THULE BLACK SANDS ARCHAEOLOGICAL SURVEY 2022

Report nr. 202303_1

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Nunatta Katersugaasivia Allagaateqarfialu // Greenland National Museum and Archives

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Cover photo: Igannapaluk Island towering over Igannap Nuunga, Mikkel Myrup 2022

Thule Black Sands – Archaeological Survey 2022

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Executive Summary

Nunatta Katersugaasivia Allagaateqarfialu/Greenland National Museum & Archives (NKA) carried out an archaeological survey in the exploration license area MEL2017-29 4-20 August 2022. In accordance with the Greenlandic Heritage Act (Inatsisartut Law no. 11 of 19. May 2010), the archaeological survey was required by the NKA prior to mining development and conducted in collaboration with and financed by GreenRoc Mining.

The licence area is situated around Igannapaluk, approximately 100 km south of Qaanaaq. The survey revealed a relatively high number of hitherto unrecorded archaeological features, including some of high cultural and scientific value. It is recommended that GreenRoc Mining and the NKA collaborate closely in identifying sound solutions regarding the areas' cultural heritage and the further development of the project.

Kalaallisut naalisarneqarnera

Nunatta Katersugaasiviata Allagaateqarfiatalu sumiiffik aatsitassarsiornissamik piaaffissatut misissuiffiussaq MEL2017-29 ulluni 4-20. augustimi 2022-imi itsarnisarsiorluni misissueqqaarfigivaa. Eqqissisimatitsineq aamma allatigut kulturikkut kingornussatut illersuineq pillugu Inatsisartut Inatsisaat nr. 11, 19. maj 2010-meersoq tunngavigalugu misissueqqusineq NKA'mit piumasaqaataavoq, tamannalu pivoq GreenRoc Mining qanimut suleqatigalugu aningaasaliisoralugulu.

Sumiiffik Qaanaamiit kujammut 100 kilometerit missaanni Igannapaluup eqqaani inissisimavoq. Misissuinerup takutippaa sumiiffik siornatigut ilisimaneqanngitsunik annertuumik itsarnitsanik peqartoq, nalunaarsukkallu ilaat kulturikkut ilisimatusarneqarnissaannullu nalitusinnaasut ilimatsaanneqarput. Innersuussutigineqarpoq suliffeqarfik piiaanissamik pilersaaruteqartoq Nunattalu Katersugaasivia Allagaateqarfialu kulturikkut eriagisassat suliffeqarfiullu suliniutaa piffissami aggersumi kikkut tamarmik iluarisaannik naapeqatigiittoqarumaartoq.

Dansk resume

Nunatta Katersugaasivia Allagaateqarfiatalu/Grønlands Nationalmuseum & Arkiv (NKA) gennemførte i perioden 4-20. august 2022 en arkæologisk besigtigelse i efterforskningslicensområdet MEL2017-29. I overensstemmelse med *Inatsisartutlov nr. 11 af 19. maj 2010 om fredning og anden kulturarvsbeskyttelse af kulturminder* var besigtigelsen påkrævet af NKA og blev udført i samarbejde med og bekostet af GreenRoc Mining.

Licensområdet ligger omkring Igannapaluk, ca. 100 km syd for Qaanaaq. Undersøgelsen afdækkede et relativt stort antal hidtil uregistrerede arkæologiske lokaliteter, herunder nogle af høj kulturel og videnskabelig værdi. Det anbefales, at GreenRoc Mining og NKA arbejder tæt sammen om at finde gode løsninger vedrørende områdets kulturarv i forbindelse med den videre udvikling af projektet.

Contents

1. Introduction

In 2022 GreenRoc Mining (hereafter the Company) contracted Nunatta Katersugaasivia Allagaateqarfialu/The National Museum & Archives of Greenland (hereafter the NKA) to perform an archaeological survey in the license area designated as MEL2017-29 as required by Greenlandic legislation, specifically *Eqqissisimatitsisarneq aamma allatigut kulturikkut eriagisassanik kulturikkut kingornussatut illersuineq pillugu Inatsisartut Inatsisaat nr. 11, 19. Maj 2010-meersoq/Inatsisartutlov nr. 11 af 19. maj 2010 om fredning og anden kulturarvsbeskyttelse af kulturminder* (the Heritage Act).

