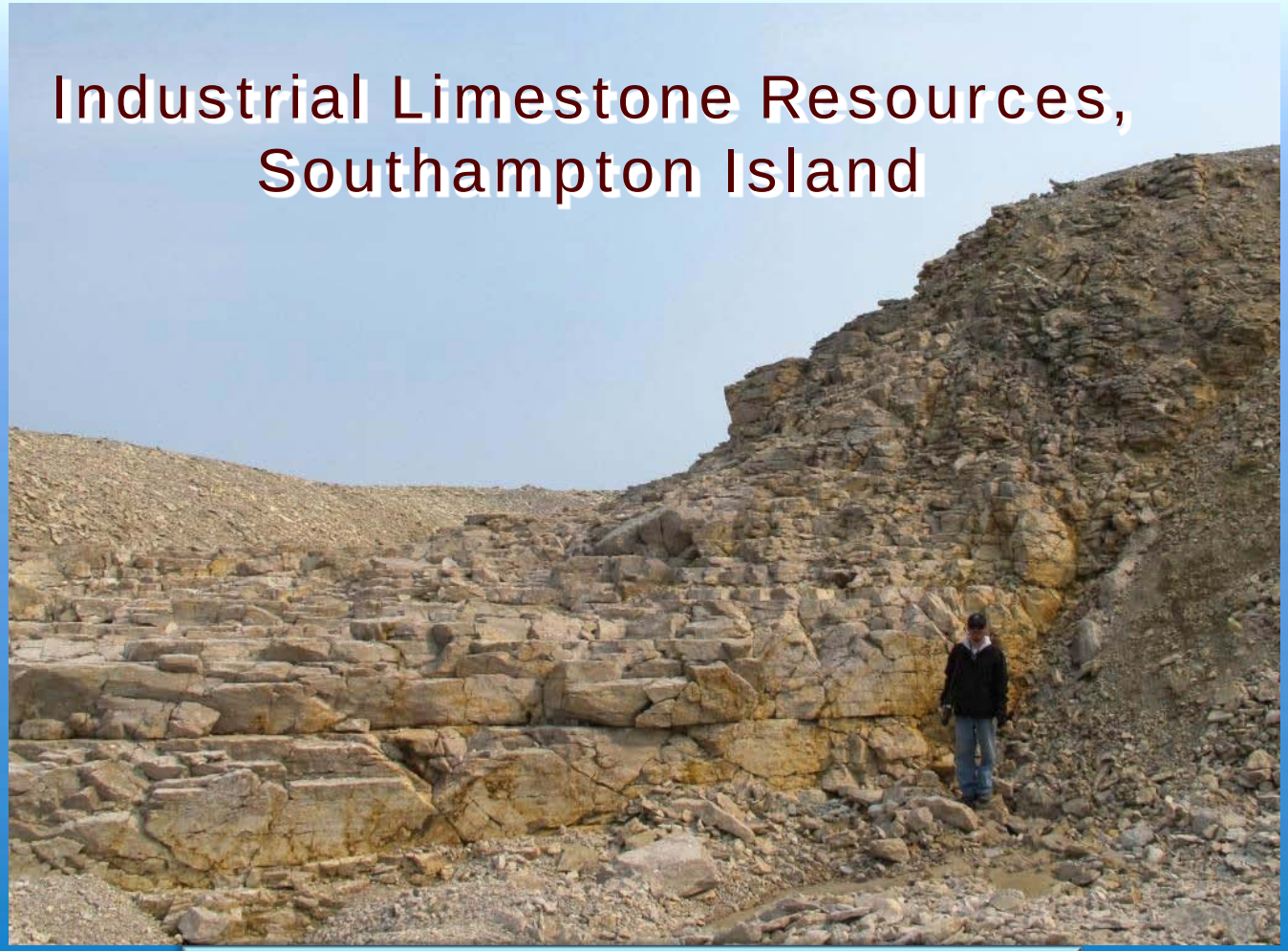
Industrial Limestone Resources, Southampton Island



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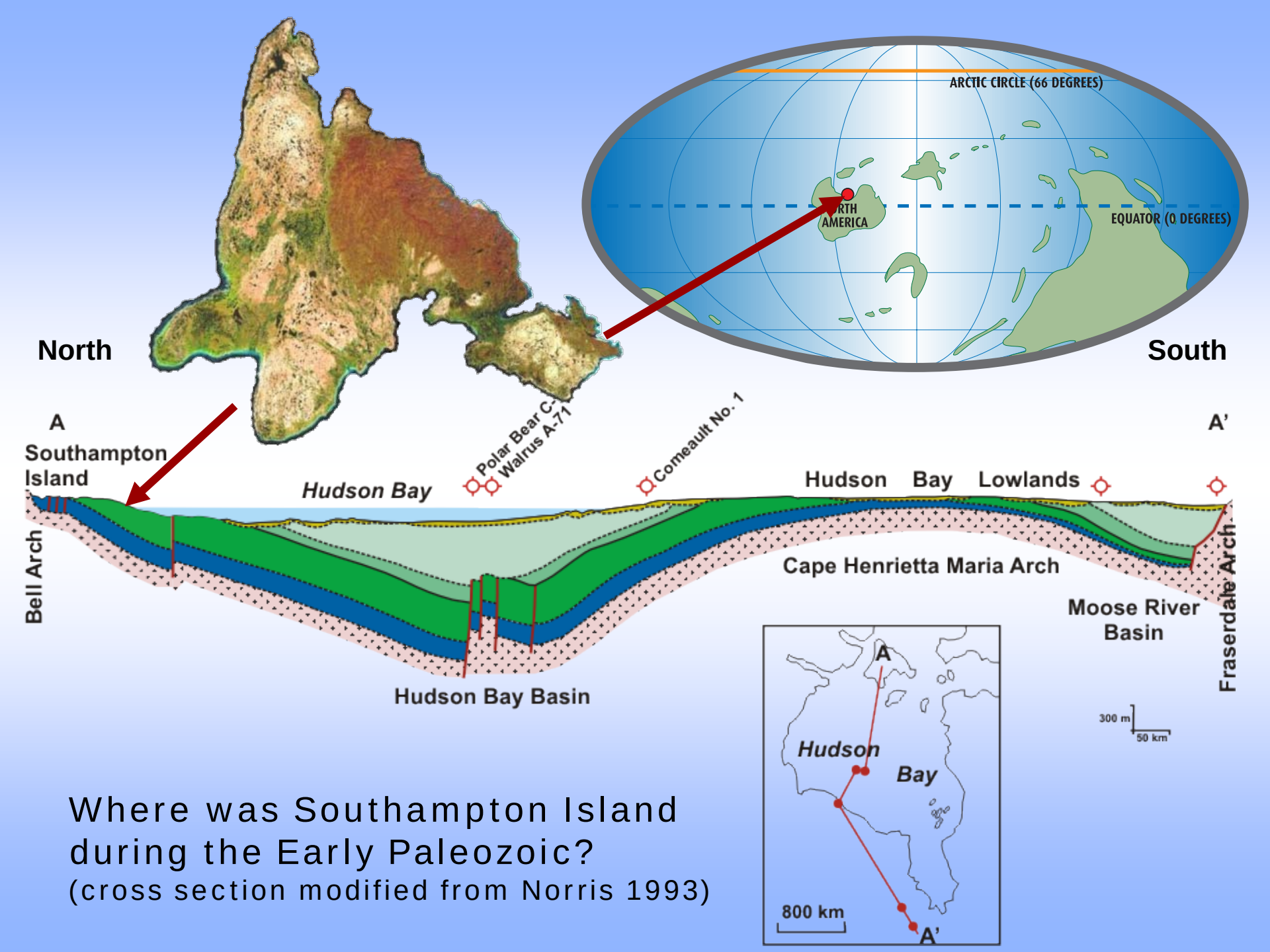
Canada-Nunavut Geoscience Office

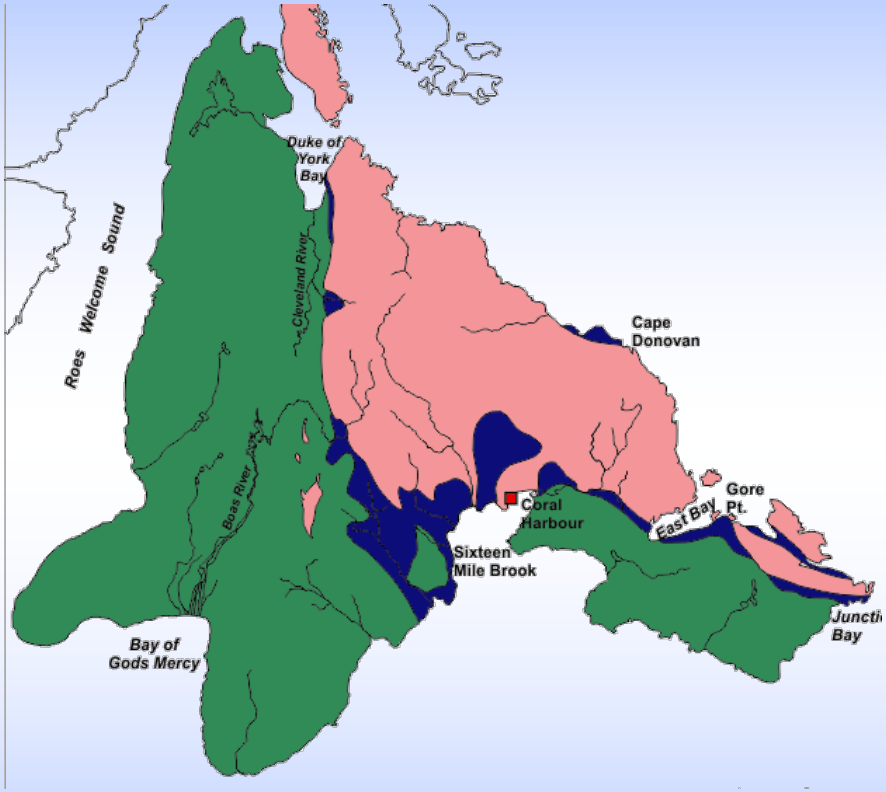
Nunavut
Natural Resources Canada
Ressources naturelles Canada
Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada
Canada

