

## TECHNICAL MEMORANDUM

**DATE** January 08, 2021

**TO** Jamie Quesnel and Michel Groleau  
Agnico Eagle Mines Limited

**CC** Jen Range (Golder)

**FROM** Dan Coulton, Corey De La Mare

**Project No.** 20351262-822-TM-Rev0

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### COLLARED CARIBOU MELIADINE AWAR INTERACTIONS

#### 1.0 INTRODUCTION

During a meeting on December 17, 2020 with the Sayisi Dene First Nation (SDFN) regarding the proposed waterline addendum for the Meliadine Mine, the response by Agnico Eagle Mines Limited (Agnico Eagle) to SDFN-TRC-01 (Agnico Eagle 2020) was discussed. The response to SDFN-TRC-01 included an analysis of 2019 collared caribou from the Qamanirjuaq (QAM) caribou herd present in the Local Study Area (LSA) and whether their movement paths crossed the All-Weather Access Road (AWAR). Review of collared caribou movements in 2019 indicated that of the 13 collared caribou that entered the LSA, 12 (92%) had paths showing movement across the AWAR. The one other collared caribou that also entered the LSA had a movement path with no potential to interact with the AWAR and move across it. Agnico Eagle committed to provide a historical annual summary of collared caribou interactions with the AWAR for all caribou collar data available and provided to Agnico Eagle from the Government of Nunavut.

#### 2.0 METHODS

Construction of Phase 1 of the AWAR began in April 2012 and was completed in fall of 2013, with construction suspended during non-frozen conditions in 2012 and 2013 (i.e., typically mid-May to mid-October). Consequently, individual caribou from the QAM herd had the potential to encounter the AWAR beginning in the summer of 2014. The LSA is delineated by a 1.5 km buffer around the Meliadine Mine, AWAR, and the proposed Discovery Road. The AWAR exhibits a general north-south alignment. While the intended interest is the frequency of collared caribou crossing the AWAR, to maximize the number of caribou with the potential to interact with the AWAR and associated mining infrastructure, all caribou interacting with the LSA buffer (i.e., 1.5 km) around the AWAR, Meliadine Mine and the proposed Discovery Road to evaluate AWAR crossings were included as a precautionary approach. Analysis of QAM collared caribou data indicates that animals typically move through the LSA during late June to mid-July annually, which is the post-calving period (Nuqsana Golder 2020).

To generate movement paths, consecutive telemetry locations occurring within the LSA were connected with a straight line for each individual collared caribou. Each movement path was then reviewed to determine whether it showed movement across the AWAR or not. Paths that did not exhibit movement across the AWAR were qualified as either having no potential to move across, based on previous movement direction, or deflected. Individuals with no potential to cross the AWAR would be present in the LSA but not have a path moving toward the AWAR. For example, an individual path could enter and exit the LSA and not traverse opposite LSA boundaries (e.g., enter and

exit the east and west LSA boundaries or animals could have a parallel movement trajectory to the AWAR). Individuals were qualified as deflected if their path moved toward the AWAR but exhibited an approximately 90 degree turn or larger and did not move closer to the AWAR again. The cause of deflected movements is unknown and could be due to a number of factors including habitat selection/avoidance (i.e., lakes/ponds), predation risk, harvest pressure or disturbance (i.e., vehicles/ATVs on the AWAR). Observations of the number of caribou that crossed the AWAR, did not cross the AWAR or were determined to have deflected were tabulated by year. Patterns related to movement paths that did not cross the AWAR were evaluated further. Movement path maps were also generated for each year.

### 3.0 RESULTS

The total number of collared QAM caribou present in the LSA varied from 4 in 2014 to 48 in 2017 (Table 1). Relative to the number of collared caribou present in the LSA, the percent that exhibited movements across the AWAR ranged from 71% (in 2016 and 2017) to 93% (in 2018) (Table 1, Figures 1 to 6). Over all years, 81% (132 of 163) of movement paths within the LSA crossed the AWAR.