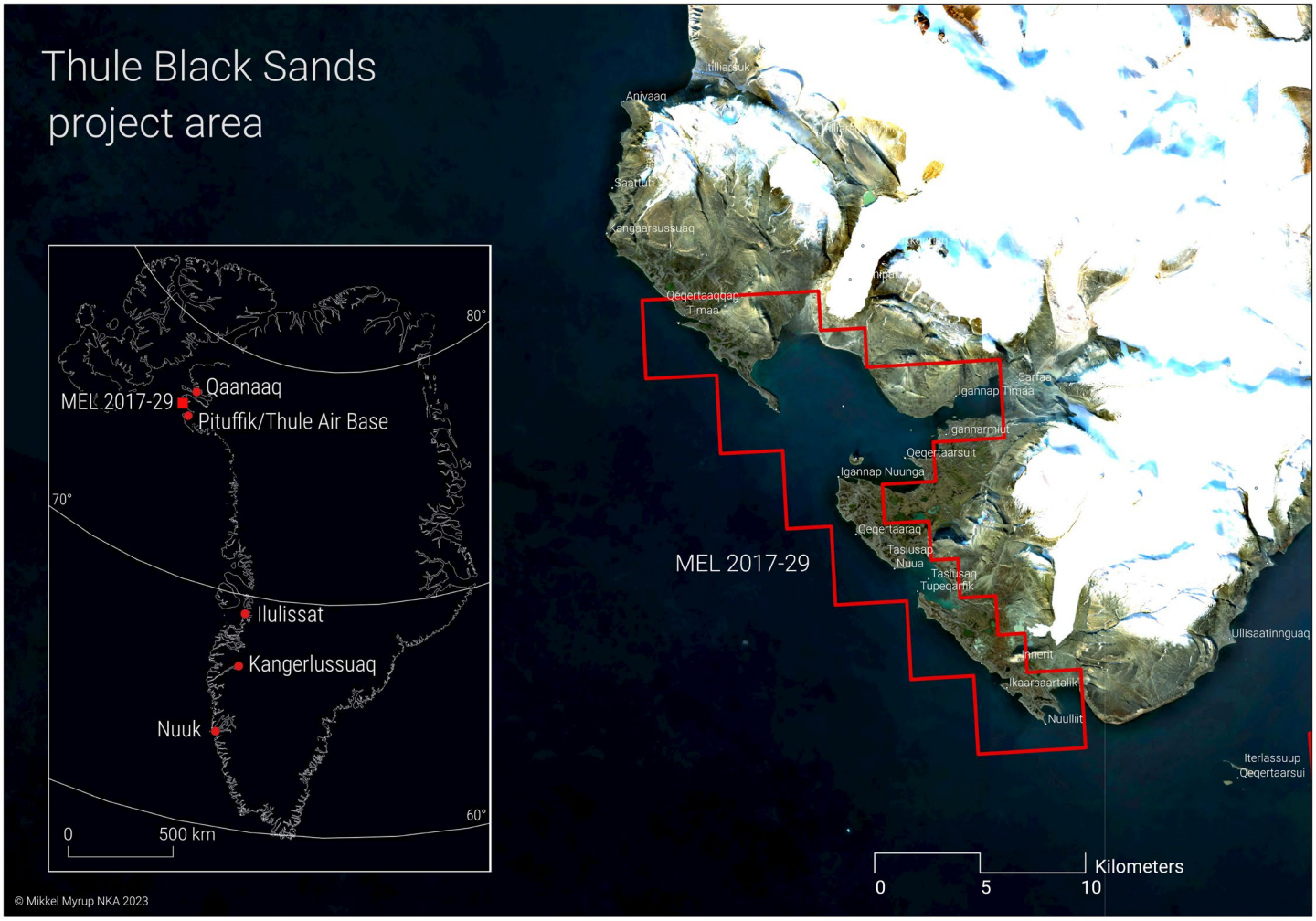
1.1. Project Description

The Thule Blacks Sands project is aimed toward mining the mineral ilmenite. Ilmenite is a black iron-titanium oxide with a chemical composition of FeTiO3. It is an accessory mineral in igneous rocks, sediments, and sedimentary rocks. Ilmenite has a high resistance to weathering. When rocks containing ilmenite (such as those at Thule) weather, grains of ilmenite disperse with the sediment. The high specific gravity of these grains causes them to segregate during stream transport and accumulate as heavy mineral sands.

Most commercially produced ilmenite is recovered by excavating or dredging these sands, which are then processed to remove the ilmenite grains. Ilmenite is the primary ore of titanium, a metal used to make a variety of high-performance alloys. However, most of the ilmenite mined worldwide is used to manufacture titanium dioxide, TiO2, which is used as an important whitening pigment in paints, paper, coatings, and plastics and as a polishing abrasive.

Located in north-west Greenland, some 80 km south of the regional settlement of Qaanaaq, the Thule Black Sands heavy mineral sands project ('TBS') is situated on the Steensby Land peninsula in north-west Greenland, on the same stretch of coastline as the Dundas Project (Mineral Resource Estimate 117Mt at 6.1% ilmenite). The project has a maiden Mineral Resource estimate of 19Mt@ 43.6% Total Heavy Minerals with an in-situ ilmenite grade of 8.9%, which is found at or near surface on active beaches and raised terraces; this is sufficient to sustain a 10-year mine life at a mining rate of 1.5 million tonnes per annum.[1]

[1] https://greenrocmining.com/project/thule-black-sands-greenland/ Accessed 11 April 2023



The project area subject to the archaeological survey

1.2. Purpose of Study

To complete the required Environmental Impact Assessment and Social Impact Assessment reports the company needs to address and describe a range of defined issues. The purpose of this report is to provide the company with an overview of the archaeology in the license area and to present preliminary recommendations regarding the registered archaeological features in relation to the further development of the project and the activities this entails.

1.3. Field methods

The NKA had two experienced staff members carrying out the archaeological survey. The methods applied were pedestrian survey, in which most of the license area was covered, and the collection of high-resolution UAV data. Standard handheld GNSS equipment was used to determine the coordinates of the observed archaeological features.

The collection of high-resolution UAV data was done only in areas with a high concentration of archaeological features as well as along coastlines with a presumed high incidence of cultural monuments. The output from the data collected using the fixed-wing UAV consist of orthophotomosaics and digital elevation models (DEMs). The

orthophotomosaics were then analyzed for archaeological structures missed in situ and corrections of the recorded structures' coordinates, adding substantially to the total number of observed archaeological structures as well as precision.

1.4. Summary of findings

The survey conducted by the NKA revealed that the license area, as initially presumed, is very rich in cultural monuments. A total number of 694 (N=694) archaeological features were recorded. Of these 212 (n=212, ~31%) features were recorded at Kangaarsussuaq outside of the license area. Although many of the structures probably are of recent use, it is still a significantly higher number compared to what we have previously observed in the adjacent Moriusaq area. Here, 89 (N=89) archaeological features were recorded in a 2018 NKA survey. (Myrup 2018)

Evidence of land use dating from the first Paleo-Inuit migrations to more recent use by the Inughuit is present in the area from Nuulliit in the south to the Kangaarsussuaq headland in the north forming a natural border of the habitable coastal stretch.

Nuulliit and Kangaarsussuaq are the only locations where turf and slab-built winter houses are present. Many tent rings and ubiquitous meat caches are found between these two large settlements. All the structures are situated in the littoral zone, near the high-water mark, as almost all activity was, and still is, oriented towards the sea and the winter ice.

