Ambiguous Matter: The Life of Mine Waste

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Abstract

This paper explores mine waste that originates from resource extraction by specifically focusing on waste rock, tailings, dust and material culture from the resource extraction industry. By drawing on examples from fieldwork, archives, local media commentary and limited interviews from two iron mining regions in Arctic Norway and sub-Arctic Canada, this paper follows mine waste as it routinely transgresses attempts to be managed. Mine waste spills out of its prescribed sinks, it oscillates between being considered waste to heritage to potentially valuable commodity, and it blurs the boundaries between spaces dedicated for mining and for non-mining. In following these trends, the paper calls for attentiveness to the ambiguous materiality of mine waste and how heterogeneity and excess circumscribe attempts at easy characterization and management of the ubiquitous wastes that come to dominate mining regions. As such, archaeological approaches to studying mine waste can illustrate how mine waste becomes the default, lived-with condition of life in regions dominated by ongoing mining operations.

Keywords: ambiguity, commodity, heritage, industrial archaeology, iron, resource extraction, waste

Introduction – The Heritage of Mine Waste

In 2021, an exhibition entitled *Workhorse* was put up at The Rooms Museum in St. John's, Newfoundland and Labrador, Canada by the Labrador City artist, Tanea Hynes. The exhibit commemorated the artist's experiences of growing up in a single-industrial iron mining town in the boreal forests of western Labrador. The exhibit mediated complex, often contradictory, feelings of home, nostalgia and familiarity with a deep awareness of being stuck in global resource market system defined by exploitation, isolation and environmental degradation (Hynes 2021; Prieto 2021). A central piece in this exhibit was *Cloud* – a photograph of the ever-present stream of smoke emanating from the local iron processing plant that serves as a constant, iconic reminder of living in a town built for mining (Prieto 2021, 5; Figure 1). Recording a by-product of iron processing, *Cloud* presents a set of contradictory meanings and associations. On one hand, it fosters feelings of belonging, identity and memory – a familiar feature in the local landscape. On the other hand, it is amorphous, ominous and threatening – literally hovering over the town. *Cloud* is thus innately ambiguous, and it is that ambiguity that I want to pull through this paper to show how mine waste goes beyond human abilities to control and characterise it neatly and that, instead, it is mine waste that comes to control and characterise mining regions.

<Insert Figure 1>

Bernd Lottermoser defines mine waste as "solid, liquid, or gaseous by-products of mining, mineral processing, and metallurgical extraction. They are unwanted, have no current economic value and accumulate at mine sites" (Lottermoser 2010, 3). Mine waste can consist of "heterogeneous materials consisting of ore, gangue, industrial minerals, metals, coal or mineral fuel, rock, loose sediment, mill tailings, metallurgical slag and wastes, roasted ore,

flue dust, ash, processing chemicals, and fluids" (Hudson-Edwards *et al.* 2011, 376). Specifically in this article, I discuss waste rock, tailings and loose sediments (dust) but also expand the definition of mine waste to also include material culture, "buildings, structures, monuments, tools, weapons, utensils, furniture, art, and indeed any physical item created by a society" (Darvill 2009) specifically to encompass human-made things associated with mineral extraction and processing. A similar move was made by Fredric Quivik (2007) – though in claiming to discuss the historical significance of mine waste he mostly focused on the significance of mine waste infrastructure itself. In this article I want to highlight both the mine waste and all the other things left over from waste generation and how they occupy ambiguous roles in association and place.

Previous researchers have commented upon the associative grey zone between mine waste, heritage and perceived current and future economic uses. This includes scholarship that has pointed out that mine wastes can evoke associations of home and act as involuntary memorials to past generations (Goin and Raymond 2001), solidify community identity (Robertson 2006), facilitate complex and shifting politics over time (Rhatigan 2020) and merit active preservation of mine wastes due to their nature-cultural associations (Bartolini and DeSilvey 2020). Living among former industrial sites also fosters diverse and often ambiguous community memories and heterogeneous associations that cannot be reduced into a homogenised whole (Storm 2014; Wråkberg 2019). As such, in active and former mining regions human and nonhuman actors have to negotiate with mine waste in how future development is imagined and carried out (Kojola 2020; Measham *et al.* 2021), how some mine waste becomes revalued from waste into potential products (Quivik 2013; Bleicher *et al.* 2019) and how persistent legacies of mine waste are managed and cared for (Hudson-Edwards *et al.* 2011; Ureta 2016a; Ureta and Flores 2018), possibly for an eternity as the heavy

materiality of mine waste becomes an ever-present reality for all future generations (Beckett & Keeling 2018; Keeling & Sandlos 2017).

Building on this work, this paper focuses on the unruly materiality of mining waste itself by taking inspiration from a recent call to rethink heritage away from a realm of human management and expectations for it to evoke positive associations, in favour of a definition that includes all human legacies, regardless of their perceived beauty, value or human significance (B. J. Olsen and Pétursdóttir 2016; see also B. J. Olsen and Vinogradova 2019). Thus, the goal for this paper is to highlight how mine waste, through its heterogeneity and excess, exhibits its own more-than-human ambiguity that comes to characterise mining regions.