**Table 1: Movements Summary of Collared Qamanirjuaq Caribou in the Local Study Area, 2014 to 2019**

Year	Total Collared Caribou in LSA	Crossed AWAR (%)	Did not Cross AWAR (%)
2014	4	3 (75%)	1 (25%)
2015	30	26 (87%)	4 (13%)
2016	28	20 (71%)	8 (29%)
2017	48	34 (71%)	14 (29%)
2018	40	37 (93%)	3 (7%)
2019	13	12 (92%)	1 (8%)
<b>Total</b>	<b>163</b>	<b>132 (81%)</b>	<b>31 (19%)</b>

AWAR = All-Weather Access Road; LSA = Local Study Area.

Note: the LSA is a 1.5 km buffer area around the Meliadine Mine, AWAR, and proposed Discovery Road.

Review of the 31 collared caribou movements that did not cross the AWAR indicated that across years, 22 (71%) had no potential to cross the AWAR (Table 2, Figures 1 to 6). These included caribou that did not travel east-west across the LSA (Figures 1 to 6) and 13 caribou in 2017 that crossed the hamlet road north of Rankin Inlet and below the southern end of the AWAR (Figure 4). Six (19%) other caribou crossed other infrastructure such as the Mine site or other roads (Table 2, Figures 1, 3, 4, 5). Three collared caribou in 2015 and 2016 (animal ids: QM1600415, QM1580415, QM1720416), were qualified as deflected (Table 2, Figures 1 to 6), because their movement trajectories changed from toward the AWAR to away from the AWAR upon approach. Assuming these are deflections as a result of the AWAR or another stressor (e.g., vehicle or ATV) on the AWAR, this indicates that 1.8% (i.e., 3 of 163 collared caribou years) of all caribou movements within the LSA may have been deflected as a result of the AWAR or AWAR activity. Of note is that one of these animals (i.e., QM1600415) crossed the hamlet road between the AWAR and Rankin Inlet in 2016 (Figure 4), and the AWAR in 2017 (Figure 5). Animals QM1580415 and QM1720416 both crossed the AWAR in 2017 (Figure 5).

**Table 2: Summary of Collared Qamanirjuaq Caribou that Did Not Cross the AWAR, 2014 to 2019**

Year	Did not Cross AWAR	Deflected	No Potential to Cross AWAR	Crossed Other Mine Infrastructure
2014	1	0	0	1
2015	4	1	3	0
2016	8	2	4	2
2017	14	0	13	1
2018	3	0	1	2
2019	1	0	1	0
<b>Total</b>	<b>31</b>	<b>2</b>	<b>22</b>	<b>6</b>

AWAR = All-Weather Access Road.

Removing the number of caribou with no potential to cross the AWAR including those that crossed other roads and mine infrastructure results in 135 collared caribou years available to interact with the AWAR (Table 3). When the focus is on the number of collared caribou available to cross the AWAR, 98% (132 of 135) have from 2014 to 2019 and was 100% in 4 of 6 years. The rate of deflected caribou increases from 1.8% to 2.2% (3 of 135 collared caribou years).

**Table 3: Summary of Collared Qamanirjuaq Caribou Available to Cross the AWAR, 2014 to 2019**

Year	Total Collared Caribou in LSA	No Potential to Cross AWAR	Crossed Other Infrastructure	Collared Caribou Available to Interact with AWAR <sup>1</sup>	Crossed AWAR (%)
2014	4	0	1	3	3 (100%)
2015	30	3	0	27	26 (96%)
2016	28	4	2	22	20 (91%)
2017	48	13	1	34	34 (100%)
2018	40	1	2	37	37 (100%)
2019	13	1	0	12	12 (100%)
<b>Total</b>	<b>163</b>	<b>22</b>	<b>6</b>	<b>135</b>	<b>132 (98%)</b>

AWAR = All-Weather Access Road; LSA = Local Study Area.

<sup>1</sup> Annual values of available collared caribou reflect the subtraction of individuals with no potential to cross the AWAR and that crossed other infrastructure from the total collared caribou in the LSA.