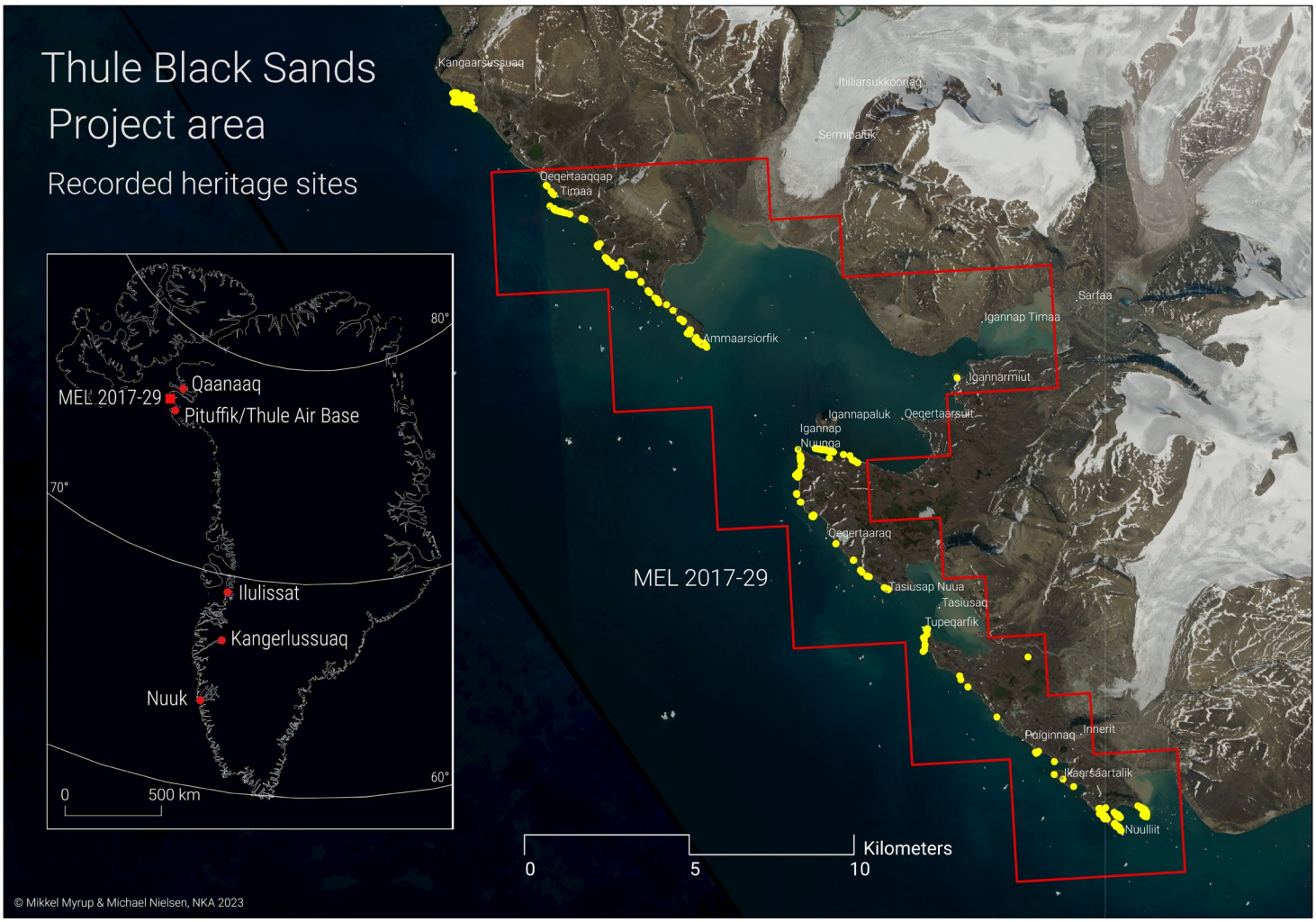
It has been long established that the early Thule Culture settlement at Nuulliit is where we find the highest number of prehistoric Inuit winter houses in one settlement in Greenland. This, combined with the fact that it is the earliest larger Thule Culture settlement, elevates its significance in the narrative pertaining to how the Inuit ancestors of present-day Kalaallit took land.

The establishment of the settlement at Nuulliit as a population and power centre has most probably played a central role in the encounter with the contemporary Late Dorset Culture and its subsequent termination as well as in the initial contact with Europeans in the shape of Norse hunters traveling from Southwest Greenland. Thus, there are still many questions that need answering through further investigations.

For well over half a century, the Nuulliit settlement and its surroundings have been recognised as one of our most important cultural landscapes, and the 2022 NKA survey further cements this fact.

2. Description of the Project Area

The recurring polynya Pikialasorsuaq is also known as the North Water Polynya. The distance between Canada and Greenland in the Smith Sound area is less than 50 km. The region is also known as the Gate to Greenland. Here, all the Inuit migrations into Greenland are represented in the archaeological record. The Early Thule Culture groups who took land in the Avanersuaq area and made Nuulliit a population and power center, entered the island here. As seen on the map below the project area's proximity to the Pikialasorsuaq hunting grounds has made it popular as a staging and camping area.



Project area map showing the distribution of recorded heritage sites in the license area. Map: Mikkel Myrup & Michael Nielsen, NKA

2.1. Environmental context

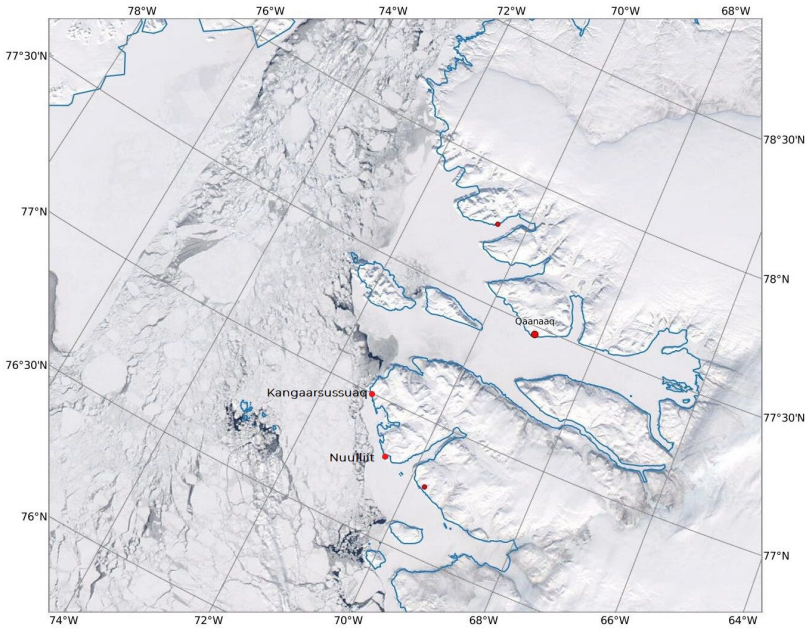
The Avanersuaq area, also known as the Thule Region, is located in the northern part of Greenland and is characterized by its unique environmental context, including sea ice conditions. The region is located in the Arctic, where sea ice cover plays a crucial role in the local climate and ecology.