As such, I draw upon the landscapes of two open-pit mining regions: the aforementioned western Labrador, Canada, divided into the towns of Labrador City and Wabush, home respectively to the Iron Ore Company of Canada (IOC) and Scully Mine – both of which are currently active – and Sør Varanger municipality in Norway, home to the currently-mothballed Sydvaranger iron mine with its associated industrial communities of Bjørnevatn and Kirkenes (Figures 2 and 3). These case studies offer similarities as single-industrial, iron-mining communities in Arctic/sub-Arctic settings with large settler populations on traditional Indigenous land, while at the same time providing contrasts between ongoing and mothballed operations in countries with slightly different policies and legislations. However, this paper does not seek to compare different forms of waste management in the two case studies or their perception across borders, but rather to build a unified account of how waste acts beyond human performances of care and management (Ureta 2016a). As such, this research is situated within a larger body of work on contemporary archaeology on such industrial towns across Canada, Norway and Russia (see Venovcevs 2020a, 2020b, 2022, in press; Venovcevs and Williamson 2022). Research within

these regions has included a combination of archival sources, local media accounts, limited interviews (as allowed by changing COVID restrictions and university best practices) and archaeological surveys that consisted of both systematic fieldwalking and recording as well as my own phenomenological experiences of the places over a combined total of five months stretching between 2019 to 2022.

As discussed throughout this paper, following mine waste through its solid, liquid, gaseous and semantic interactions reveals the fluid ambiguous nature of this matter stemming from its excessive quantities and heterogenous qualities, such that it cannot be said that mine waste occupies "a series of 'other' spaces, outside of the realm of everyday life" (Harrison 2021, 35). This is not to say that such other spaces do not exist, but rather to point out that there is a productive grey zone in which the stuff from the mines repeatedly seeps out to the point that entire mining regions become "deterritorialised" (Harrison and Sterling 2020) and waste and non-waste start occupying the same social, semantic and physical spaces, creating zones saturated by constant visual, auditory and material encounter with mining and its by-products.

<Insert Figure 2>

<Insert Figure 3>

Mine Wastes – Sør Varanger and Western Labrador

Waste Rock

I start my discussion with waste rock – nonprofitable, non-ore that forms most of the matter generated by an open-pit mine. As has been well established (LeCain 2009, 119–122), the difference between ore and non-ore is socially, technologically and economically determined,

meaning that waste rock, despite the name, is an assorted category consisting of uneconomical overburden, low-grade ores, buried polluted soils and a variety of other objects (including things like antiquated mining material culture) that become buried in the flat-top waste rock plateaus that become the most visible features of mining landscapes.

During a survey of the Sydvaranger mine in May 2021, I realized that neat storage in flat-top plateaus need not be universal, as I came across a series of large heaps of tight, dump-load-sized clusters of rock on top of more orderly placed deposits (Figure 4). Given their location, next to the last ore body mined before Sydvaranger's last shutdown in 2015, I can deduce that they are the remains of disorganised, rush waste-rock disposal from the last months, weeks and days of the site's active use when the company frantically tried to squeeze maximum economic value out of rapidly falling ore prices – as confirmed by local accounts from that period. This trace of a dying mine highlights how archaeology can uncover material memories even among the massive waste-rock piles created through open-pit mining.

<Insert Figure 4>

Such archaeological observations stand in contrast to the company archives of Sydvaranger AS, which are surprisingly mute about the decisions taken regarding waste rock storage during its 90-year-history and so highlight the routinisation of waste creation. This silence is echoed in the *Sør-Varanger Avis*, the local newspaper for Sør Varanger municipality where the topic of waste rock did not appear until the 1970s, 1980s and early 1990s, when a series of pieces asserted that waste rock could be "used for something useful"

(*Sør-Varanger Avis* 1980)[1], "gives work" (Syrstad 1991) or could even be worth billions of kroner (Taranrød 1993). What that "useful" was, however, remained vague – material for buildings and gravel for roads were the most common suggestions – as occasionally practised elsewhere (Kivinen 2017, 7).

The desire to do something with waste rock accelerated with the closure of Sydvaranger mine in 1997, and there was celebration when a small gravel operation started up from 2000 to 2002 to use the waste rock. It shut down in part due to difficulties with the municipality and in part due to the heterogeneity of the rock itself (Jakobsen 2000; Bjørgan 2002; Sandø 2002). Regarding the latter, the waste rock piles were never created with reuse in mind – they were heterogeneous piles, not single, uniform rock. Heterogeneity makes poor gravel compared to specifically quarried rock that could be pre-selected for uniform physical properties and quarried closer to site, avoiding expensive transportation fees (Wikan 2006, 262–263). In recent years a gravel enterprise started up again as a subsidiary of the current owner – but operations remain small and sporadic.

Difficulties in repurposing waste rock highlighted another aspect regarding this material: it is highly localised. As such, it carries with it vagaries of local geology, traces of extractive technologies and strategies of keeping the waste stored and contained (Lottermoser 2010). Unlike ore, which is processed and shipped all over the world, waste rock is highly resistant to transportation – movement needs to be minimised for cost reasons while its reuse

[1] The other option was for the waste rock to be "removed", posing the obvious question of "removed where?" – they were already in their engineered waste rock piles. While waste rock can and is often used as backfill for open-pit mines, the process of carting some matter away from the mine site implies that the mines are destined to remain human-designed landscapes (Berger 2002).

as aggregate is circumscribed by the material's origin as waste. The last attempt to turn waste rock into "something useful" took place in 2009 when it was suggested that the flat, high, barren tips of waste rock piles could form a foundation for wind turbines, though this was never actualised (Sweco 2009).