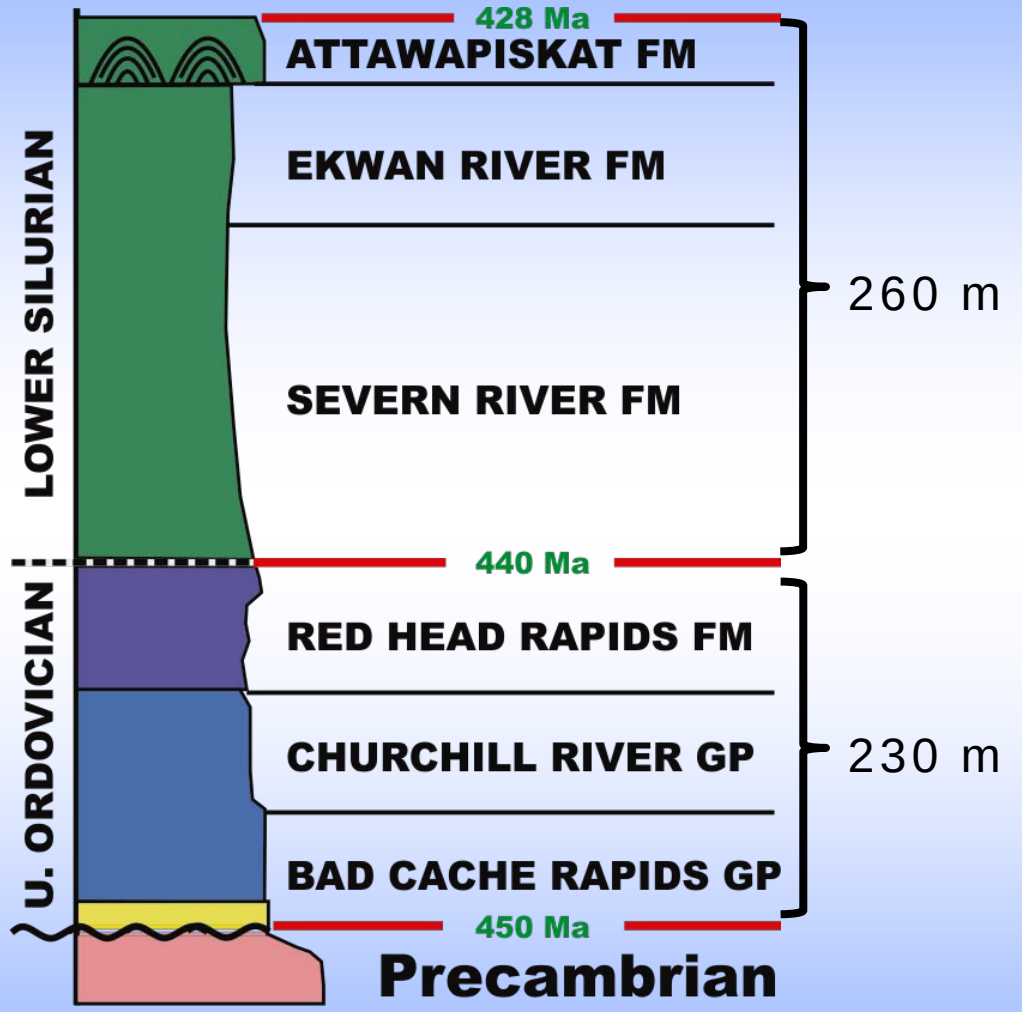
Where is Southampton Island today ?



Where was Southampton Island during the Early Paleozoic?

(cross section modified from Norris 1993)

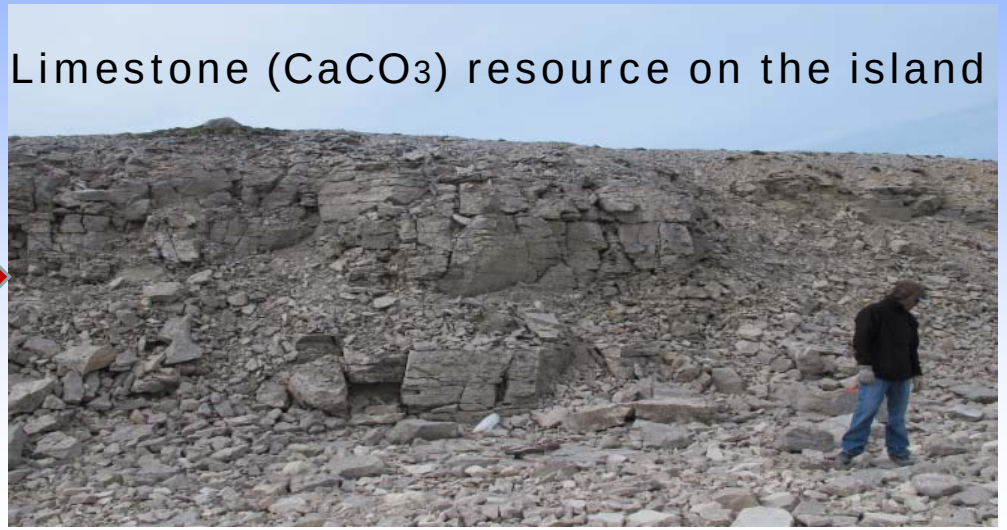

Roes Welcome Sound
Duke of York Bay
Cleveland River
Cape Donovan
Boas River
Coral Harbour
Sixteen Mile Brook
East Bay
Gore Pt.
Bay of Gods Mercy


428 Ma
ATTAWAPISKAT FM
EKWAN RIVER FM
SEVERN RIVER FM
LOWER SILURIAN
260 m
440 Ma
RED HEAD RAPIDS FM
CHURCHILL RIVER GP
BAD CACHE RAPIDS GP
U. ORDOVICIAN
230 m
450 Ma
Precambrian

Why have CNGO & EDT of GN done a study of the limestones on Southampton Island?