During the winter months, the Avanersuaq area experiences the phenomenon of polar night, where the sun does not rise above the horizon for several months. This leads to extremely low temperatures and the formation of sea ice. The sea ice cover in the Arctic acts as a critical habitat for a wide range of marine organisms, including algae, phytoplankton, zooplankton, and fish, which in turn support the region's food web. In recent years, the sea ice cover in the Arctic has been declining rapidly due to the impacts of climate change, including rising temperatures and changing weather patterns. The decline in sea ice cover is having a significant impact on the ecology of the region, including changes in the distribution and migration patterns of wildlife, such as polar bears, walruses, and seals, that rely on the sea ice for survival. (Rysgaard, et al. 2019)

The decline in sea ice cover is also affecting the local communities in the Avanersuaq area, including the Inughuit, who rely on the sea ice for hunting and transportation. The loss of sea ice is making it increasingly difficult for hunters to access traditional hunting grounds and is leading to changes in the timing and success of hunting expeditions. (Greenlandic Government 2021)

In addition, the decline in sea ice cover is having wider implications for the region and the planet, including rising sea levels, changes in ocean currents, and impacts on global weather patterns. (Rysgaard, et al. 2019)

Overall, the environmental context of the Avanersuaq area is shaped by its unique geography, climate, and ecology, including sea ice conditions, which are of critical importance to the local communities and have global implications for the planet.



Satellite image (MODIS-Aqua) illustrating the Nuulliit/Kangaarsussuaq area's proximity to the recurrent polynya Pikialasorsuaq, the North Water. The image is from 18 April 2022. *Image: Nasa Goddard Space Flight Center*

2.2. Land Use

The earliest known land use in the Avanersuaq area dates to the Paleo-Inuit period, which began around 2500 BCE and lasted until the arrival of the Thule people in the region around 1200 CE. During this period, the region was inhabited by the Saqqaq and Dorset cultures, who were known for their hunting and fishing practices. The Saqqaq culture is believed to have been the first human culture to inhabit Greenland, with evidence of their presence in the Avanersuaq area dating back to around 2500 BCE. The Saqqaq people were known for their hunting of seals, caribou, and muskoxen, as well as for their use of stone tools and harpoons.

The Dorset culture, which emerged in the region around 500 BCE, is believed to have descended from the Saqqaq culture. Like the Saqqaq people, the Dorset culture relied on hunting and fishing for their subsistence. They were known for their use of bone tools, including harpoons and fishhooks. Both the Saqqaq and Dorset cultures were adapted to the harsh Arctic environment of the Avanersuaq area, and their land use practices reflected this. They were skilled hunters and fishers and were able to survive in the region by using the natural resources available to them. Overall, the earliest land use practices in the Avanersuaq area were shaped by the unique environmental conditions of the region and were focused on subsistence hunting and fishing. (Friesen 2017)

The Late Dorset culture was a significant archaeological culture that inhabited the Avanersuaq area and is believed to have emerged around 700 CE. This culture is known for its distinctive artistic style, which includes elaborately decorated harpoons and other artifacts, as well as its use of stone tools and bone needles. According to Appelt (2003), the Late Dorset people in the Avanersuaq area were primarily focused on subsistence hunting and fishing and relied heavily on the resources of the surrounding marine environment. They were skilled hunters of sea mammals such as seals and whales and also hunted caribou and muskoxen. They were also skilled fishers who caught a variety of fish species using bone hooks and nets.

The Late Dorset culture is believed to have maintained a relatively low population density in the Avanersuaq area, and to have lived in small, mobile groups that moved frequently in search of food (Appelt 2003). They also developed complex social and cultural systems, as evidenced by the elaborate artwork and other artifacts that they left behind.

Gulløv (2015) provides additional insights into the Late Dorset culture in the Avanersuaq area. According to Gulløv, the Late Dorset people in this region were highly skilled at navigating the challenging Arctic environment and adapting to changing climatic conditions. They developed a range of sophisticated technologies and survival strategies to cope with the harsh conditions, including the construction of igloos and the use of dogsleds. The arrival of the Thule culture in the Avanersuaq area around 1200 CE marked the beginning of a period of significant cultural change and the eventual disappearance of the Late Dorset culture. The Thule people were skilled hunters and fishers who relied on dogsleds and boats to traverse the region and access new hunting grounds. (Gulløv 2015)

The arrival of the Thule people in the region coincided with a period of climate change, including the onset of the Little Ice Age, which may have contributed to the decline of the Dorset culture (Bennike 2015). However, it is likely that the Thule people also played a role in the disappearance of the Dorset culture, either through competition for resources or through direct conflict (Fitzhugh 2007). The Thule culture was characterized by a number of technological innovations, including the use of more advanced tools and weapons, such as the bow and arrow and the harpoon with detachable heads (Friesen 2017). They were also skilled metalworkers and were able to craft iron and copper objects using materials obtained through trade with other cultures. Overall, the arrival of the Thule culture in the Avanersuaq area marked a significant turning point in the history of the region and contributed to the eventual disappearance of the Late Dorset culture.

Subsistence hunting is still an important activity for residents in the Avanersuaq area. The Inughuit continue to rely on hunting for their livelihoods and cultural traditions. They primarily hunt marine mammals such as polar bears, narwhals, and walruses, as well as fish and seabirds using a combination of modern technologies such as snowmobiles, rifles, and outboard motors, as well as traditional hunting techniques such as harpoons and nets.

Subsistence hunting in the Avanersuaq area is closely regulated by the Greenlandic government to ensure sustainability and conservation of the region's wildlife populations. Hunting quotas are set each year, and hunters are required to report their catches to government authorities. In addition, hunting regulations and practices are informed by traditional ecological knowledge and practices passed down through generations of Inughuit hunters.

While subsistence hunting continues to be an important part of life in the Avanersuaq area, it is important to note that not all residents in the region rely on hunting for their livelihoods. Many residents of the region work in areas such as public administration, public utility companies, health services, education, and tourism.