While ideas of turning waste rock into a valuable commodity were ongoing, questions arose as to their possible historicity. A year before closure of the Sydvaranger mine, a letter to the editor made a call to "take care of the past" and went on to state that it was a matter of national interest to protect both the buildings and the waste rock piles as traces of the mining industry (Fløtten 1996). Similar thoughts were expressed in the wind-turbine proposal that questioned if the waste rock piles are heritage and if the construction of wind turbines would harm their heritage value (Sweco 2009, 17–18). While waste-rock piles were never offered formal protection, in interviews with some of the retired miners from Sydvaranger they acknowledged that waste-rock piles could be thought of as something like monuments to their labour. Similar associations have been documented elsewhere, where people living in the shadows of waste piles considered them heritage of past generations of miners or even naturalised them as taken-for-granted features of the local topography (Goin and Raymond 2001, 38–39; Robertson 2006, 57–63; Bartolini and DeSilvey 2020).

Such discussions disappeared from community print media after 2009 with the reopening of the Sydvaranger mine. They were replaced with a new rhetoric of threat focusing on waste-rock piles impinging upon open access to land, reindeer herding and Indigenous rights, interests of cabin owners and skiers, and even its existential threat to Bjørnevannet – a lake that gives the mining community of Bjørnevatn its name (Grønvik 2014, 2019; Henriksen 2013; B. W. Olsen 2014). It seemed that since the ore in Sydvaranger once again had economic value, no heritage or economic considerations for waste rock needed to be found. Rather, waste was on the verge of spilling out and constraining cherished viewsheds,

recreational access, traditional cultures and toponymic identities. In fact, spills – visual, material and chemical – are the biggest concern and are regular occurrences when it comes to waste rock and its storage (Lottermoser 2010; Hudson-Edwards *et al.* 2011). Interestingly, the rhetoric of threat has not dissipated, with the most recent concerns arising from the speculated mine reopening, which would double the height of waste-rock piles (Sundland 2019) and so carry with them a visual spill for the people who must live in the shadow of waste rock.

It would thus appear that waste rock at Sydvaranger occupies a position of ambiguity when it comes to living in its presence. Potentials of renewed mining, hopes for turning rock into something useful and questions about its historicity with respect to the former miners all conflict, making it difficult to create coherent characterisations. At the same time, the waste rock's size and heterogeneity further make it difficult to create a clear and single narrative.

Similar heterogeneous qualities are emerging in western Labrador where, for example, in the early years waste-rock piles were seen as a convenient place to deposit domestic garbage (Royal Commission on Labrador 1974, 691–692). Beyond this, however, waste rock has not stimulated a great deal of public discussion. possibly in part because most waste-rock piles are quite far from the mining communities themselves. Another reason is that mining is still ongoing, making waste rock a taken-for-granted lived-with reality of these communities. However, as I discuss below, distance and taken-for-granted-ness fade when it comes to particles and objects carried out of the mines.

Tailings

Tailings come from the other part of the waste rock equation. Ore-bearing rock that does not get piled around the mine site gets hauled away to the processing plant, where it is crushed and undergoes a series of physical and chemical processes to extract the maximum amount of usable minerals that are then exported. The rest – a slurry of inorganic sand, trace minerals,

processing chemicals, fluxes and flocculants – is tailings. Tailings are also relatively new features. While waste rock dates back to the first Stone Age quarries, from material discarded from the act of making stone tools, tailings are the direct results of the open-pit-mining methods pioneered in the early twentieth century that involved a transition to mass blasting, hauling and crushing of low-grade ore to extract ever-dwindling percentages of usable minerals (LeCain 2009). The mines in Sør Varanger and western Labrador use this method, creating massive fields of fine-particle wastes that Sebastián Ureta referred to as "chemical rubble" to highlight the ongoing, deglamourised, multi-scalar ruination that tailings carry with them (Ureta 2016b).

The production of tailings at Sydvaranger began in 1910 from the ore-concentrating plant in Kirkenes, which dumped tailings into Langfjorden (Holmøy 1974). This was also the year of the first environmental protest, in which complaints were sent to the regional council predicting the destruction of fish life in the fjords and requesting that the tailings not be deposited in the ocean (Wikan 2006, 118). That request was not heeded, and the local fishery declined as a result. This first tailings field lasted the longest, operating for more than half of the mine's active life. However, two more were needed – a larger one in Langfjorden and a final one in Bøkfjorden (Figure 3).

