-grained, peloids, crinoids, beds greater than ¼m, very good reaction to HCl
19601	RA	3	<u>Wackestone</u> , grey weathered and fresh, fine- to medium-grained, peloids, poor exposure, fractured, blocky
-	-	11	covered
19600	RA	2	<u>Lime Mudstone</u> , light-grey weathered, grey fresh, micritic to fine-grained, occasional crinoid, fractured, beds greater than ¼m
✓ 19599	RA	2	<u>Wackestone</u> , light-grey weathered, grey-brown fresh, medium-grained, crinoids, smelly, fractured, beds greater than ¼m
19598	RA	2½	<u>Lime Mudstone</u> , as per 19596, occasional rugose coral
19597	RA	2¼	<u>Lime Mudstone</u> , as per 19596
19596	RA	3	<u>Lime Mudstone</u> , grey-tan weathered, grey fresh, micritic to fine-grained, occasional crinoids, vuggy, fractured, massive, attitude of beds 143°/63° SW
19595	RA	1½	<u>Wackestone</u> , light-grey weathered, grey-brown fresh, medium-grained, crinoids, peloids, beds greater than 15cm, excellent reaction to HCl

Sample	Unit	Strat. Thick. (m)	Description
<b>Section MM2004-09: 1.0 km Northeast of peak of Marble Mountain</b>			
19445	RA	2¼	<u>Packstone - Wackestone</u> , medium- to dark-grey weathered, grey-brown fresh, medium- to coarse-grained, peloids, crinoids, beds greater than ¼m
19444	RA	2	<u>Packstone</u> , as per 19443
19443	RA	3	<u>Packstone</u> , medium-grey weathered and fresh, medium- to coarse-grained, crinoids, peloids, massive
19442	RA	3	<u>Wackestone</u> , medium- to dark-grey weathered, grey-tan fresh, medium-grained, crinoids, massive, attitude of beds 146°/48° W
<b>Section MM2004-10: 650 m Northeast of peak of Marble Mountain</b>			
19586	RA	3	<u>Lime Mudstone</u> , light-grey weathered and fresh, fine-grained, beds 10cm, coarsens through top 1 metre to <u>Wackestone</u>
19585	RA	3	<u>Wackestone</u> , grey weathered, grey-brown fresh, coarse- to very coarse-grained, crinoids, beds greater than 5cm, attitude of beds 148°/67° SW
-	-	3¼	covered
✓ 19584	RA	3½	<u>Lime Mudstone - Wackestone</u> , grey weathered and fresh, fine- to medium-grained, occasional peloid, rugose coral, vuggy, smelly, massive
19583	RA	3	<u>Wackestone</u> , as per 19582
19582	RA	3	<u>Wackestone</u> , grey weathered, grey-brown fresh, medium- to coarse-grained, crinoids to 2mm, few peloids, crumbly at base, slightly blocky, massive
<b>Section MM2004-11: 750 m North of peak of Marble Mountain</b>			
✓ 19441	RA	3	<u>Grainstone</u> , light-grey weathered, medium-grey-tan fresh, coarse-grained, crinoids, peloids, beds ¼ - ½m, attitude of beds 142°/49° E
19440	RA	3	<u>Grainstone</u> , grey weathered, light-tan-grey fresh, coarse-grained, large crinoids, brachiopods, massive
19439	RA	2¾	<u>Wackestone</u> , as per 19438
19438	RA	3	<u>Wackestone</u> , medium-grey weathered, grey-brown fresh, medium-grained, crinoids, blocky, platy beds