3. Previous Archaeological Investigations

Nuulliit is the only location in the MEL2017-29 license area that has been subjected to archaeological excavations. Archaeologist Erik Holtved of the Danish National Museum investigated the location when he carried out field campaigns in Avanersuaq in 1946-47. Holtved and his assistants identified sixty-two winter houses at Nuulliit and performed comprehensive excavations which yielded some of the most significant artifact assemblages for the elucidation of the earliest Inuit settlement in Greenland, the Ruin Island Phase. (Grønnow, et al. 2016)

In the late 1950'ies count Eigil Knuth initiated a four-season stint of excavations at Nuulliit. Knuth's focus was on the Paleo-Inuit tent rings situated on the plateaus north of Holtved's excavations at the Thule Culture settlement of *New Nûgdlît*. He dubbed this part of Nuulliit *Old Nûgdlît* and spent the seasons of 1958, 1960, 1975, and 1990 here. Mikkel Sørensen has since demonstrated that Knuth's excavations yielded the southernmost occurrences of Independence I and Pre-Dorset Cultures in Greenland (Sørensen 2010)

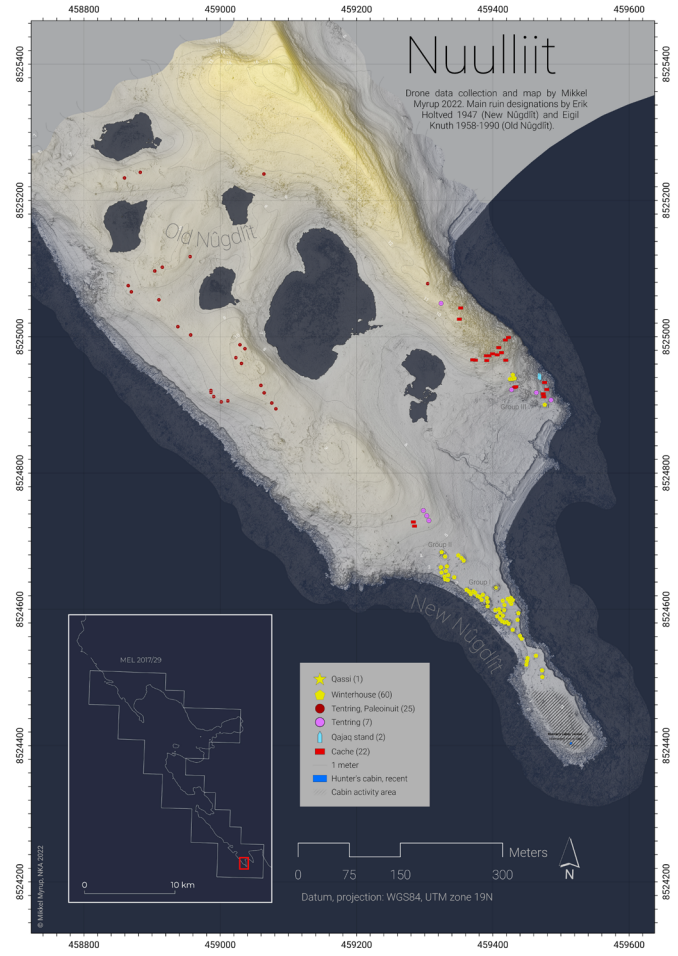
In newer times archaeological excavations have been conducted at Nuulliit under the auspices of the NOW Project in 2015. Here a 36 m² excavation in front of House 30 yielded a plethora of new information, *inter alia* that meteoric iron from the meteor fragments found in the Savissivik area played an important role as raw material for implement manufacture in the earliest Thule Culture period. (Grønnow, et al. 2016)

4. Results of the Investigation

Nuulliit
NKAH3984, 5760, 5761

Download map here and here

Classic Paleo-Inuit and Early Thule Culture site Nuullit, one of Greenland's most important prehistoric settlements. Extensive excavations took place in the 1940'ies, but investigations in 2015 revealed new knowledge about Early Thule Culture life. This site still contains new knowledge about the earliest times of present day Kalaallit's Inuit ancestors. Nuulliit now consists of three heritage numbers, one each for New Nûgdlît, Old Nûgdlît and Group III.



Map generated from data obtained with fixed-wing UAV WingtraOne in 2022. Data resolution: 0,75 centimeter/pixel. Data collection, post-processing and cartography: Mikkel Myrup

New Nûgdlît seen from N. In the background Appat/Saunder's Island and M/V Kisaq. Photo: Mikkel Myrup

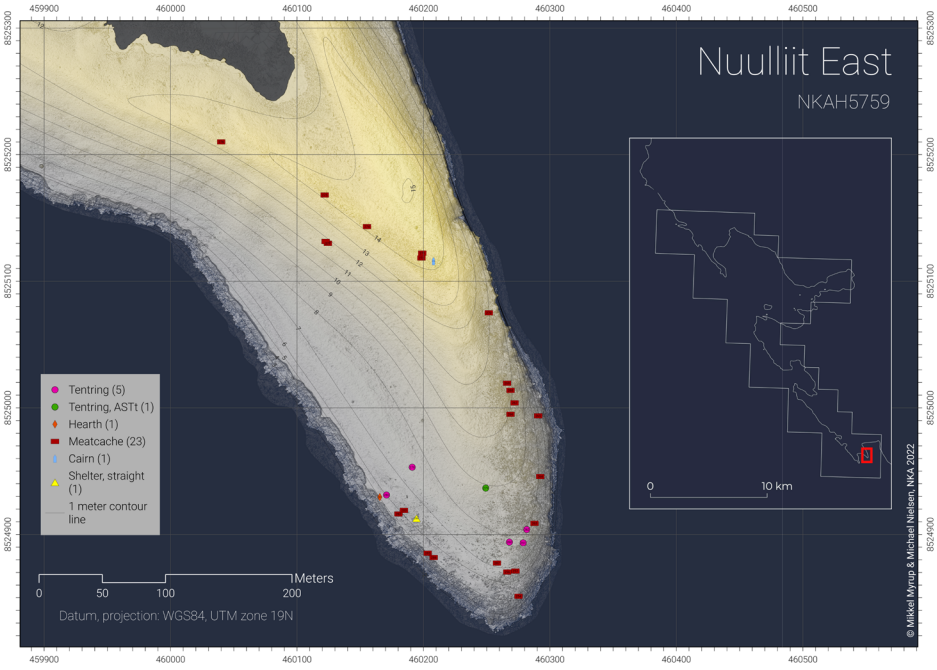
House 30, Qassi (men's house) with the standing oblong rock, in the foreground right part of large whale skull is seen. Photo: Mikkel Myrup