Common chemical reagents produced from high purity limestone

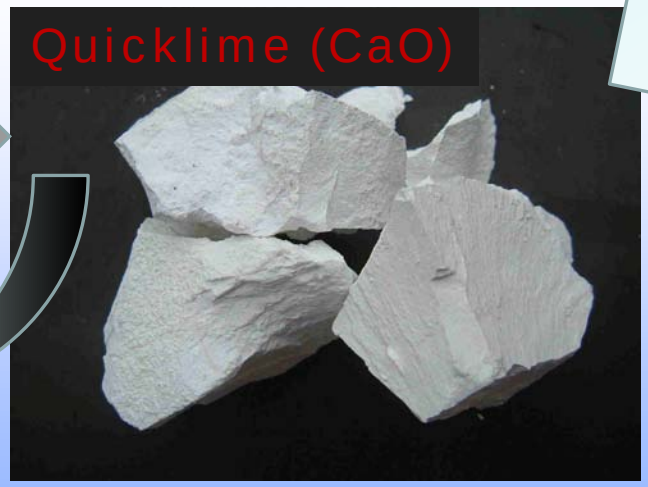
HEAT



CO_2

$CaCO_3$ + heat (>900°C) = CaO + CO_2

H_2O

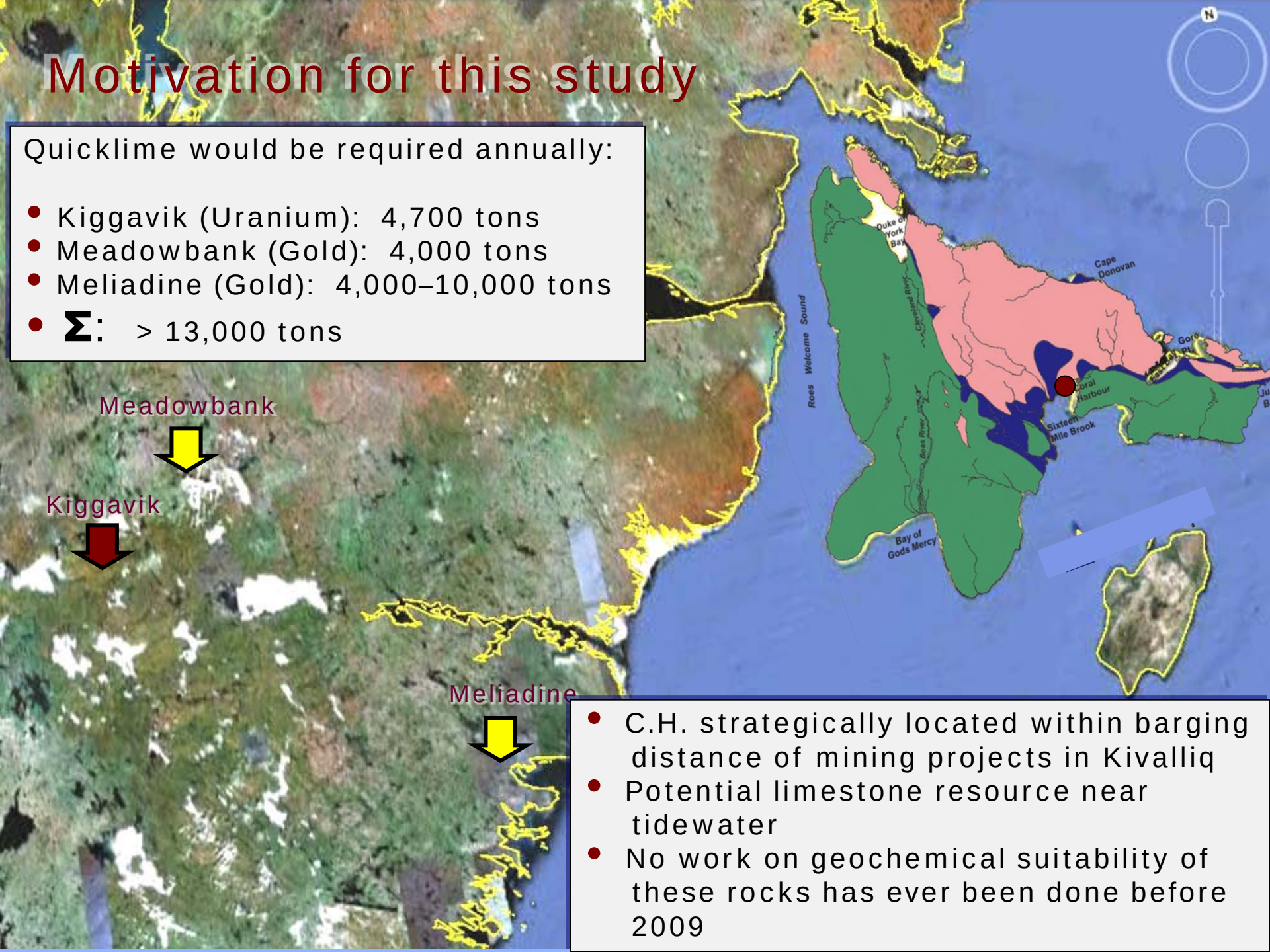


CaO + H_2O = $Ca(OH)_2$

Motivation for this study

Quicklime would be required annually:

- Kiggavik (Uranium): 4,700 tons
- Meadowbank (Gold): 4,000 tons
- Meliadine (Gold): 4,000–10,000 tons
- **Σ**: > 13,000 tons

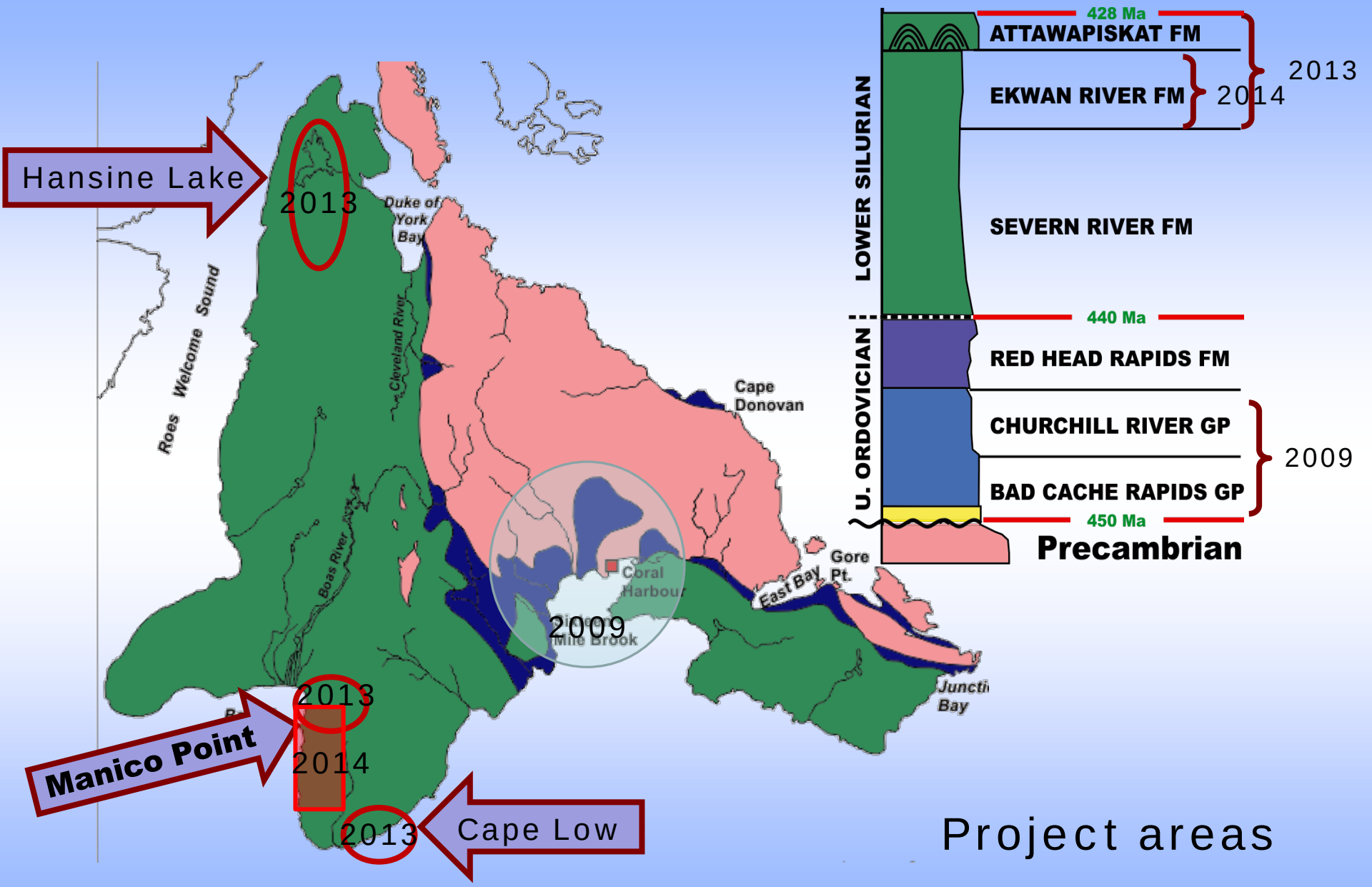


- C.H. strategically located within barging distance of mining projects in Kivalliq
- Potential limestone resource near tidewater
- No work on geochemical suitability of these rocks has ever been done before 2009

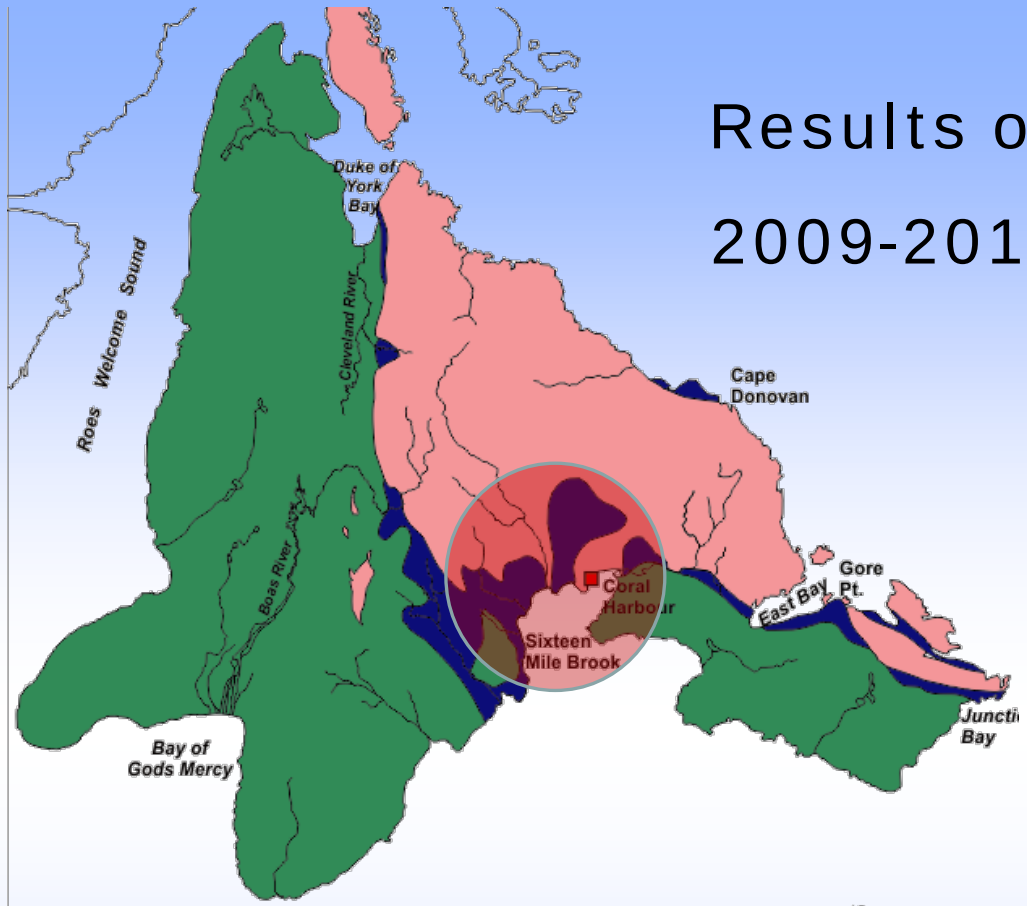
Industrial standard in evaluating limestones