The second tailings field began in 1960 through the construction of a 2000 m tunnel deeper into the Langfjorden (*Sør-Varanger Avis* 1960) (Figure 5). This solution lasted only a decade before serious concerns emerged about silting of Langfjorden, initially voiced by A/S Sydvaranger as a threat to Kirkenes's large, commercial harbour (A/S Sydvaranger 1970; Greiner 1970). The solution was a third tailings pipe running into Bøkfjorden (see Figure 2, above). This was built in 1974 and, according to A/S Sydvaranger, the planned contests of the tailings were mostly quartz and hornblende along with smaller quantities of magnetite, limestone, hematite, apatite, pyrite and "the waste from toilets of approximately 240 people

who have their work in this part of the industrial area" (A/S Sydvaranger 1973, translation by the author). In a 1978 interview, A/S Sydvaranger's plant director said that this was clean sand, although he admitted that no studies had been carried out (*Sør-Varanger Avis* 1978a). It was not until 1995 that it became known that Sydvaranger set the Norwegian record for the release of carcinogenic dioxins and that the Bøkfjorden tailings pipe was impregnated with them (Sandø 1995, 137–138; Lund 2015). This pipe was reused during the latest active phase of mining at Sydvaranger, although currently it is not known if it will be reused if or when the mine reopens[2] (Sydvaranger Gruve AS 2012, 35). Visible evidence of this pipe, which runs under downtown Kirkenes, is scarce, exemplified best by a concrete cylinder and a sign warning boats to avoid mooring in the vicinity (Figure 6) – "hyperart" (Farstadvoll 2019) of Kirkenes's mothballed industrial age.

The discussions around economic and heritage value versus potential threat followed a roughly opposite trajectory from that of waste rock. While the first mention of tailings in Langfjorden in the *Sør-Varanger Avis* was optimistic – reporting on a study of reusing tailings as concrete aggregate (*Sør-Varanger Avis* 1956) – no other mention about the tailings was made until 1971. That year and in those following the newspaper ran various editorials calling attention to the damage being done (*Sør-Varanger Avis* 1971, 1976, 1978b, 1978c; Øvrewall 1984). The timing of this was not accidental, as only when Sydvaranger started the work of redirecting the waste flow out of Langfjorden did the tailings in Langfjorden come to mind – moving from a state of lived-with day-to-day functionality to a problem in need of a fix (B. J. Olsen 2010, 69–72). Issues raised included the destruction of fish habitat, the quality of life of the people living in Sandnes, a historically Sámi community deeper in Langfjorden, and the

[2] Norway remains one of only five countries that still allows dumping of mine waste into the sea.

almost complete closure of the entrance to the fjord itself, presaging similar controversies with more recent mining developments in Norway (Koivurova *et al.* 2015, 31–32). The term "*slambanken*" ("the sludge bank") did not appear in print until 1978, highlighting the emergence of a topological consciousness regarding this landscape feature and crystalising the desire to do something about this "scar" (Storm 2021).

<Insert Figure 5>

Nothing could be done, and by the late 1990s and early 2000s there was an understanding that *slambanken* was there to stay. It did not threaten the fjord entrance and the mass seemed more or less inert (Næss 2000). A set of new ideas emerged: making the tailings valuable, specifically as land for a new shipping area to supply new Arctic oil and gas developments and/or the northern sea route to Asia (Bjørgan 2003). The area even received a new name – "KILA", Kirkenes Industrial and Logistics Area (Jerijervi 2010). Despite high optimism, and even a launch event with coffee and sausages on *slambanken* (B. W. Olsen 2009), material realities interfered again, specifically regarding infrastructure – electricity, water, sewer and road access. There is a steep 100–150 m climb from the tailings up to the hilly plateau that forms the eastern side of Langfjorden, necessitating the construction of a long tunnel to access the area – an unfeasibly expensive proposition for a small municipality. Years of debates, zoning changes and even the allocation of large sums of money in the municipal budget for the construction of infrastructure have not led to any work. A place designed as a sink for waste has proven resilient to becoming anything else.

<Insert Figure 6>

The final attempt at turning waste into value came in the form of tailings reprocessing, a fairly common practice in making old mine waste profitable (Bleicher *et al.* 2019). It was first suggested in the *Sør-Varanger Avis* in 1981, where it was claimed that the tailings were worth billions (*Sør-Varanger Avis* 1981). With great fanfare, in 2016 (a period when the mine was technically shut down) 77,000 tons of iron was shipped off to China, of which half came from *slambanken* and the rest from loose, low-grade waste rock that found a brief moment of economic value (Grønvik 2016, 2017). Despite the publicity, this was never repeated, but this ongoing engagement with tailings challenges previous assertions that they are only there to be avoided, managed or cared for as something inherently threatening (Quivik 2013; Ureta 2016a; Ureta and Flores 2018). The old tailings at Sydvaranger have become a node for visitation, the potential heritage value of *slambanken* has never been discussed in written accounts except for the potential significance of the objects within the tailings. This was mostly limited to the *Gothia*, an early 1900s ship that had sunk in 1944 and was now partially submerged within mine tailings from Sydvaranger (B. W. Olsen 2010; Tschudi Kirkenes and Sør-Varanger kommune 2011). Existence of automatically protected heritage objects within what is otherwise seen as either a menace or a commodity highlights the heterogeneity of what may be mistaken for an undifferentiated material mass. Additionally, parts of *slambanken* also contain less-tangible associations. While it is difficult to get to, requiring a long hike over rough terrain, the people who managed the hike claim to find a sense of peace and quiet within the waste landscape. During my visits to *slambanken*, I also experienced similar feelings while observing reindeer tracks in the summer and rabbit tracks in the winter, pointing toward the more-than-human values of the place.