Nuulliit East

NKAH5759

Download map here

Tent ring with possible mid-passage. New Nûgdlît and M/V Kisaq is seen in the background. Photo: Mikkel Myrup



Tupeqarfik

NKAH5745

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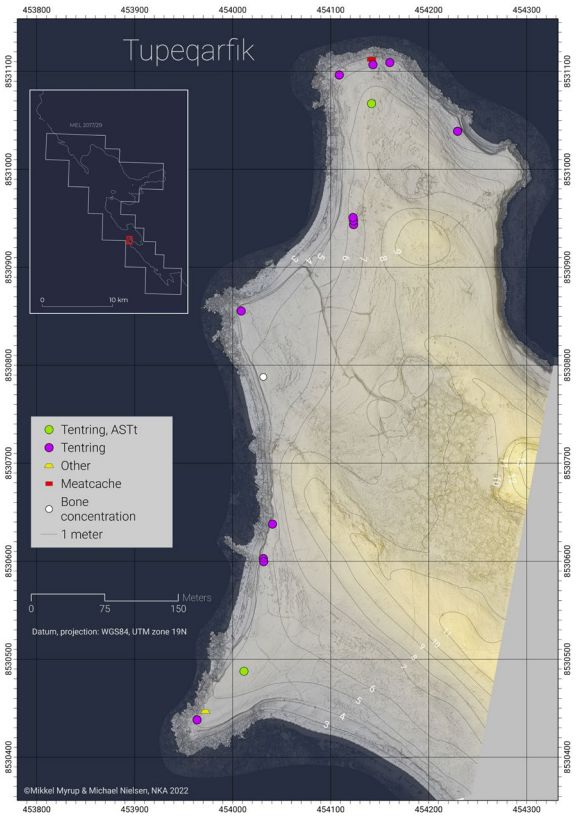
Tupeqarfik means ‘tent place’ and this is what we find here, tent rings. Two of them stem from Paleo-Inuit times.



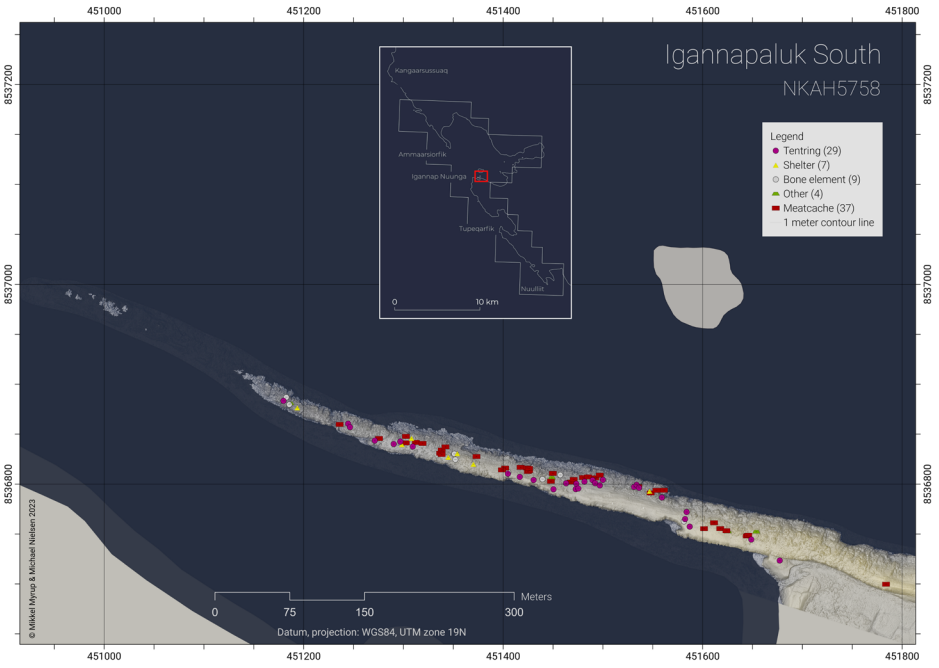
UAV and base station on Tupeqarfik with the characteristic Igannapaluk in the distance. Photo: Mikkel Myrup

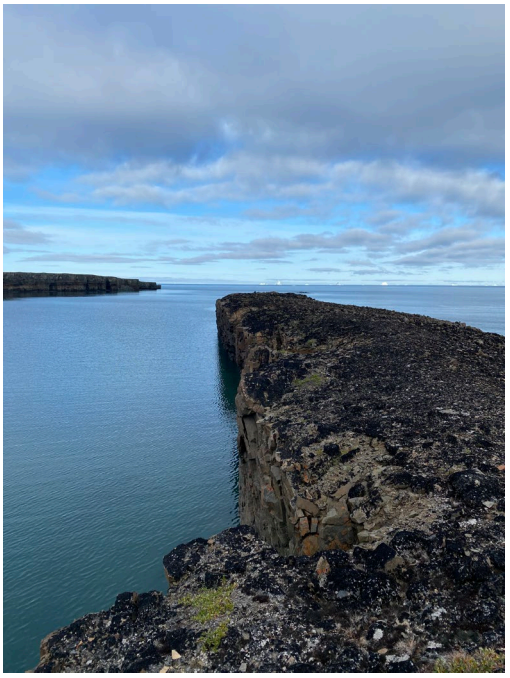
Igannapaluk South

NKAH5758

Download map here and here

Probably a spring hunting camp. Some tent rings and meat caches are of considerable age, others are of recent use. An iron rod, an assemblage of wooden pegs, and walrus bone elements suggest use by the inhabitants of nearby “village” Igannarmiut situated in inner Booth Sound. This settlement was apparently established after the closure and forced abandonment of the Uummannaq settlement near the Thule Air Base. The small houses here have been built with scrap wood and discarded packaging residues covered by green paint and yellow lettering.