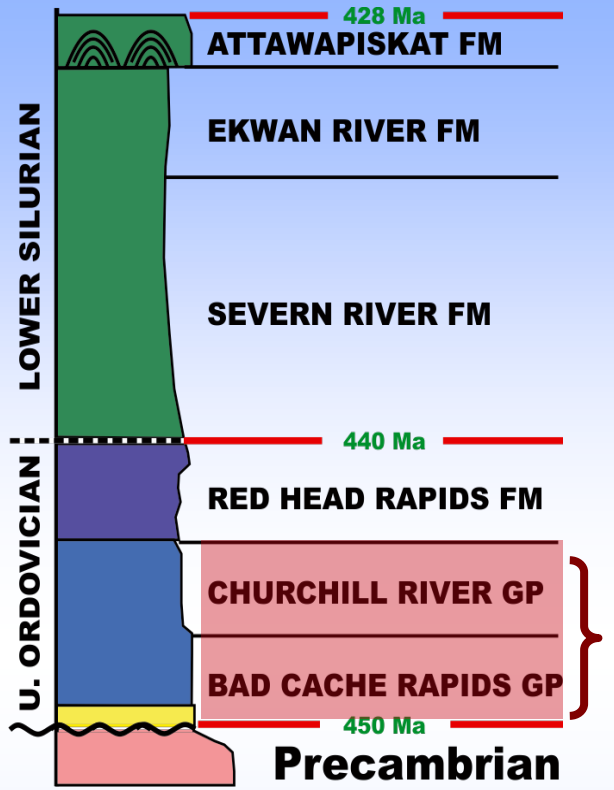
British Geological Survey Scheme for the Classification of Limestone by purity (*after Harrison, 1992*)

No	Percentage of		Category
	$CaCO_3$ (XRD)	CaO (XRF)	
1	> 98.5	> 55.2	Very high purity
2	98.5 - 97.0	55.2 - 54.3	High purity
3	97.0 - 93.5	54.3 - 52.4	Medium purity
4	93.5 - 85.0	52.4 - 47.6	Low purity
5	< 85.0	< 47.6	Impure


Hansine Lake
2013
Manico Point
2013
2014
2013
Cape Low
2009
Project areas
Duke of York Bay
Welcome Sound
Roes
Cleveland River
Boas River
Cape Donovan
Coral Harbour
East Bay
Gore Pt.
Mill Brook
Bay
428 Ma
ATTAWAPISKAT FM
EKWAN RIVER FM
2014
2013
LOWER SILURIAN
SEVERN RIVER FM
440 Ma
RED HEAD RAPIDS FM
U. ORDOVICIAN
CHURCHILL RIVER GP
BAD CACHE RAPIDS GP
2009
450 Ma
Precambrian

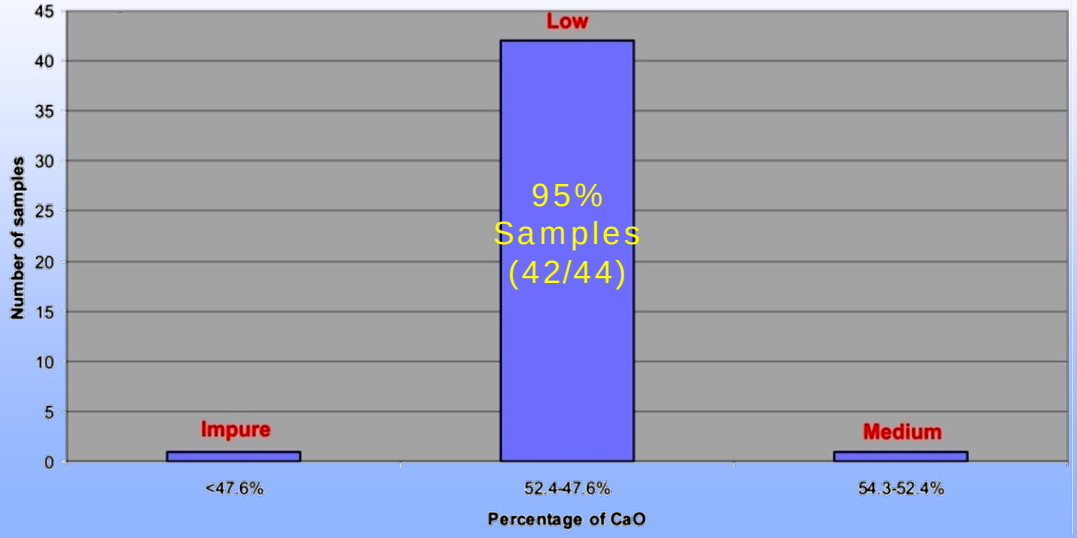
Results of 2009-2010





ALL 44 samples collected from Upper Ordovician Bad Cache Rapids and Churchill River limestones at 4 localities near Coral Harbour contains

<54.3% CaO



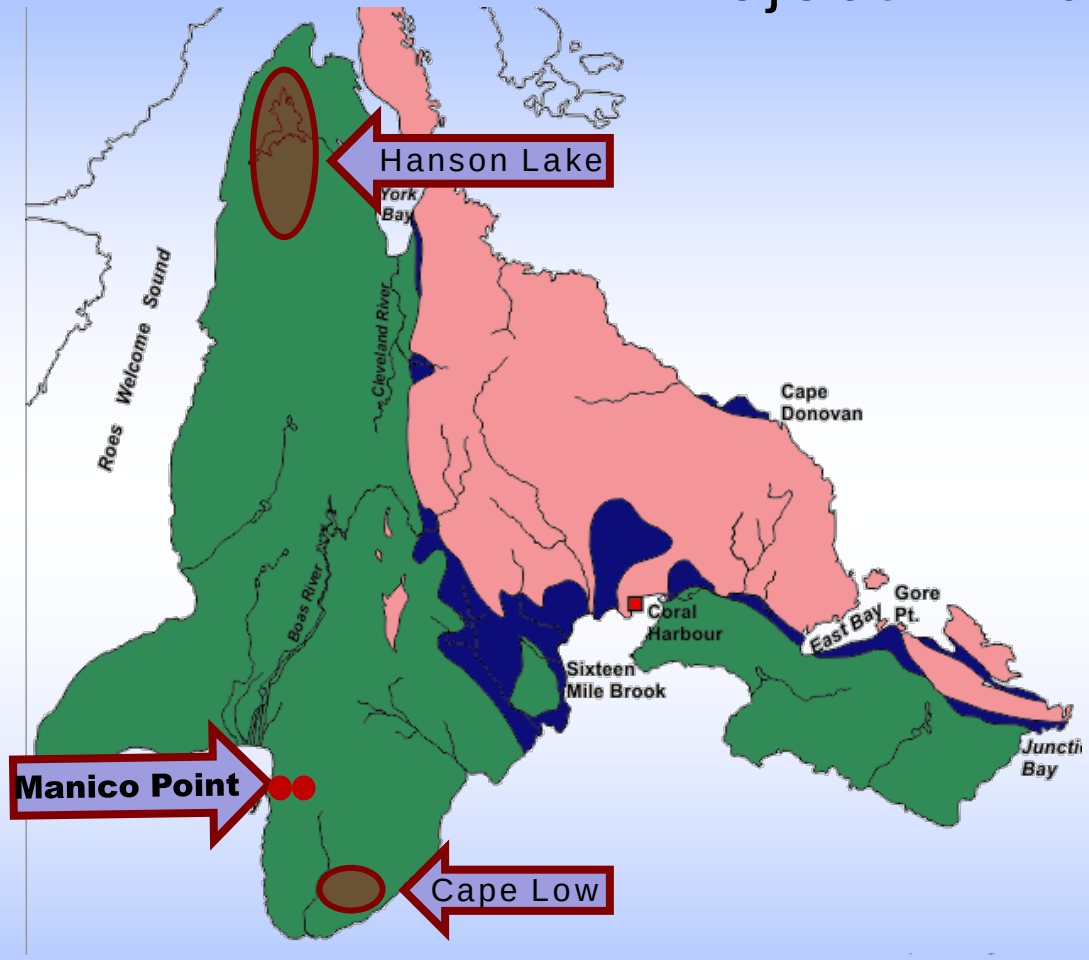
Are there any other potential for pure limestone on Southampton Island?