I surveyed the tailings in Sør Varanger three times, in August 2020, May 2021 and February 2022, limiting my investigations to the first tailings field.[3] Besides a protected shipwreck lying under water, the tailings were a textured place with ample traces of the 2016 attempt at reprocessing (pits, piles, ditches and abandoned equipment) along with other objects like rock deposits, old and discarded things, wayward iron pellets and disused pieces of waste management infrastructure which have themselves become waste (Figures 5–7). The material itself was highly variable, as seen in a 1974 study that revealed varied concentrations of iron across the site (Nystad 1974). It could be said that ambiguity is an emergent property of this place – first from a creation of a sink to take unwanted material away, then from the desire to clean it and then in attempts to find it valuable through waste reprocessing or land repurposing, while in the meantime it accumulated assemblages of valued and unvalued things.

<Insert Figure 7>

Similar characterisations can be seen emerging within the mine tailings in western Labrador. Since the start of mining in the 1960s, two tailings fields operated – one going into Big Wabush Lake from the IOC mine by Labrador City and one going into Flora Lake from the smaller Scully Mine. Excluding a temporary shutdown at Scully Mine (2014–2018), which prompted a brief discussion regarding mining Wabush tailings for manganese (Keating 2018, 20), the mines never faced a prolonged period of closure that fostered the discussions

[3] A full survey is impossible. Only the first tailings field is easily accessible by foot. Estimated together, the tailings in Langfjorden cover an area of 1,000,000 sq m and are 35 m. deep (Grønvik 2017). The tailings deposits in Bøkfjorden are entirely underwater.

seen in Sør Varanger. However, social, economic and environmental changes have led to a growing awareness of the mining legacies accumulating around the twin communities (Hammond 2010).

Similar to the situation in Sydvaranger, the creation of mine tailings – approximately 10,000,000 tons annually at the IOC mine alone (Geren and McCullough 1990, 285) was unremarked and unremarkable in the local media and early promotional material. As one rather extreme example (Pickards Mather & Co. 1968, 6–7), a brochure by Scully Mine did not even show a waste arrow, creating an appearance of a smooth flow chart where capitalist value is realized without any externalities.

That is not to say that mine managers were not concerned about tailings; they were, but largely in an economic sense to maximise the recovery of fine iron particles that escaped into the tailings (up to 20% at the start of mining in the 1960s) (Geren and McCullough 1990, 290–294). Magnetic separation enhanced iron extraction but the tailings still consisted of a slurry of quartz, silica, asbestos, iron and a mixture of other minerals (Hammond 2010, 54). To this, there were numerous inclusions of different fluxes from the pelletising process as well as flocculants that were added to help settle the particles deeper into the lake and help keep the waste in place (Hammond 2010, 56–57). Like at Sydvaranger, changes in mine operations created chemically heterogenous wastes.

Concerns about keeping tailings in place grew slowly over time, from the locals' daily encounters with "red water" surrounding the mines (Hammond 2010, 55–56). Red water, a symptom of concentrations of iron oxides floating in the water, is both a constant reminder of mining activity and a source of ecological alternations in the pH levels that impacts fish and other wildlife to which the residents of western Labrador grew attuned to over time through the ongoing act of living with this waste (Payne *et al.* 2001). Adding flocculants and establishing berms were all attempts to divide the lakes into zones of waste and non-waste,

boundaries which are constantly transgressed (Hammond 2010, 62). This has been a constant struggle, with a constant threat of failure. During my fieldwork in 2021, there was a new and much larger tailings management plan in development at the IOC mine while the Scully Mine tailings were overflowing Flora Lake, creating a waste plateau clearly visible from its associated community (Figure 8). Since both the IOC mine and Scully Mine were operational during my fieldwork, I could only experience the tailings from a distance – the only exception being a brief private tour of the IOC mines in 2019.

<Insert Figure 8>

Dust

Experiencing mine waste from a distance in western Labrador gave me the same lived-with perspective on the mines and their waste as most residents, who also never step inside the mines. These indirect points of contact were seen in the standing structures – specifically Scully Mine, clearly visible from both Labrador City and Wabush and heard in the sounds – the distant noise of heavy machinery was ever present – and felt in the dust blowing off the mine and the tailings (Figure 9).

<Insert Figure 9>

Dust in the mines has been a constant problem since the 1960s, although its health implications, specifically the high concentrations of silica and asbestos, were not realised until decades later (Cabinet Briefs 1979, 149; Hammond 2010, 41–55). However, even before such studies, dust had a constant presence within the communities. Some new hires would leave immediately when they saw people exiting the mine with blackened faces (Darrel Brenton, in

Hammond 2010, 31). Waiters covered in dust was a common sight in the early days as workers earned extra pay by going from the mines straight to their second jobs at the bar (Spracklin 1993). However, as dust-control measures became common in the plants and the mines in the 1970s and 1980s, a new problem emerged – dust from the tailings.