## 4.0 CONCLUSIONS

A simple and precautionary analysis of collared Qamanirjuaq caribou indicates that at least 81% of caribou move across the AWAR. This rate is likely underestimated because it considers movements that had no potential to interface with the AWAR as non-crossers. Non-AWAR crossing caribou also included movement paths that crossed other roads (n=13) and Mine infrastructure (n=6). Had the assessment of crossing considered all disturbed areas (i.e., AWAR and all infrastructure), then the frequency of crossing would increase from 81% to 93% (151 of 163). When the analysis is focussed on only on the AWAR, the frequency of crossing increases to 98% (132 of 135). Three deflections were qualified in two of six years examined since the AWAR was constructed which supports that deflection events are rare but these patterns could also be associated with non-AWAR factors such as predation risk or harvest. The annual pattern of deflections demonstrates that deflections do not occur every year and that caribou that typically encounter the AWAR cross it. As well, these three caribou crossed other roads or the AWAR the following year so any assumed aversion to cross the AWAR appears to be temporary. Key Terrestrial Ecosystem Management and Monitoring Plan (TEMMP) mitigation applied to the AWAR (and proposed waterlines) to minimize barrier effects to caribou movements includes operational closure of the AWAR when caribou are migrating through the area (Golder 2015), which appears to be effective. It is also important to note that only a fraction of collared Qamanirjuaq caribou move through the LSA annually (Nuqsana Golder 2020), consequently the entire herd does not interact with the AWAR.

The proposed waterlines will be located next to the AWAR and approximately 80 - 90% of the proposed waterlines will be covered. The cover design includes low slope shoulders constructed with finer grain material to facilitate movements across the AWAR. The height of the cover will be consistent with the AWAR road surface. Construction of the waterlines will eliminate traffic associated with hauling saline water to Rankin Inlet for discharge. A reduction in traffic volume predicts a decrease in the magnitude and frequency of sources of mine-related sensory disturbance to caribou from the AWAR. However, incremental changes (positive or negative) to barrier effects to caribou movements resulting from the construction of the waterlines relative to the AWAR is also predicted to not be measurable because the apparent influence of the AWAR on caribou movements is already very small.

## 5.0 CLOSURE

Please contact the undersigned with any questions or concerns.