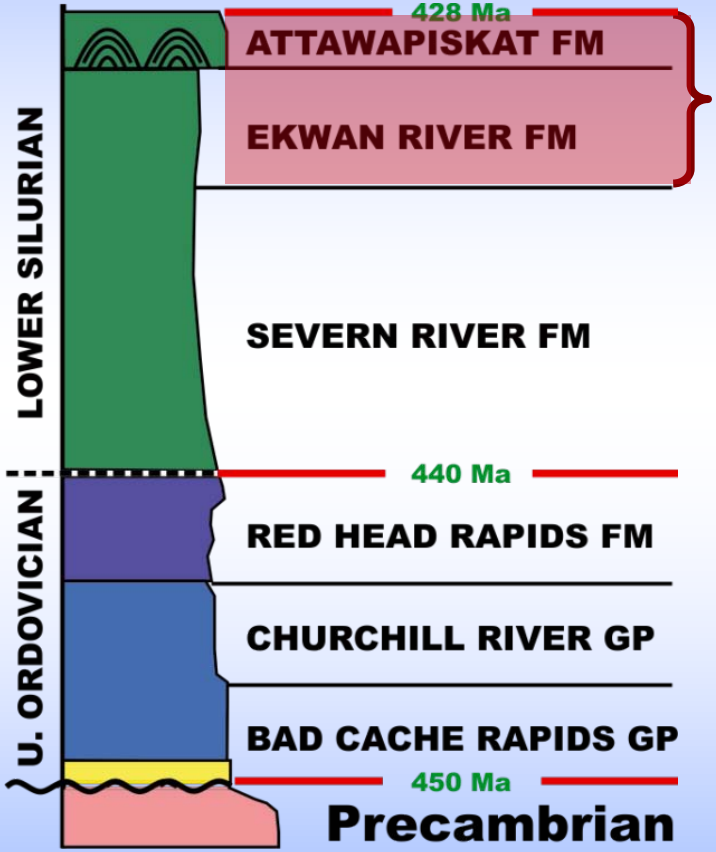
We need to look at other units on the island with the potential to host & preserve limestone with higher purity.

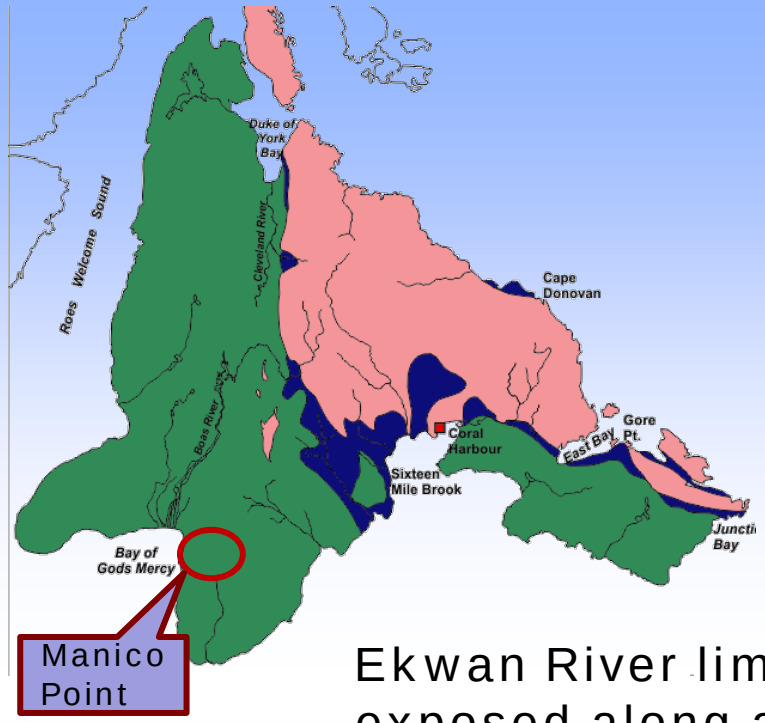
Two main prospective types of deposit from other areas:

- fossil reefs (L. Silurian Attawapiskat Fm)
- high-calcium limestone (L. Silurian Ekwan River Fm)