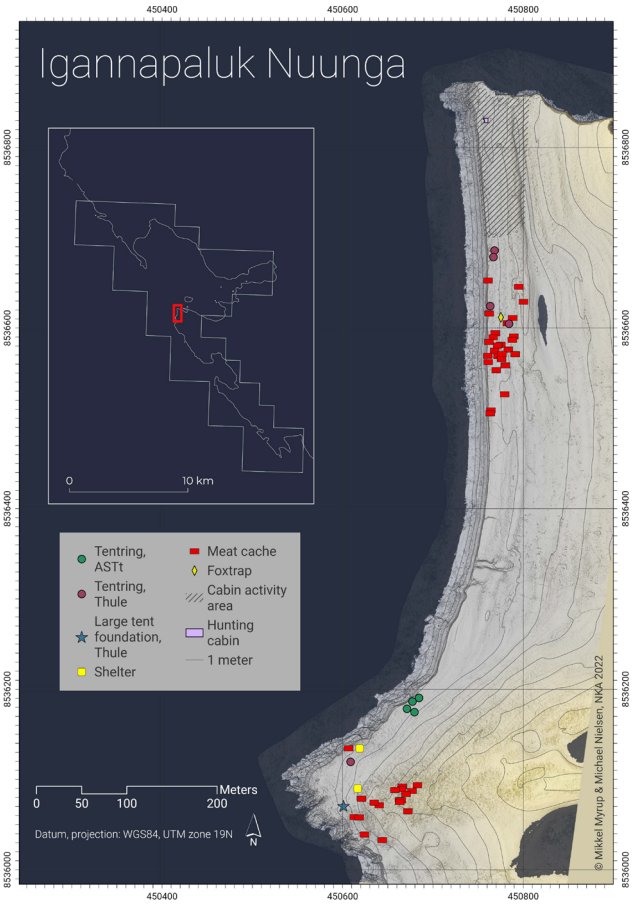


The very distinctive rocky spit just south of Igannapaluk. In the background to the left Igannap Nuunga is seen. Photo: Mikkel Myrup

Igannapaluk Nuunga NKAH5763

Download map here

This site just south of Igannap Nuunga can be described as a spring hunting camp consisting of mainly tent rings and meat caches. Some of the structures are situated right next to the erosion zone above the beach, and this combined with the lichen growth on the tent ring rocks implies a certain age.



Tent ring at NKAH5763 right next to erosion zone, seen from NE. Photo: Mikkel Myrup, NKA

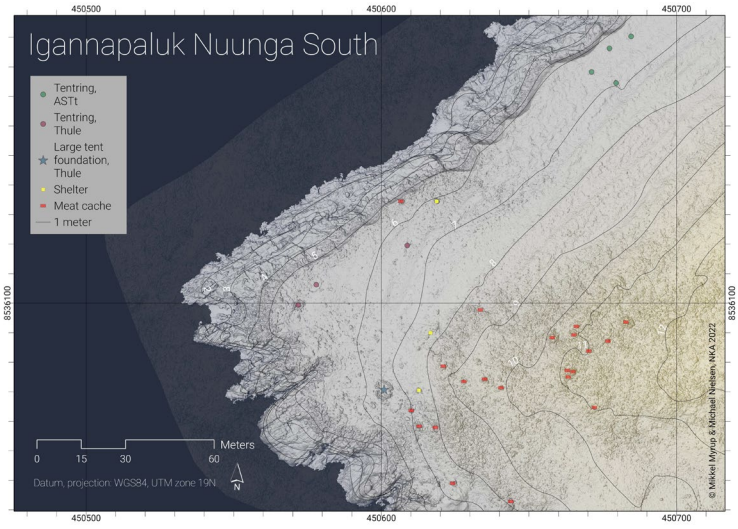
Meat cache at NKAH5763 right next to eroding beach. Photo: Mikkel Myrup, NKA

Igannapaluk Nuunga South

NKAH5762

Download map here

An interesting site consisting of Inuit and Paleo-Inuit structures. Numerous large meat caches in the boulder field east of the settlement area. Round shelter wall largest observed/documented in the Avanersuaq area.



Paleo-Inuit tent ring with mid-passage feature. In the background Igannapaluk. Photo: Mikkel Myrup

Horseshoe shaped shelter wall, a type also seen in the Savissivik area next to the Woman and Dog meteorite fragments find spots. Photo: Mikkel Myrup

Large (c. 10 X 8 m) round shelter wall. Photo: Mikkel Myrup

Ammaarsiorfik

NKAH5764

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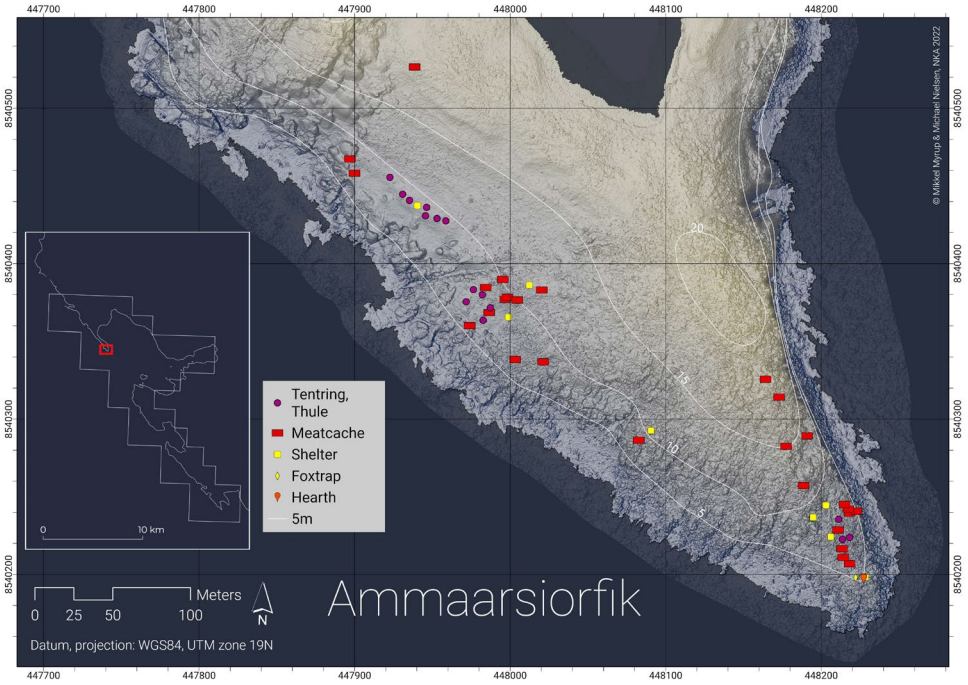
On Ammaarsiorfik two activity areas are found. The northern tent rings seem to be the older ones. The southern tent rings, shelter walls and meat caches could sporadically still be in use.