Dan Coulton, Ph.D., RPBio.  
*Senior Wildlife Biologist*



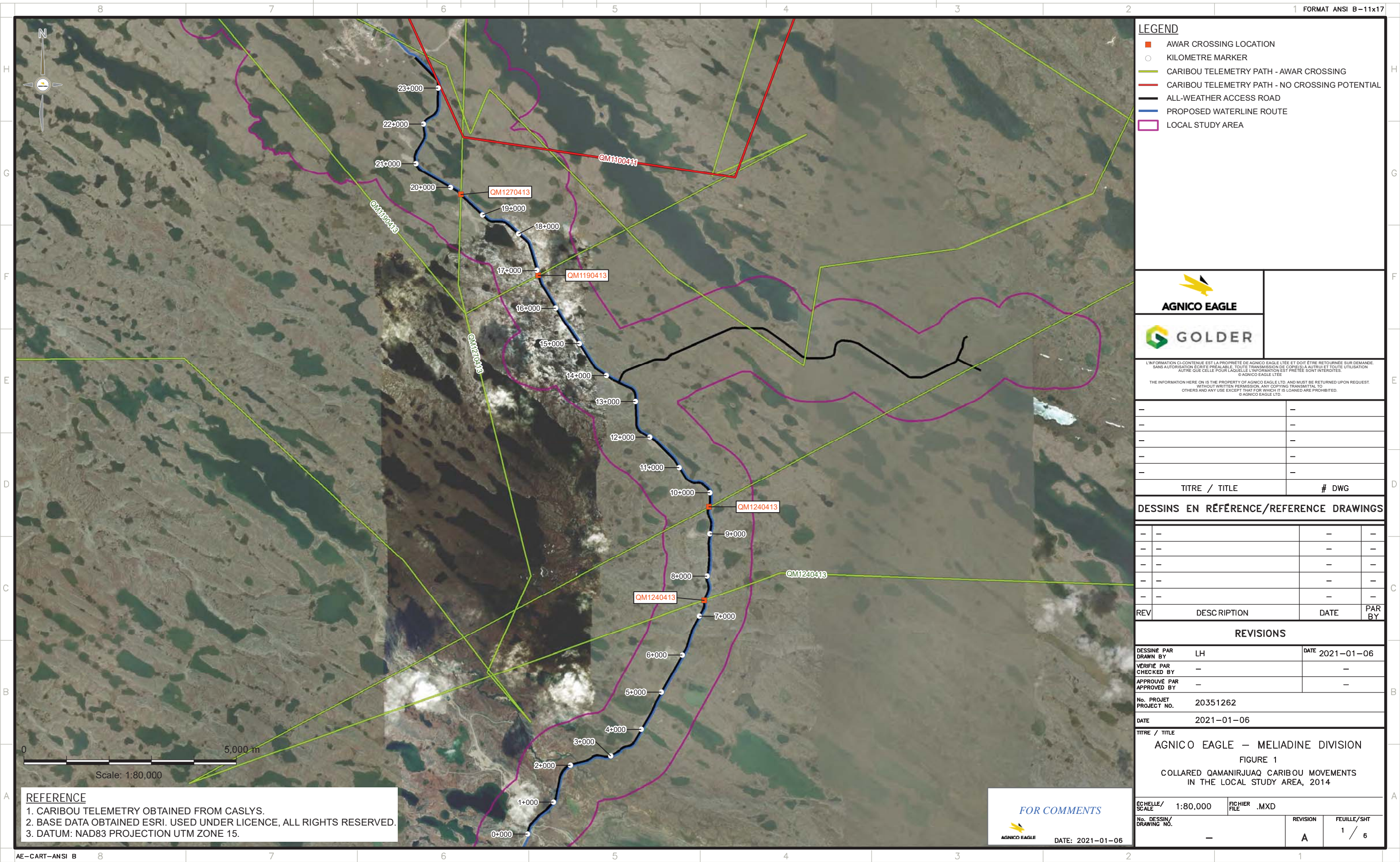
Corey De La Mare, P. Biol.  
*Principal, Senior Ecologist*