While the tailings were pumped underwater into Big Wabush and Flora lakes, the issues were mostly limited to the water. When tailings accumulated above the water, they became airborne. The tailings' inorganic consistency made it difficult for plants to colonise, letting the dust blow freely into the surrounding areas. Active revegetation initiatives were launched at Scully Mine and the IOC mine in 1996 and 1999 respectively, with the efforts requiring constant care (Pickett 2005; Rio Tinto 2007). This was highlighted in 2004, when a labour dispute at Scully Mine shut down the water systems keeping the dust in check (*53 North* 2004) – without human involvement dust quickly overwhelmed the communities.

More recently, the use of hydroseeding and organic fertilisers has increased vegetation cover on the mine tailings, but there have been further limits to this. A study carried out in the early 2000s found that the tailings at the IOC mine were suitable for only one type of evergreen tree (Hammond 2010, 61). Over my fieldwork, I learned that the IOC has started planting speckled alder (*Alnus incana rugosa*), a prolific Labrador rewilder, as its latest attempt at keeping the tailings from blowing away.

Yet dust continues to make its presence felt year after year, becoming a tangible lived reality for the people who live in western Labrador (Genge 2009; N. Genge and P. Genge 2005; P. Genge and N. Genge 2005). It is a source of constant concern, especially in mid-summer when dry weather and high winds carry lose particles over the communities (Careen 2021). Dust covers every surface (Figure 10), abrades the skin on a windy day, absorbs into trees that dull chainsaws trying to cut them down, and creates a continuous thin archaeological stratum over the entire region, to the point where it can be postulated that the

towns, cabins, plants, people, ground, and all other surrounding things are part of a broader low-level tailings zone.

While this might mean that dust is essentially a negative manifestation within western Labrador, its absence can be unexpectedly alarming for communities that are used to living with its constant presence. One example of this came after the temporary shutdown of Scully Mine – upon restart, locals were happy to see dust rising from the mine again. As such, while unruly and unmanageable, dust's presence can also be a signal economic of activity facilitating a sense of belonging that carries with it mining towns' aesthetic qualities of the material being mined: iron towns become red, coal towns become black, copper towns become brownish and so forth – an industrial patina (Dawdy 2016) upon human and non-human ecology.

<Insert Figure 10>

Material Culture

As mentioned in the introduction, the expansion of the term "mine waste" to include machinery, buildings, tools and other objects of material culture is an unconventional approach but a necessary archaeological intervention to capture the full scope of material iterations that surround contemporary resource extraction. I briefly made mention of this above regarding how both tailings and tailings pipes both eventually become waste.

To further this transition, consider the iron pellet as a boundary object between material culture and more common definitions of mine waste. Pellets are spheroid objects approximately 1 cm in diameter and consisting of approximately 64% iron. They could easily be mistaken for a heavy pebble, but they are wholly anthropogenic objects created from fusing the extracted fine iron powder with a binding agent and, occasionally, a flux. The size,

shape and composition of pellets makes the iron easy for transport to steelworks. In my study areas, pelletising has been ongoing at the IOC mine since 1963, while at Sydvaranger the pellet plant was built in 1971 and demolished in 2012 (Geren and McCullough 1990, 290–292; Arvola 2004, 51).

Pellets made ubiquitous appearances during my surveys. Around Kirkenes, the creation and demolition of the pellet plant makes them a tight chronologically diagnostic artefact – a piece of the past that no longer gets produced in the region. Heaps of pellets along with stray, isolated examples litter the Sydvaranger plant in Kirkenes, dump areas behind the plant and within the tailings fields, creating highly magnetic pellet strata covering entire hillsides. These once-valuable objects within global iron commerce have slipped into waste with the changing business models of Sydvaranger's owners. In western Labrador, where they are still being actively produced and exported, pellets become stray pieces of litter. Small and ubiquitous, they can be transported out of the production site easily in boots, clothing and vehicles and deposited in the surrounding area. During my fieldwork, I observed pellets on streets, trails and parking lots creating indirect material encounters of living with the iron mining industry.[4]

Like pellets, buildings and equipment often also occupy ambiguous space between waste, commodity and heritage value. In the current case studies, this is best exemplified by the material from the Sydvaranger mine. When the mine closed in 1997, there was a massive

[4] Pellets can also serve as souvenirs. They are sold or given out at iron mines – imparting a piece of material memory of the encounter with mining to the visitor. I too have collected a handful of discarded pellets behind the Sydvaranger works in Kirkenes – I keep them in a jar on my desk. Thus, pellets can simultaneously occupy a space of waste, commodity and memory object.

auction to sell off all the assets which was summarised in a 1644-line itemised catalogue that included everything from office chairs to excavators, to nuts and bolts (Butcher 1997). Despite the sale and frantic attempts to save the most representative pieces of equipment for the museum, just a few years later a local museum curator decried the amount of stuff left over from the mining operation that included old and new standing structures, unsold antiquated equipment and kilometres of infrastructure that was impossible for the local museum to handle adequately (Arvola 2004).