Project in 2013

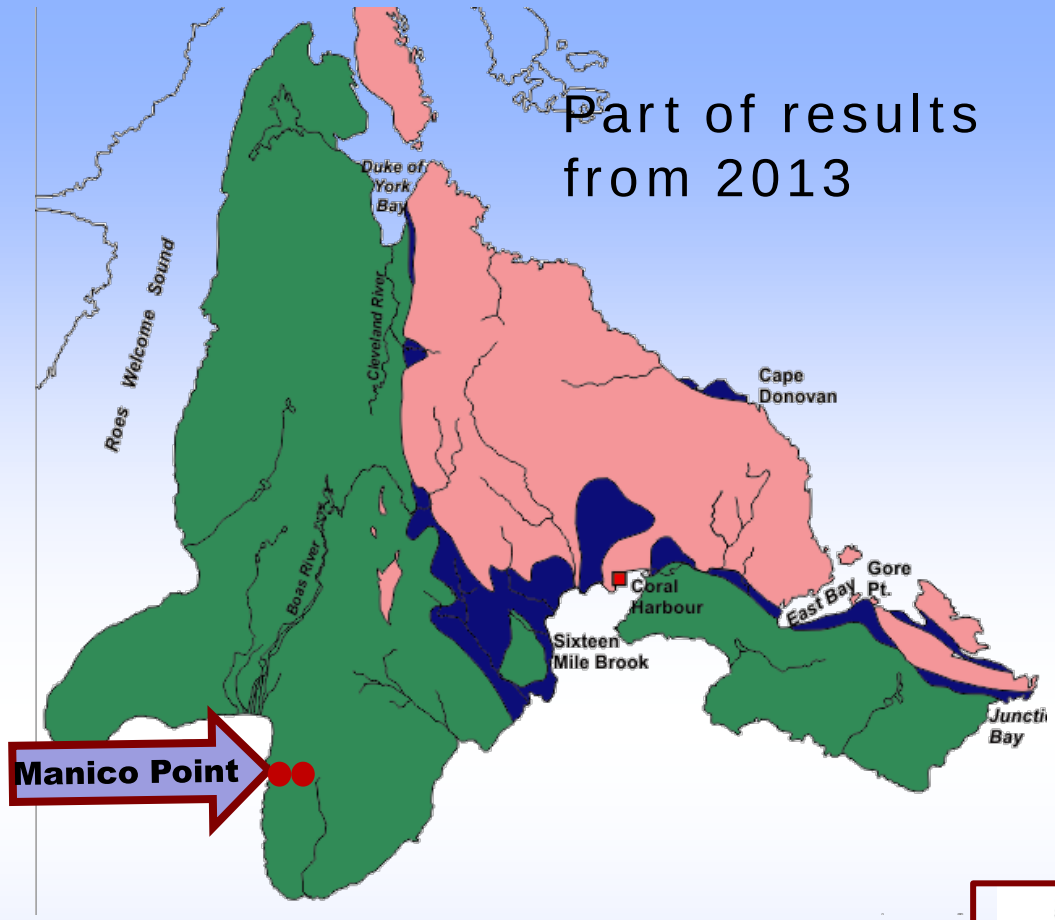


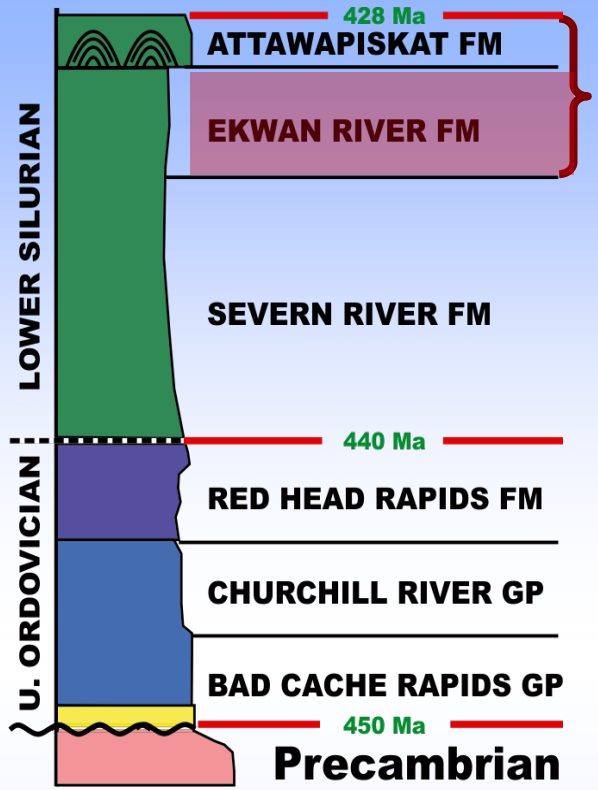




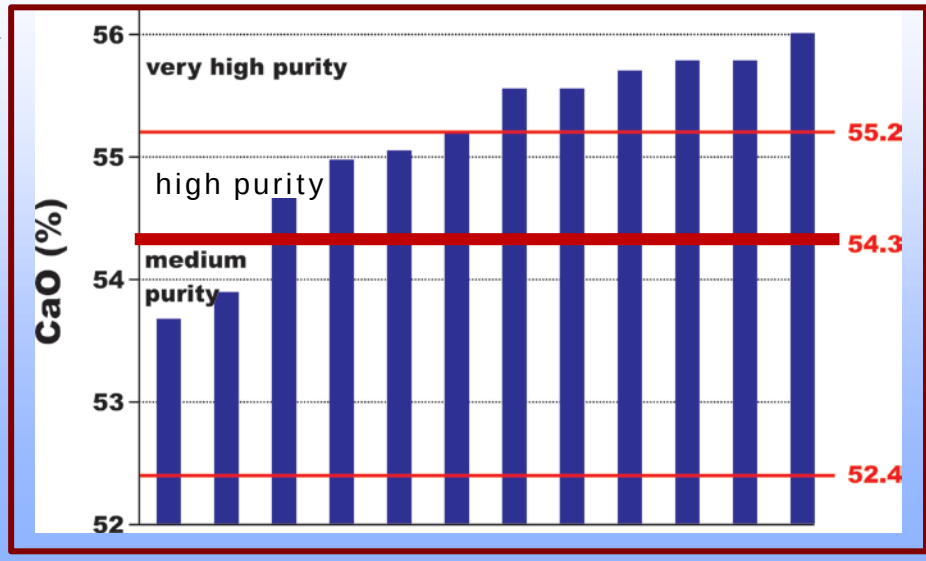
Ekwan River limestone well exposed along a creek near Manico Point

Part of results from 2013





- 12 samples collected from two localities along a creek near Manico Point for XRF analysis; 10 of 12 (83%) are classified as HIGH PURITY and VERY HIGH PURITY.
- These limestones meet the standards for most industrial uses.

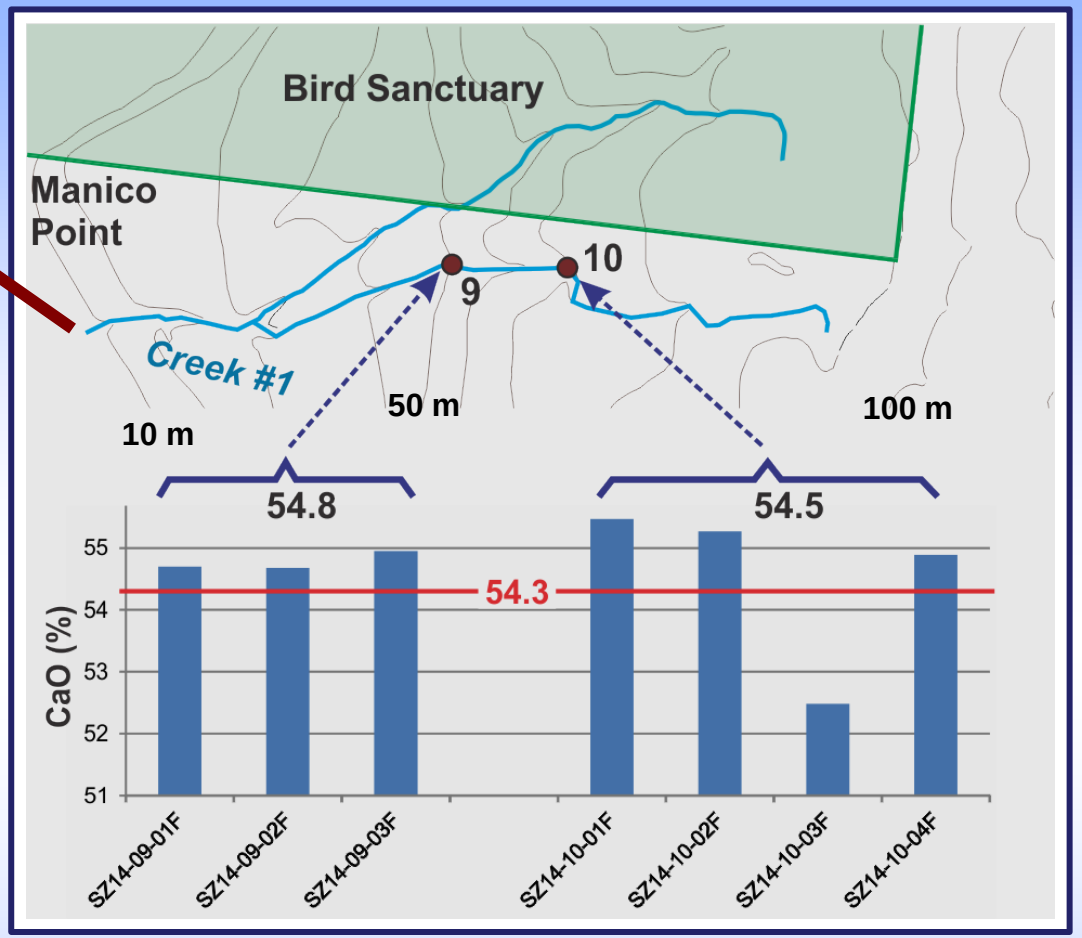


Reasonable potentials in the region

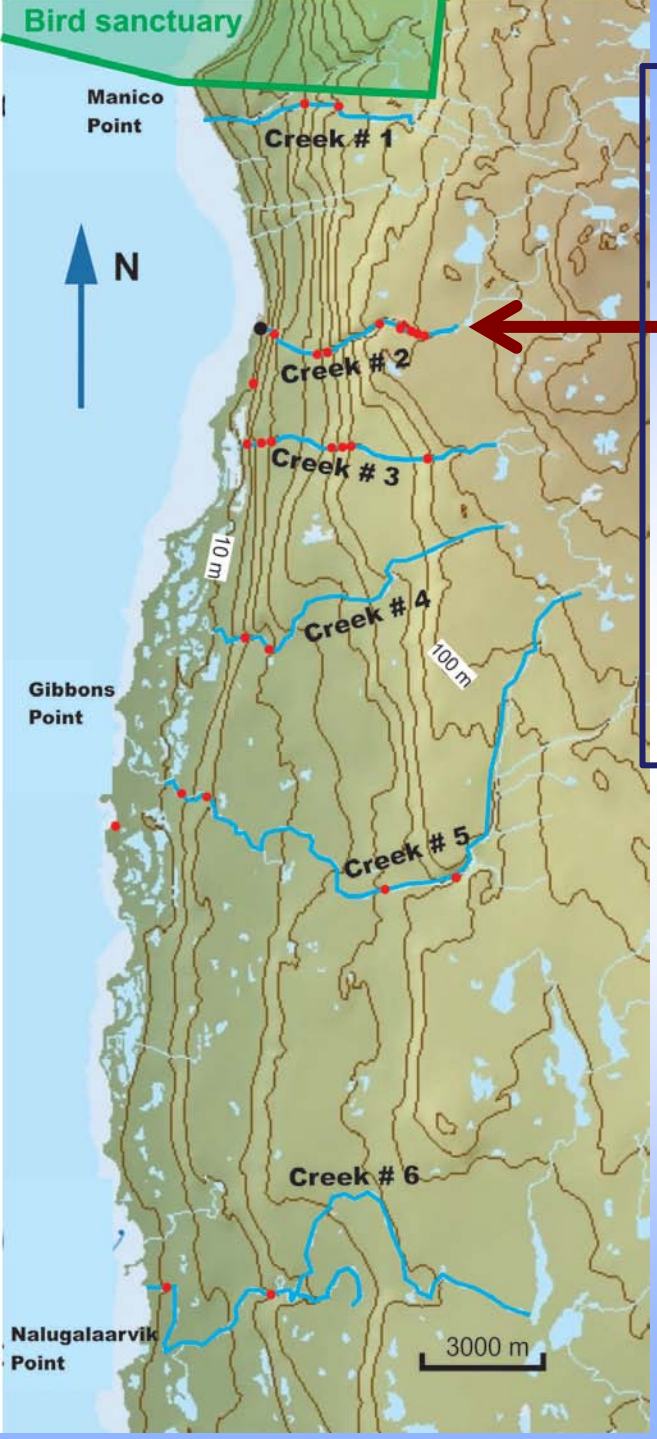
Paleozoic strata on Southampton Island are distributed horizontally; therefore, rocks from Manico Point to Nalugalaarvik Point along west coast belong to same unit – Lower Silurian Ekwan River Fm.