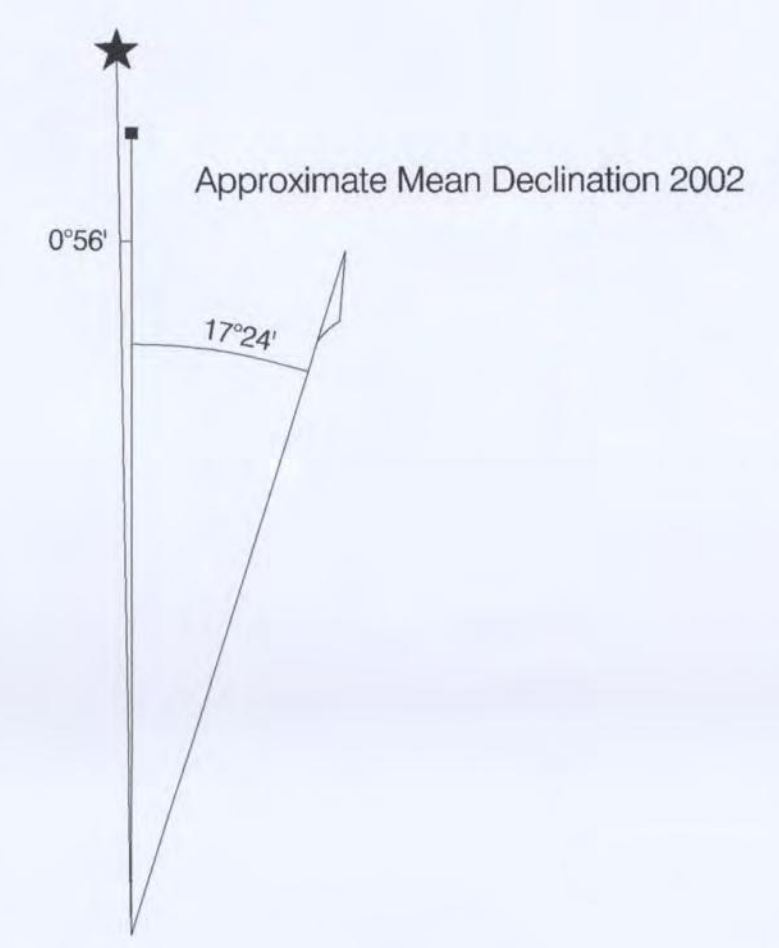
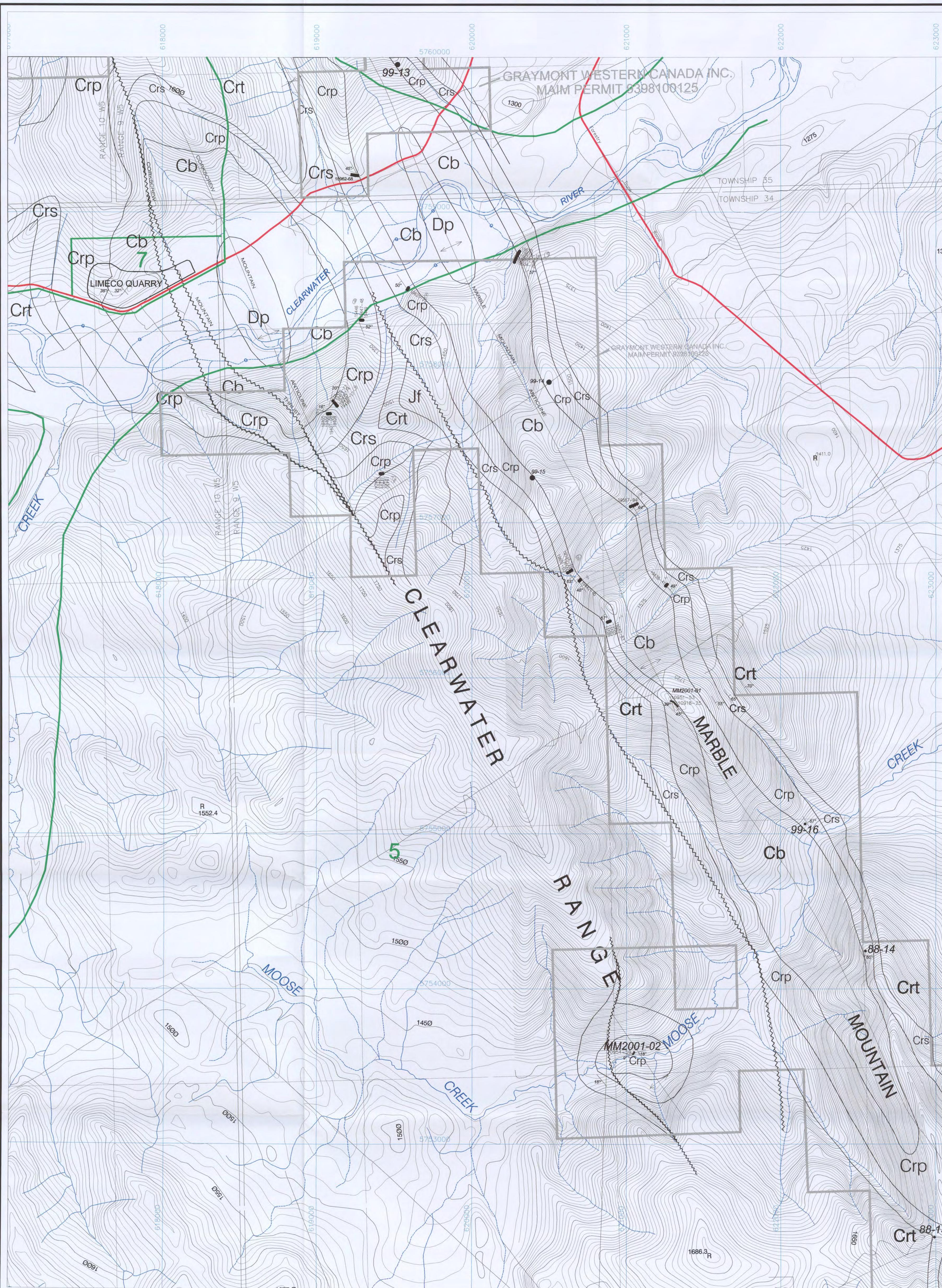
### **APPENDIX 3: STATEMENT OF QUALIFICATIONS**