DWC/CDLM/jr

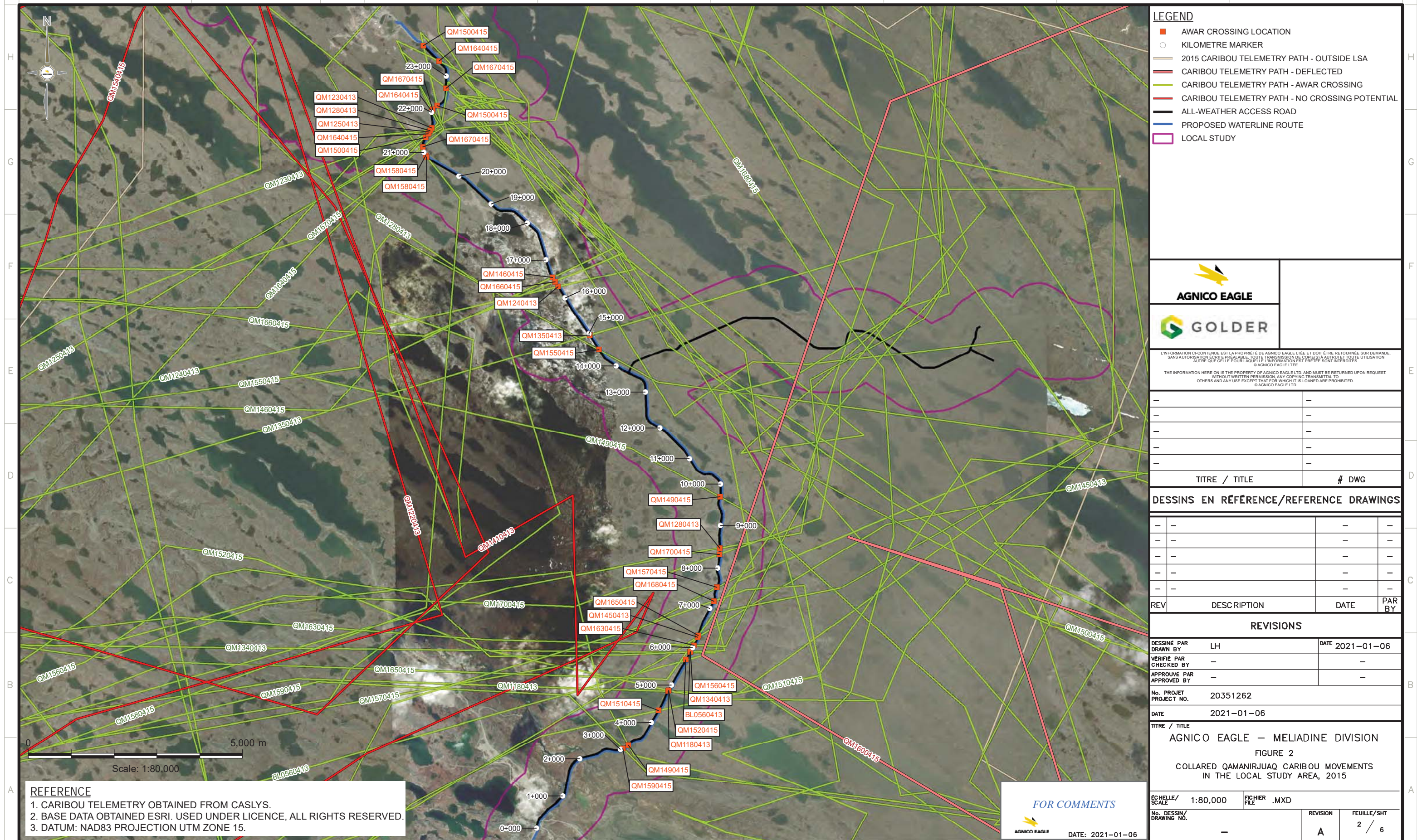
## **6.0 REFERENCES**

- Agnico Eagle (Agnico Eagle Mines Limited). 2020. Waterline FEIS Addendum – Meliadine Mine, Technical Comment Responses. Submitted to Nunavut Impact Review Board. November 20, 2020.
- Golder (Golder Associates Ltd.). 2015. SD 6-4 Terrestrial Environment Management and Monitoring Plan (TEMMP) – Meliadine Golder Project, Nunavut. Prepared for Agnico Eagle Mining Limited. Rankin Inlet, NU.
- Nuqsana Golder (Nuqsana Golder Engineering and Environmental Inc.). 2020. Agnico Eagle Mines Limited – Meliadine Division: 2019 Terrestrial Effects Monitoring and Mitigation Program Annual Report. Prepared for Agnico Eagle Mines Limited. Ottawa, ON.