Controversies on what and how to preserve persist to this day (e.g. see Abarkach 2021). Some buildings are informally protected: these include Rørbua, a bathhouse inside the Sydvaranger mine; an excavator bucket-turned-bus-shelter in Bjørnevatn; and the locomotive building in Kirkenes.[5] Others, such as the old ore crusher building, are "preserved as a ruin" and allowed to decay gradually without intervention (Berg *et al.* 2016, 293). A few, like the 1970s pellet plant, have been torn down. Over several visits to the Sydvaranger mine, I observed a wide gradient of how individual buildings were cared for – with some boarded up and abandoned, some rented out and some still partially in use. This creates an anarchic patchwork where excessive, abandoned, wasting buildings stand next to those that are formally protected as heritage and those that are mothballed or rented out, all located within the boundaries of a mine that might restart.

Such convoluted configurations are mostly absent from western Labrador, as the buildings at the mines and municipalities remain in use, although not without cracks. One example is the Wabush Mall, a large structure built as a commercial centre for an affluent mining town but mostly abandoned during the temporary closure of Scully Mine and never

[5] Retrieved from the Norwegian cultural heritage registry (https://askeladden.ra.no/). For more information about the bus shelter see Valestrand (2014).

revitalised. Its empty shell stands as a constant reminder of the past downturn within the central part of the town.

Given the lack of examples among the machinery and structures of mines within western Labrador, the material culture of the mining industry was approached from a more indirect perspective – by engaging with the objects and infrastructures within and around Labrador City and Wabush (Venovcevs 2022, in press; Venovcevs and Williamson 2022). These included places like runways, mine survey camps, railroads, gravel pits and an abandoned hydroelectric dam – some of which fell within the guidelines for formal archaeological protection the Newfoundland and Labrador Provincial Archaeology Office. All these places and the objects within them are the direct result of the arrival and growth of the mining industry in western Labrador and now occupy ambiguous zones between historically protected sites and waste.

The same can be extended to day-to-day litter on the streets of Labrador City and Wabush. For these reasons, I conducted systematic archaeological surface surveys over five outlying areas around Labrador City in June–July 2021 to see the types of objects a contemporary mining town produces as its day-to-day operations and as part of my own archaeological attentiveness to ordinary things that might have otherwise been missed or overlooked without a systematic survey (Figure 3). The areas chosen were frequently traversed but lay outside of streets, parks or other formally managed municipal areas. I fieldwalked these places at one metre intervals and every object was photo documented with a scalebar. Two areas were surveyed twice to account for the receding water levels of high summer, and more objects were found accumulating in this liminal zone. In total, I documented 3003 objects over the five areas (Venovcevs 2022, tables 1–7). The objects consisted of everyday waste from people living within a contemporary mining community –

cigarette butts, beer cans, zip ties, coffee cups, fast food bags and cannabis containers[6] (Figure 11). Most of it was plastic. Out of this assemblage there were two iron pellets.

<Insert Figure 11>

The surface surveys demonstrate two things. First, the surveys are the documentation of everyday waste from a contemporary mining town that habitually escapes formal systems of waste management and human control – a finding made more dramatic by the fact that my most abundant surface survey location, SS2, had a trash can right next to it. The trash can did not prevent the area being covered with stuff. The objects behaved like other forms of mine waste: either getting tapped down like waste rock to form heterogeneous anthropogenic strata – a heritage of sorts – that will persist into the deep future; or, like tailings, being blown away in the wind or washed away in the water to carry the effects of mining away from their place of production, purchase, consumption and primary deposition. In Arctic and sub-Arctic regions like those of my case studies, it could also be said that communities have a material respiration – objects accumulate in the deep snow and ice in the winter and in the dryness of summer only to be carried off in the wetter seasons of spring and fall.

Second, the presence of two iron pellets among the thousands of products from global capitalism highlights that which is not there – mountains, landscapes and traditional territories of Indigenous peoples. As places get blasted and dissolved for iron that is shipped off-site to the opposite ends of the world, what remains is excessive amounts of ambiguous matter: towering piles of waste rock, spilling fields of tailings and multitudes of material culture. This

[6] Cannabis has been legalized in Canada since October 2018 and is sold at government-regulated stores in clearly identifiable packaging.

is material that will always occupy space between control, heritage and commercial value – unruly matter for, by, and of resource extractive regions.

Conclusion – Heterogeneity and Excess

Discussing the complexities for a potential reopening of the Sydvaranger mine, Urban Wråkberg has highlight the need to understand "the heterogeneous and politically divided social reality that this place exhibits" within the sphere of collective memory among Sør Varanger's diverse population (Wråkberg 2019, 2). In a similar vein and with similar social, political and economic implications, the waste-based materiality of Sør Varanger and western Labrador needs to be taken seriously. As highlighted repeatedly through this article, it is in part the materiality of discarded mine material that destabilises potential futures and transgresses the prescribed boundaries it is placed in. There is a methodological intervention here through the focus on ambiguity to highlight the need to take this materiality seriously and to acknowledge the muddled boundaries between categories such as waste, codified heritage and valued commodity. In so doing, two threads emerge from the preceding discussion – heterogeneity and excess.