The field work described in this report was supervised by Jody Dahrouge.

J.R. Dahrouge is a geological consultant with Dahrouge Geological Consulting Ltd. based in Edmonton, Alberta. He obtained degrees in geology and computing science from the University of Alberta, Edmonton in 1988 and 1994, respectively. He has more than 10 years of experience in mineral exploration. He is a member of the Canadian Institute of Mining and Metallurgy and is registered as P. Geol. with the Association of Professional Engineers, Geologists, and Geophysicists of Alberta.

R. Wolbaum is a geological consultant with Dahrouge Geological Consulting Ltd. based in Edmonton, Alberta. She obtained a degree in geology from the University of Alberta, Edmonton in 2003 and has been employed in the mineral exploration industry since. She is registered as a Geol. I.T. with the Association of Professional Engineers, Geologists, and Geophysicists of Alberta.





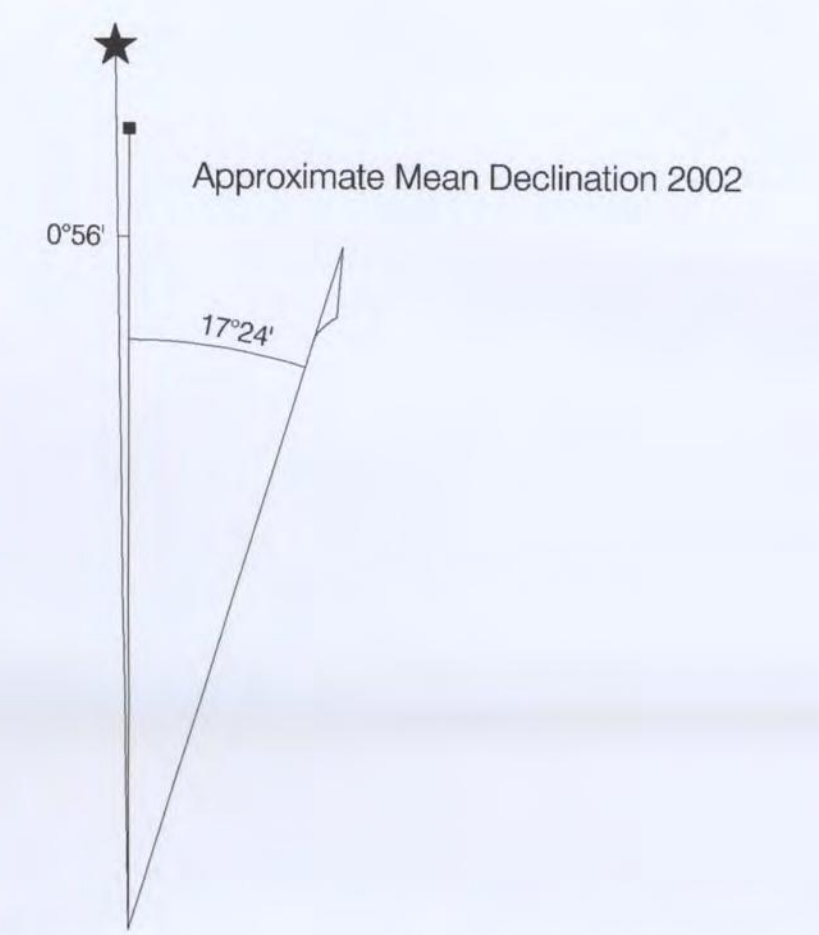
**LEGEND AND SYMBOLS**

- LOWER CRETACEOUS**
- Kl** Luscar Formation: carbonaceous shale, sandstone, coal seams
  - Kc** Cadomin Formation: chert and quartz-pebble conglomerate
  - Kn** Nikanassin Formation: light-grey and black sandstone, shale; coal stringers
- JURASSIC**
- Jf** Fernie Formation: shale, sandstone, carbonates
- CARBONIFEROUS**
- Rundle Group**
- Cr** Turner Valley, Shunda, and Pekisko formations: Undivided
  - Cb** Banff Formation: argillaceous and cherty limestone, fissile and calcareous shale
- DEVONIAN**
- Dp** Palliser Formation: massive mottled limestone and dolomite, porous and vuggy dolomite, argillaceous limestone
  - Da** Alexo Formation: silty dolomite, sandstone, dolomite breccia
  - Dm** Mount Hawk Formation: brown cherty dolomite, dark grey argillaceous limestone
- Geological boundary
- Bedding (inclined, vertical, overturned, horizontal)
- Fault
- Synclinal axis (arrow indicates plunge)
- Anticlinal axis (arrow indicates plunge)
- Sample section with sample numbers
- Isolated sample with sample number
- Location of cross-section
- Elevation contour (interval: 10 m)
- Secondary Road
- Gravel road
- Trail or cut line
- MAIM Permit
- Land Use Zone Boundary; Zone Number
- 2 Critical Wildlife
  - 4 General Recreation
  - 5 Multiple Use
  - 8 Facility

- NOTES**
- 1) Base map compiled from 1 : 20 000 scale digital base maps 820/14NE.NW, supplied by Spatial Data Warehouse Ltd., Calgary, Alberta.
  - 2) Geology modified after Ollerenshaw (1968).
  - 3) UTM grid is based on North American Datum, 1983 (NAD83); UTM grid zone: 11U.