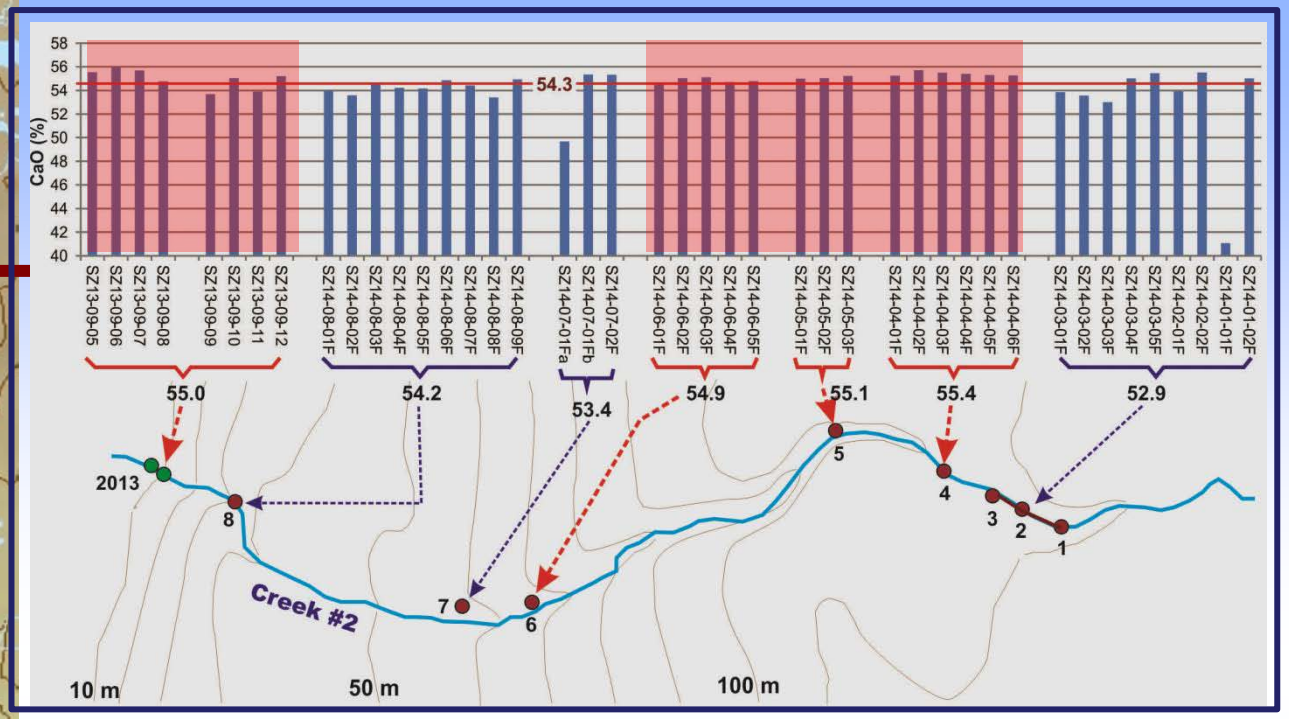
Research project in 2014

- Detailed sampling at 27 localities along 6 creeks between Manico Point and Nalugalaarvik Point
- XRF analysis for 106 samples
- Identifying minable intervals
- Making purity distribution map of the area between Manico Point and Nalugaarvik Point



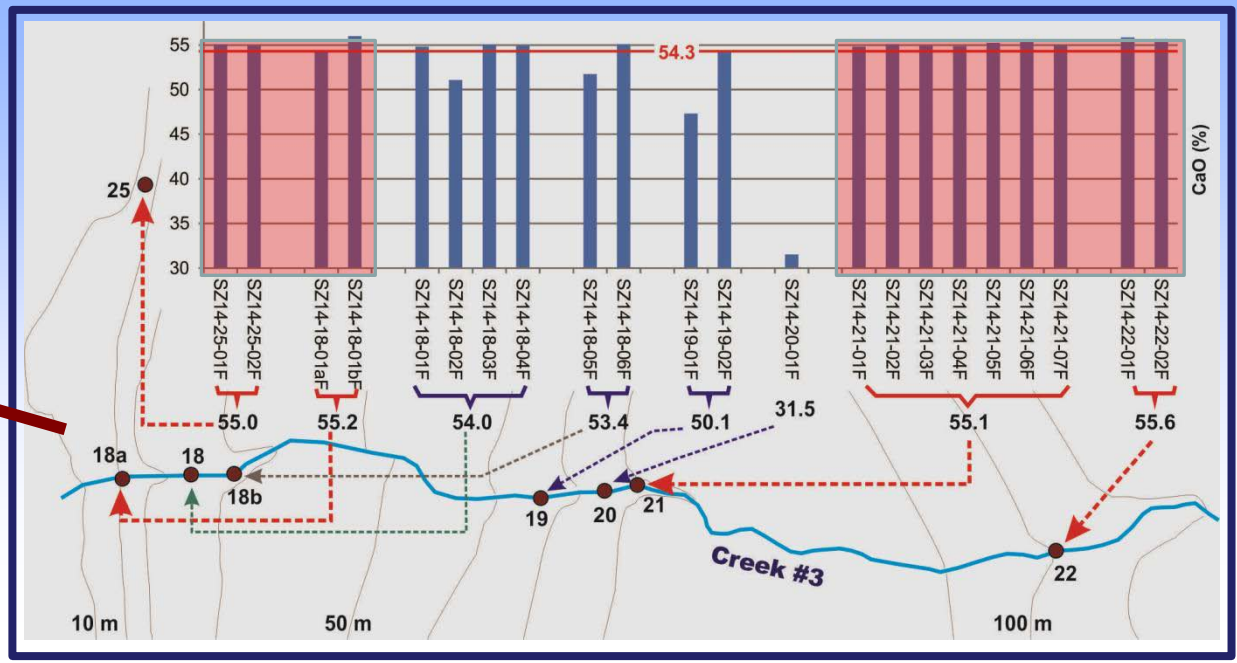
A total of 7 samples were collected from two localities along Creek #1; all samples but 1 contain CaO >54.3% at elevation of 50-70 m.





A total of 43 samples were collected from 10 localities along Creek #2 where limestone exposed off and on at elevation 100 m and below; on the average, CaO>54.3% at 2 elevations/intervals:

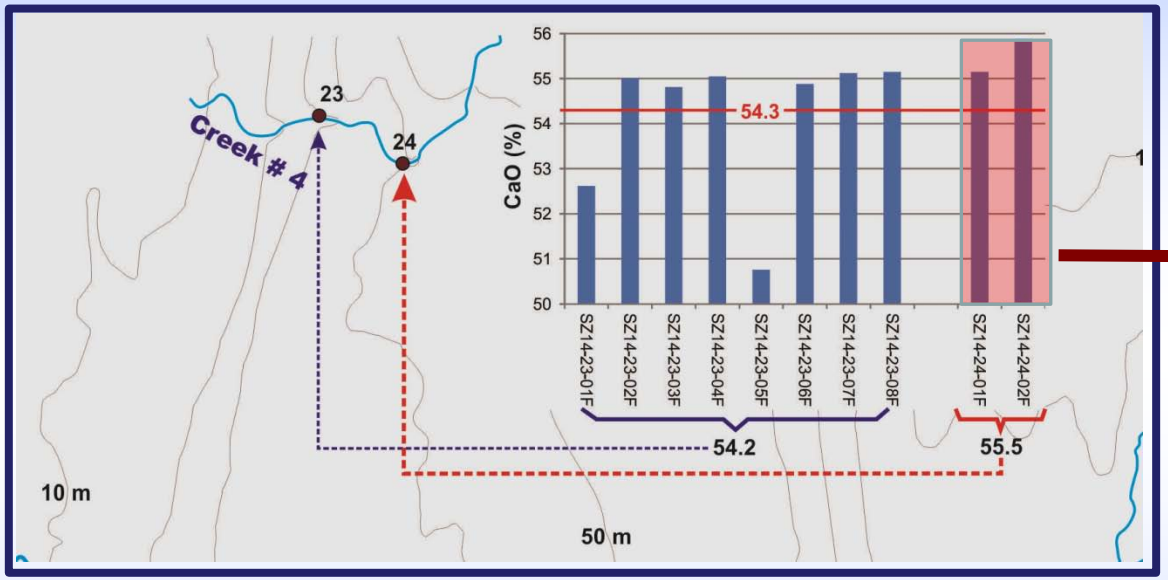
1) 8-10 m strata at elevation of 10 m and below
2) ~35 m strata at elevation of 65-100 m



A total of 22 samples were collected from 8 localities along Creek #3 and 1 locality north of Creek #3 on the cost. On the average, CaO>54.3% at 2 elevations/intervals:

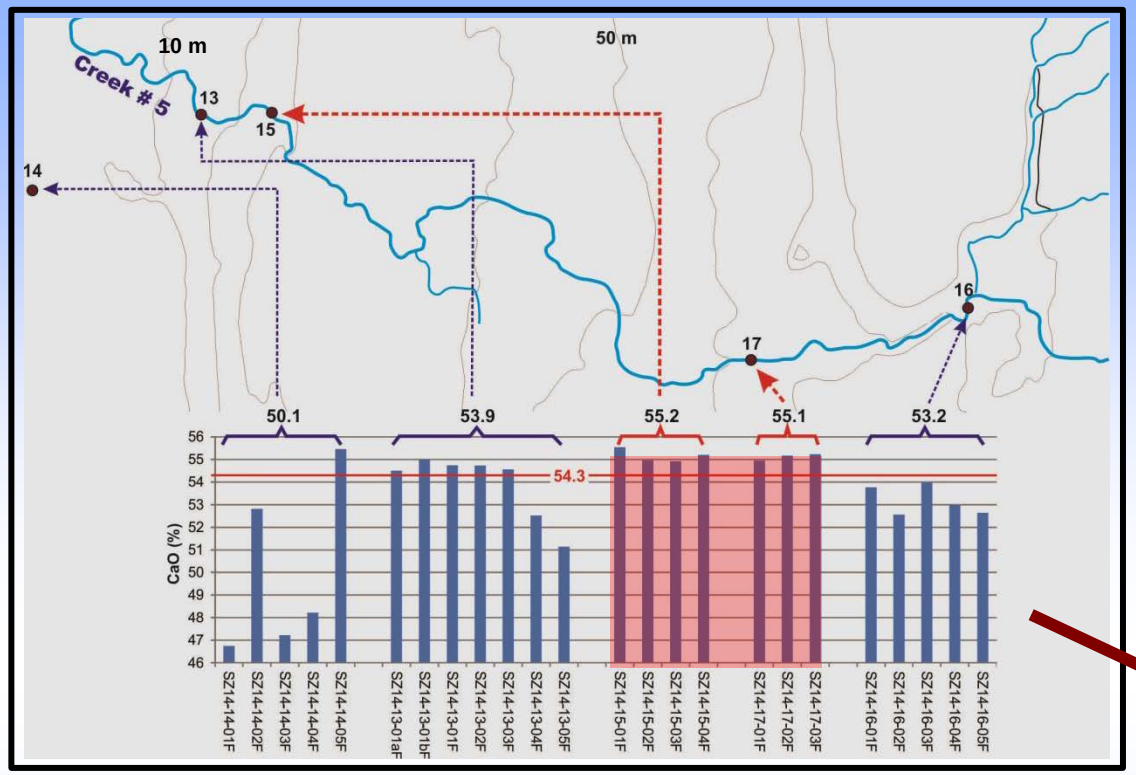
1) ~ 10 m strata at elevation of 10-20 m
2) ~ 20 m strata at elevation of 80-100 m

A total of 10 samples were collected from 2 localities along Creek #4, where limestone exposed off and on below elevation of 40 m.



On the average, 3 m strata with CaO>54.3% at elevation of ~40 m

~10 m strata at elevation of 20-30 m are debatable; 6/8 samples with CaO>54.3%, but on the average CaO=54.2%, slightly <54.3%.

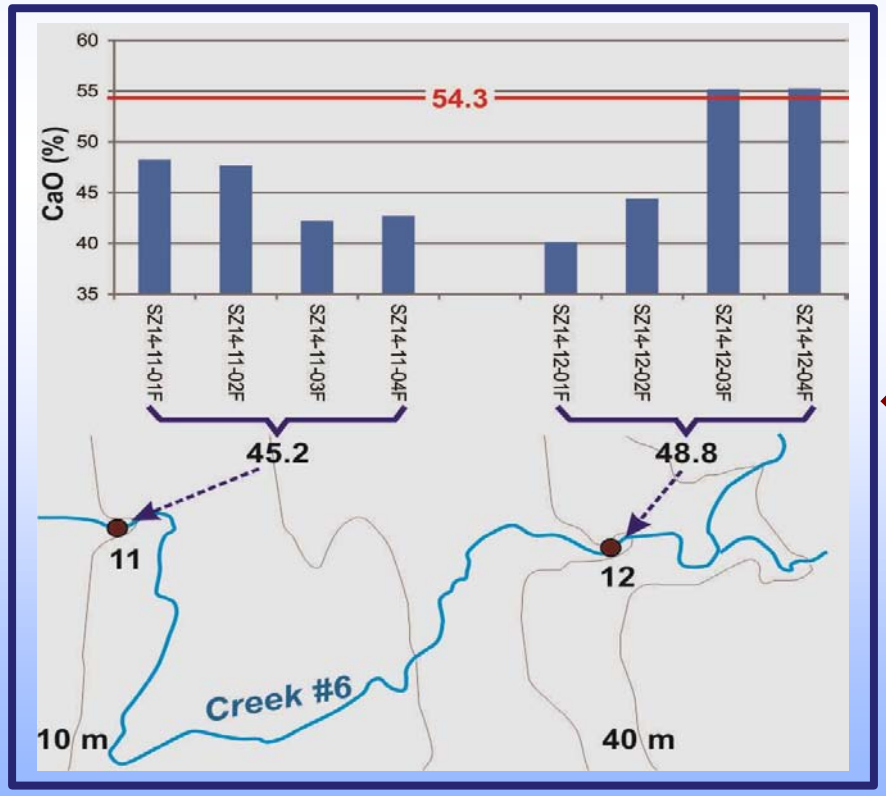


A total of 24 samples were collected from 5 localities along Creek #5 where limestone exposed off and on below elevation of 80 m; on the average, strata with CaO>54.3% at 2 elevations/intervals:

1) 8-10 m strata at elevation of 20-30 m
2) ~5 m strata at elevation of 60-70 m

A total of 8 samples were collected from 2 localities along Creek #6, where limestone exposed off and on below elevation of 30 m.

On the average, CaO=45.2% (impure) and CaO=48.8% (low purity) at 2 localities



X-ray fluorescence data show 70/106 (66%) samples contain >54.3% CaO; and low CaO intervals are related to either high SiO_2 or high MgO.

Examples of chert (or dolomite) nodules recognized in the filed, which are associated with low pure or impure intervals

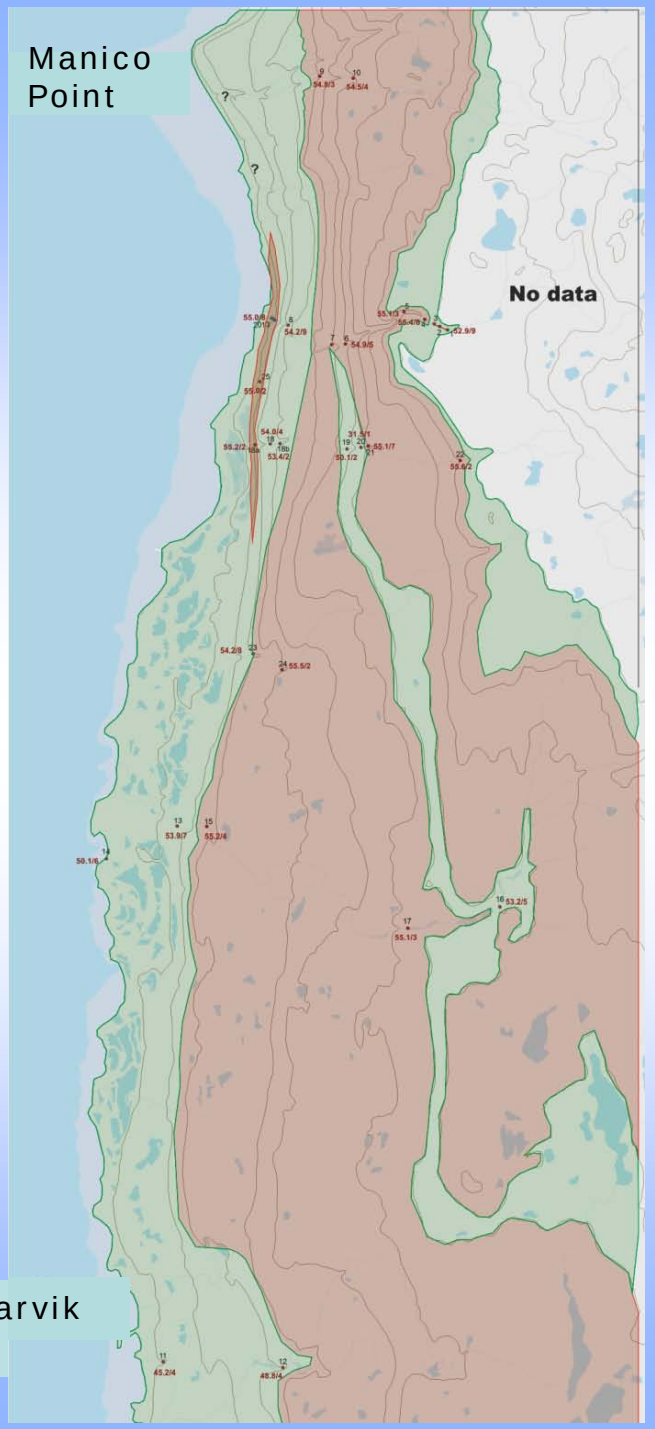
Based on

1) geochemical data collected from the Ekwan River limestone along 6 creeks between Manico Point and Nalugalaarvik Point;
2) field observation;
3) horizontally distributed Paleozoic strata on Southampton Island.

Conclusion:

The Ekwan River limestone with high purity (CaO>54.3%) is distributed

1) at elevation of 30-110 m except for 70-80 m in the middle and southern part of project area
2) a narrow interval below elevation of 30 m in the northern part of project area.



CaO>54.3%

CaO<54.3%

Acknowledgements

- Financial support from SINED (CanNor)
- Logistic support from Polar and Continental Shelf Program (PCSP)
- Assistance from Coral Harbour Hamlet & HTO
- Field assistant Randy Hinanik and Peter Adams
- R & A Vehicle Rentals, Coral Harbour