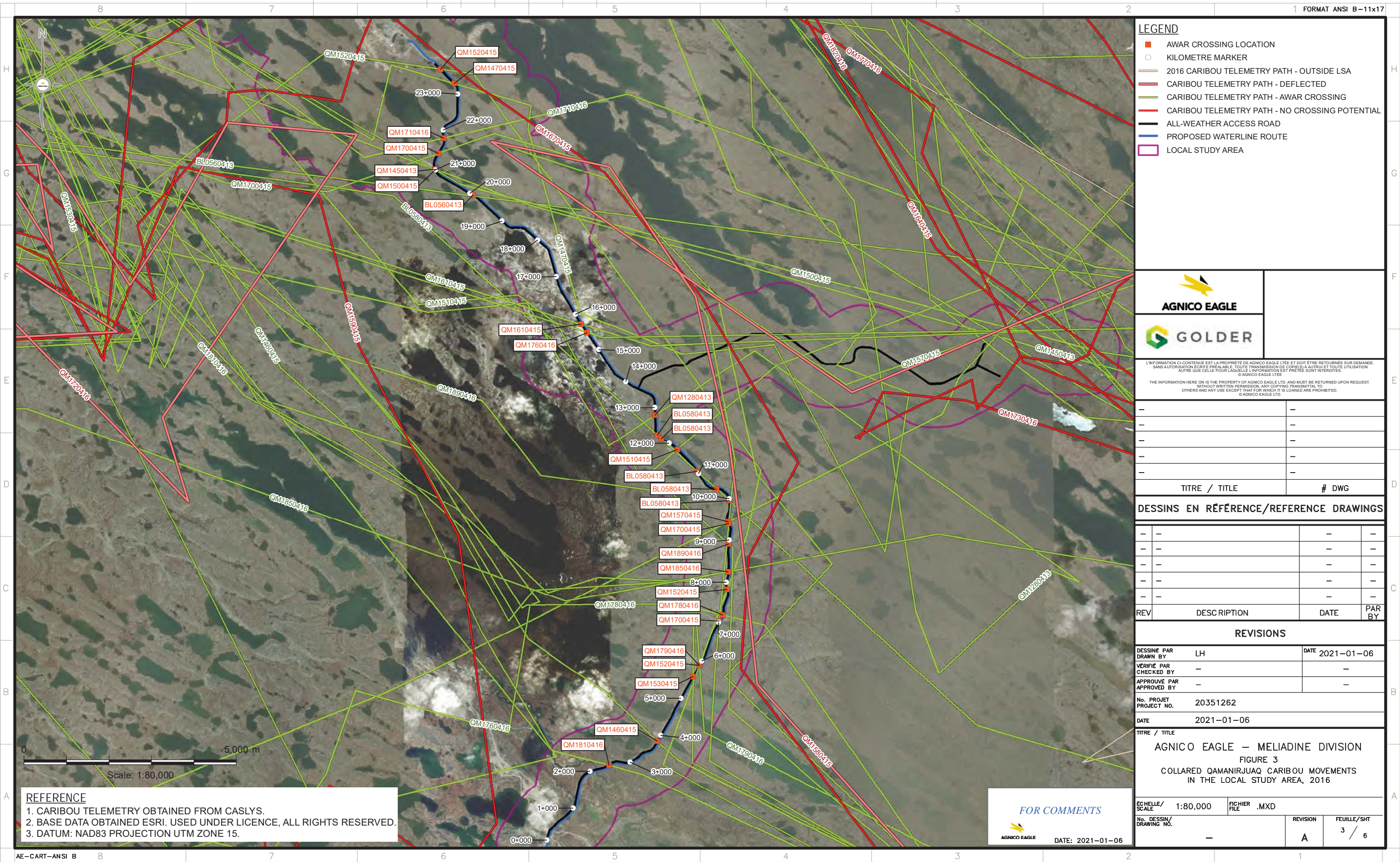




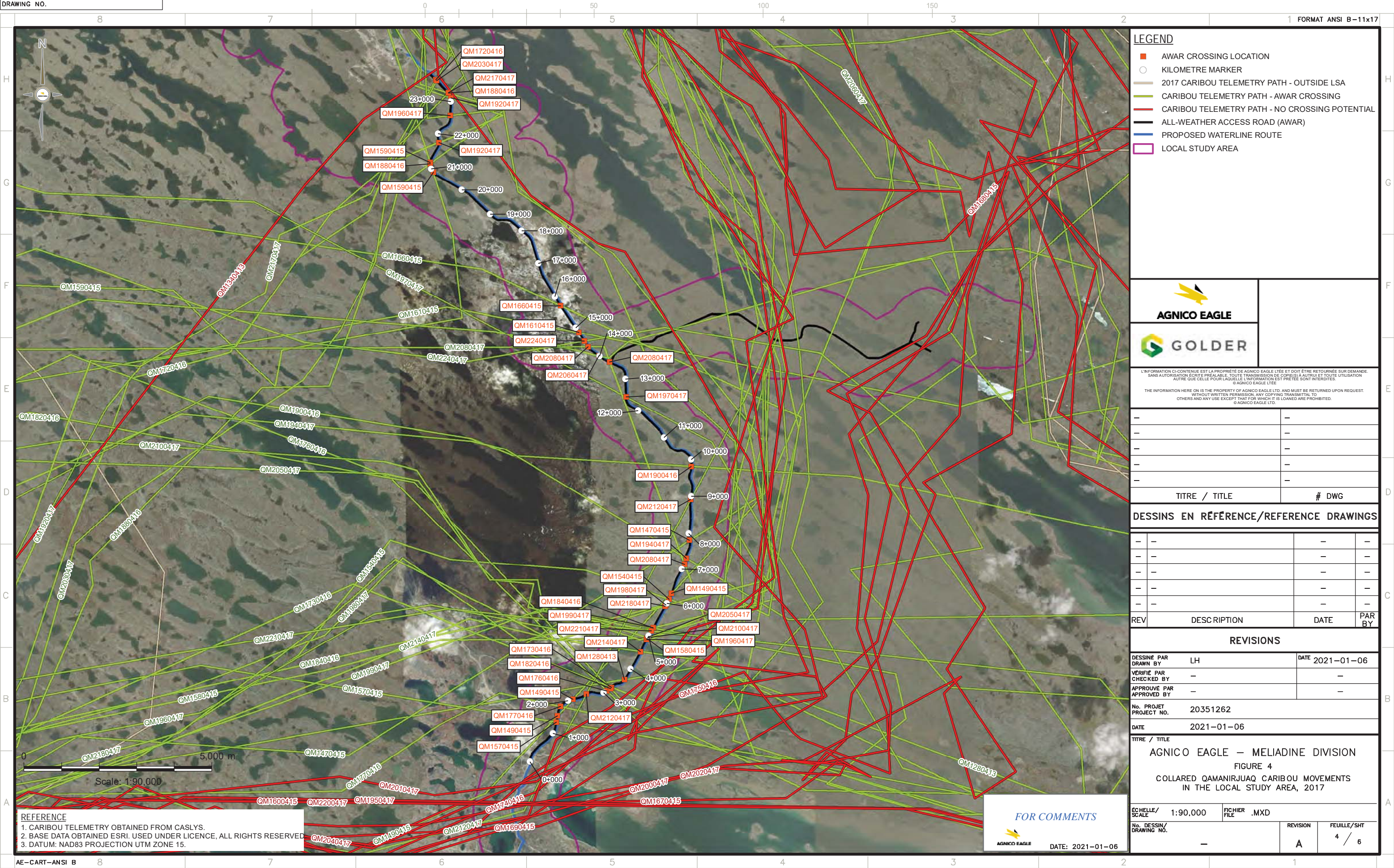




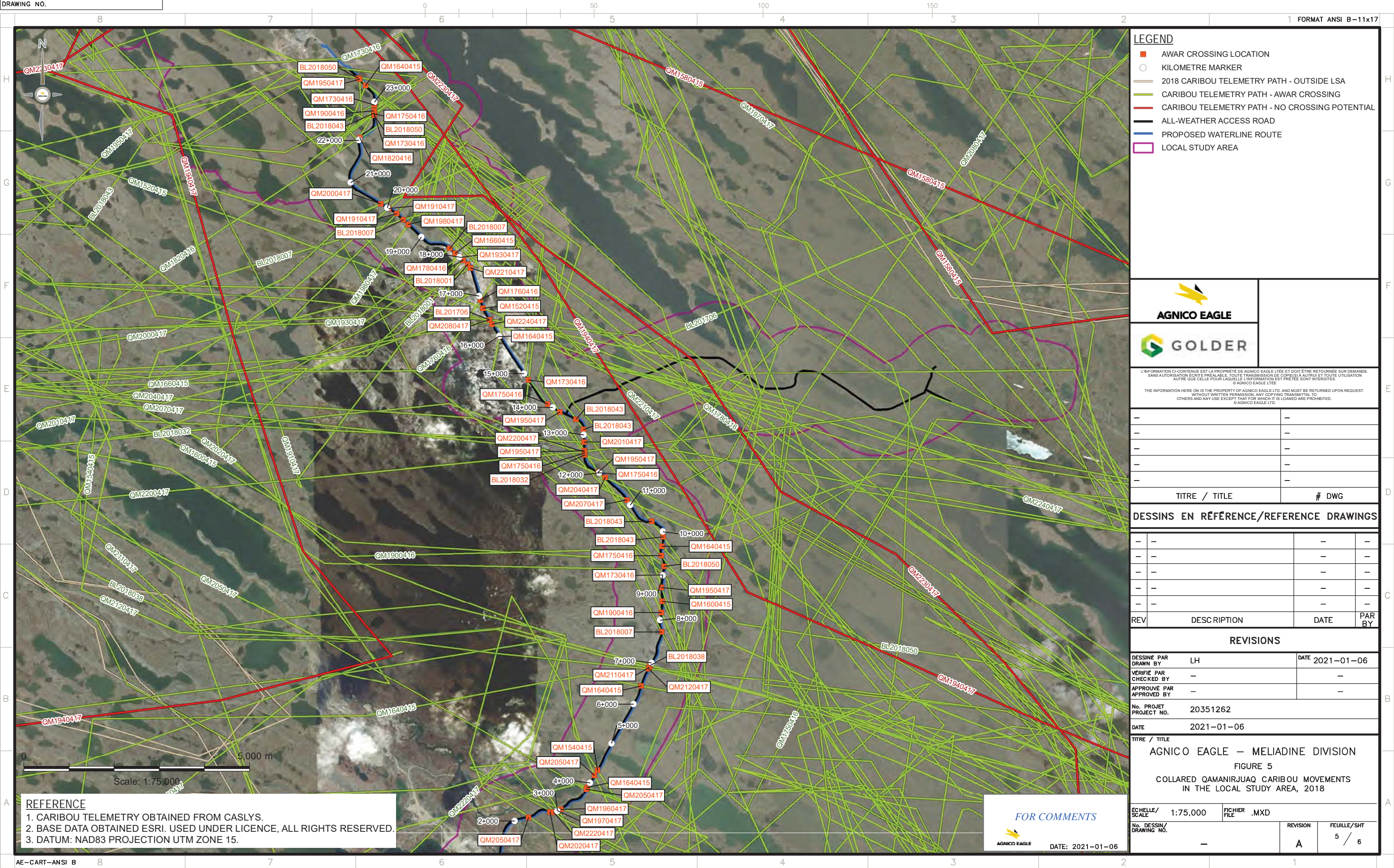












**LEGEND**

- AWAR CROSSING LOCATION
- KILOMETRE MARKER
- 2018 CARIBOU TELEMTRY PATH - OUTSIDE LSA
- CARIBOU TELEMTRY PATH - AWAR CROSSING
- CARIBOU TELEMTRY PATH - NO CROSSING POTENTIAL
- ALL-WEATHER ACCESS ROAD
- PROPOSED WATERLINE ROUTE
- LOCAL STUDY AREA



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DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS

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REVISIONS

DESSINÉ PAR DRAWN BY	LH	DATE	2021-01-06
VÉRIFIÉ PAR CHECKED BY	—		—
APPROUVÉ PAR APPROVED BY	—		—

No. PROJ PROJECT NO.	20351262
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DATE	2021-01-06
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TITRE / TITLE  
AGNICO EAGLE — MELIADINE DIVISION  
FIGURE 5  
COLLARED QAMANIRJUAQ CARIBOU MOVEMENTS  
IN THE LOCAL STUDY AREA, 2018

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FOR COMMENTS