  - 4) To accompany Assessment Report entitled '2004 Exploration and Fieldwork at the Limestone Mountain Metallic and Industrial Minerals Permit, West-Central Alberta' by J.R. Dahrouge and R. Wolbaum (2005/02/23).

REVISIONS		GRAYMONT WESTERN CANADA INC. DAHROUGE GEOLOGICAL CONSULTING LTD. Edmonton, Alberta
BY	DATE	
		M AIM PERMIT 9398100125, WEST-CENTRAL ALBERTA
Fig. 6.1 Geology and Locations of Sections Along the Northern Part of Marble Mountain		
0 200 400 600 800 1000 m		Scale
WM		2005.02





**LEGEND AND SYMBOLS**

- LOWER CRETACEOUS**
- Kl** Luscar Formation: carbonaceous shale, sandstone, coal seams
  - Kc** Cadomin Formation: chert and quartz-pebble conglomerate
  - Kn** Nikanassin Formation: light-grey and black sandstone, shale; coal stringers
- JURASSIC**
- Jf** Fernie Formation: shale, sandstone, carbonates
- CARBONIFEROUS**
- Rundle Group
- Cr** Turner Valley, Shunda, and Pekisko formations: Undivided
- Cb** Banff Formation: argillaceous and cherty limestone, fissile and calcareous shale
- DEVONIAN**
- Dp** Palliser Formation: massive mottled limestone and dolomite, porous and vuggy dolomite, argillaceous limestone
  - Da** Alexo Formation: silty dolomite, sandstone, dolomite breccia
  - Dm** Mount Hawk Formation: brown cherty dolomite, dark grey argillaceous limestone

- Geological boundary
- Bedding (inclined, vertical, overturned, horizontal)
- Fault
- Synclinal axis (arrow indicates plunge)
- Anticlinal axis (arrow indicates plunge)
- Sample section with sample numbers
- Isolated sample with sample number
- Location of cross-section
- Elevation contour (interval: 10 m)
- Secondary road
- Gravel road
- Trail or cut line
- MAIM Permit
- Land Use Zone Boundary; Zone Number

- NOTES**
- 1) Base map compiled from 1 : 20 000 scale digital base maps 820/14NE,NW, supplied by Spatial Data Warehouse Ltd., Calgary, Alberta.
  - 2) Geology modified after Ollerenshaw (1968).
  - 3) UTM grid is based on North American Datum, 1983 (NAD83); UTM grid zone: 11U.
  - 4) To accompany Assessment Report entitled "2004 Exploration and Fieldwork at the Limestone Mountain Metallic and Industrial Minerals Permit, West-Central Alberta" by J.R. Dahrouge and R. Wolbaum (2005/02/23).

REVISIONS		BY	DATE	<b>GRAYMONT WESTERN CANADA INC.</b> <b>DAHROUGE GEOLOGICAL CONSULTING LTD.</b> Edmonton, Alberta MAIM PERMIT 9398100125, WEST-CENTRAL ALBERTA
NO.	DESCRIPTION			
				Fig. 6.2 <b>Geology and Locations of Sections along the East Part of Limestone Mountain</b>
				WM Scale 2005.02