Ammaarsiorfik II

NKAH5765

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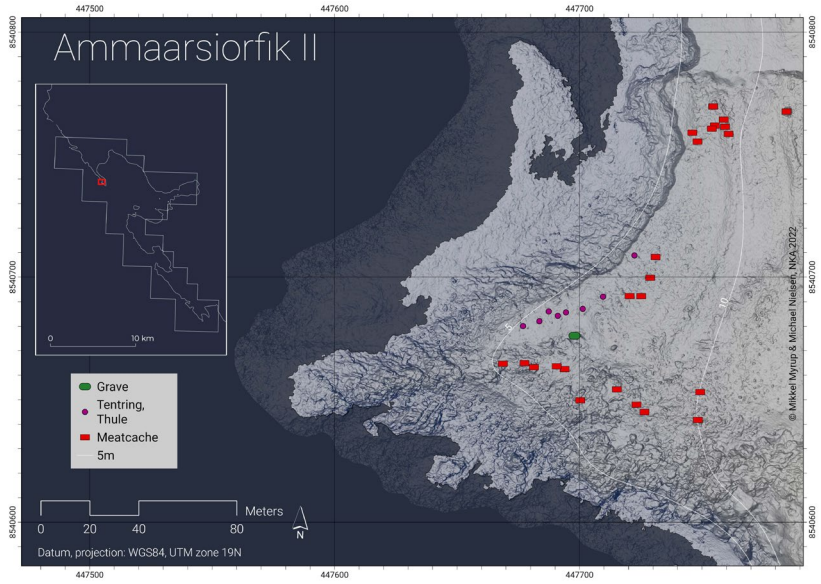
At this northern part of Ammaarsiorfik some of the tent rings and meat caches appear as being of a considerable age. As a very rare occurrence we find a grave containing human remains. A human skull and what appear to be a walrus rib was visible through a hole in the stone constructed grave.



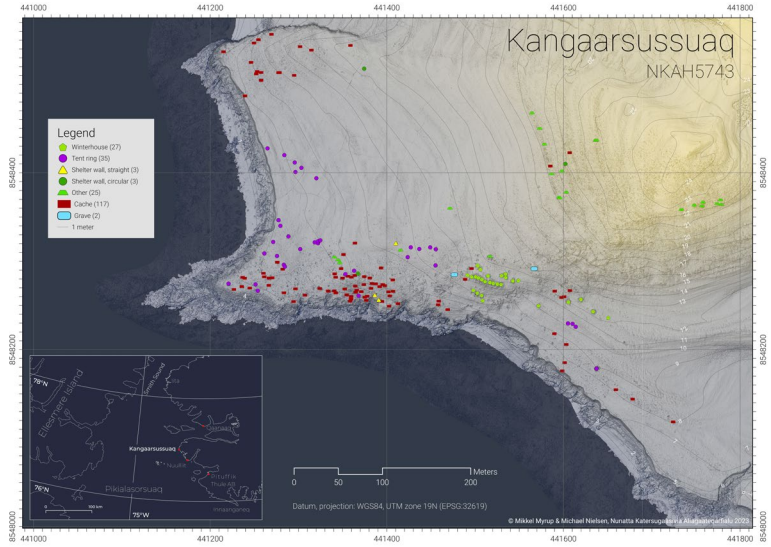
A single human skull was observed in the grave lying next to a walrus rib. Graves containing human remains are rarely seen in Avanersuaq. Photo: Mikkel Myrup

Kangaarsussuaq

NKAH5743

Download map here and here

The large settlement Kangaarsussuaq is situated outside the license area. This site, with its 212 recorded structures, is only surpassed in size by Nuulliit. Furthermore, it is not present in the archaeological literature. At least one grave containing human remains was observed here. Winter house architecture not observed anywhere else in the area.



Archaeologist Michael Nielsen standing in one of the Kangaarsussuaq winter houses. Notice the huge slabs incorporated in the construction. The NKA is looking forward to further investigate these unusual structures. Photo: Mikkel Myrup

Grave containing at least one human skull. Photo: Mikkel Myrup

5. Conclusion and Recommendations

The mineral license MEL2017-29 is situated in one of our most important cultural landscapes. This was known even before the NKA carried out the archaeological survey in August 2022 as the classical site Nuulliit constitute the southernmost part of the license area. Several previously unrecorded sites were identified in the 2022 campaign further elucidating prehistoric and historic land use and enhancing the cultural significance of the area.

The archaeological survey established that all the identified heritage sites in the license area, except some at Nuulliit, are situated in the extreme littoral zone, in most cases almost right up to the high-water mark. The reason being off course that all activities are oriented toward the sea and winter ice.

The introduction of the high endurance UAV system equipped with an advanced sensor making it possible to collect high resolution data of large areas is basically a new method for scanning the landscape in a hitherto unseen quality. This mean that we have unprecedented knowledge of the position of all recorded archaeological structures enabling us to make well informed decisions and identify appropriate solutions concerning possible construction of, for example, extractive infrastructure. This applies to the entirety of MEL2017-29 except its southernmost part, the Nuulliit complex of settlements and the other identified settlements as illustrated in the map material above. At Nuulliit, it is not possible to conduct activities related to exploration and extraction without inflicting damage on the cultural landscape.

The NKA has the following recommendations regarding future activities in MEL2017-29.

The Company is urged to abstain from destructive activities in the close vicinity of the culturally important Nuulliit complex of settlements.

It is recommended that the Company collaborate closely with the NKA on any future construction work as one will find protected cultural heritage along most of the coastline in MEL2017-29.

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