As pointed out by discard studies scholars (MacBride 2012; Liboiron 2014, 2021; Lepawsky 2018), one of the defining characteristics of contemporary waste is its heterogeneity. This is equally true for waste from the extraction of resources, which demonstrates heterogeneity both in its composition and geographical extent. Whether it be piles of waste rock that cannot readily be turned into gravel, tailing fields that create chemically varied flats or the diverse afterlives of things used and discarded by miners, mine waste presents a highly differentiated assemblage of material and forms human management or care. Likewise, through their perpetual spill, mine waste transgresses its prescribed boundaries and settles across the wider region in a series of patchy traces of greater or lesser

concentrations of matter that erode the distinctions between waste and non-waste, inside and outside of the mine.

The second factor – excess – is a more relative term wherein again material composition of waste matters. The iron-mining waste described in this article is relatively benign compared to substances such as copper, nickel, gold, uranium, bauxite and a variety of other minerals that will generate new and more problematic wastes in the future (Hudson-Edwards *et al*. 2011, 378–379).[7] Excess is a relative term, in that a small amount of nuclear waste can be as problematic as tons of iron processing waste. My conceptualisation of excess is when the material accumulates to the point where there is too much of it to be easily handled – when the waste cannot be restricted to another place and exposes nearby humans and non-humans into constant visual, audial, olfactory and bodily encounter with itself. There is a desire to do something with it, but what that something is remains undefined and uncertain.

In iron-mining country, iron and iron-mining waste become the defining feature of the region – it dominates the horizons, it fills the air, it glistens in the snow, it echoes in the vestiges of mine survey camps, quarries and the abandoned power plants that supported the development of mining regions (Goin and Raymond 2001; Robertson 2006; Staniscia and Yuill 2017; Venovcevs 2020c, 2022, in press; Venovcevs and Williamson 2022). It even penetrates bodies to the point that humans, fish, reindeer, plants and fungi become living vectors of this perpetual spill. In mine country, we do not sublate waste; waste sublates us[8].

[7] The introduction of plastics into remote boreal forest environments, however, is anything but benign.

[8] With inspiration from (B. J. Olsen 2003, 93).

To live with mine waste is to live in a constant ontological grey zone dealing with fluid and enduring material.

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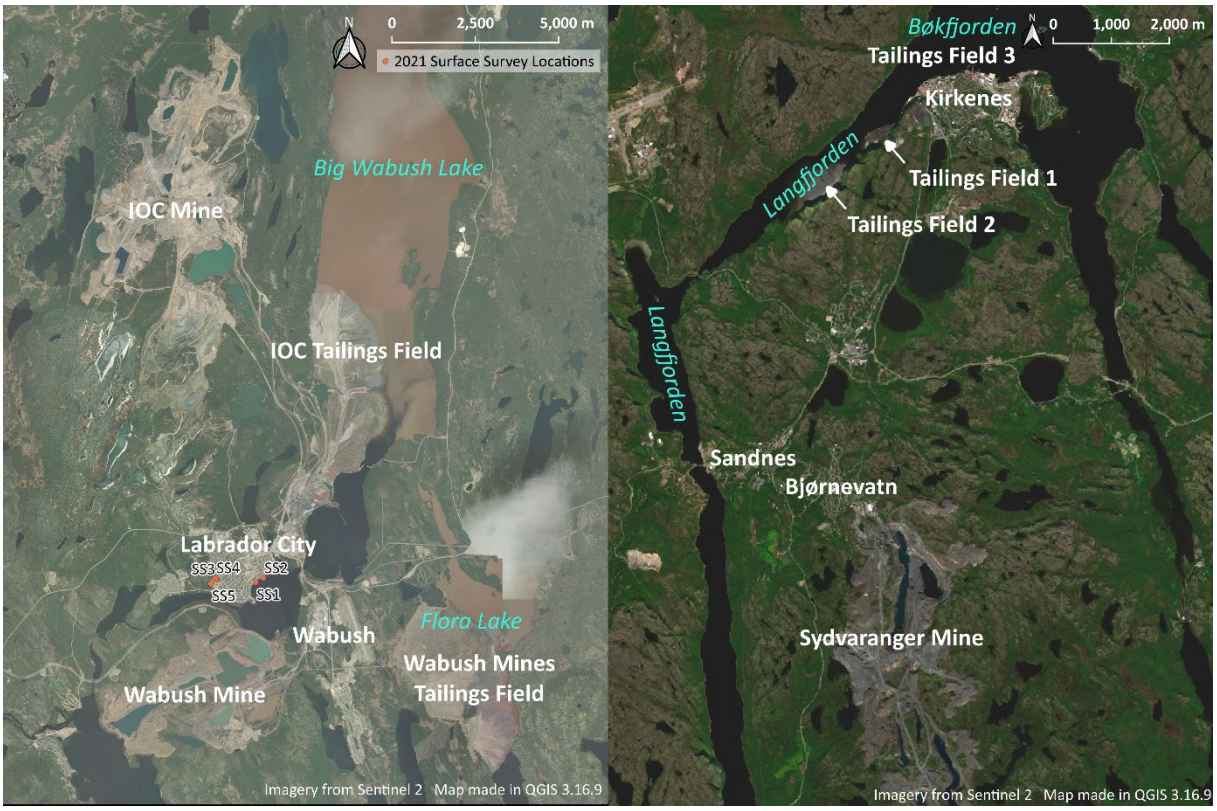

FIGURE 1. *Cloud*, by Tanea Hynes (reproduced with permission).

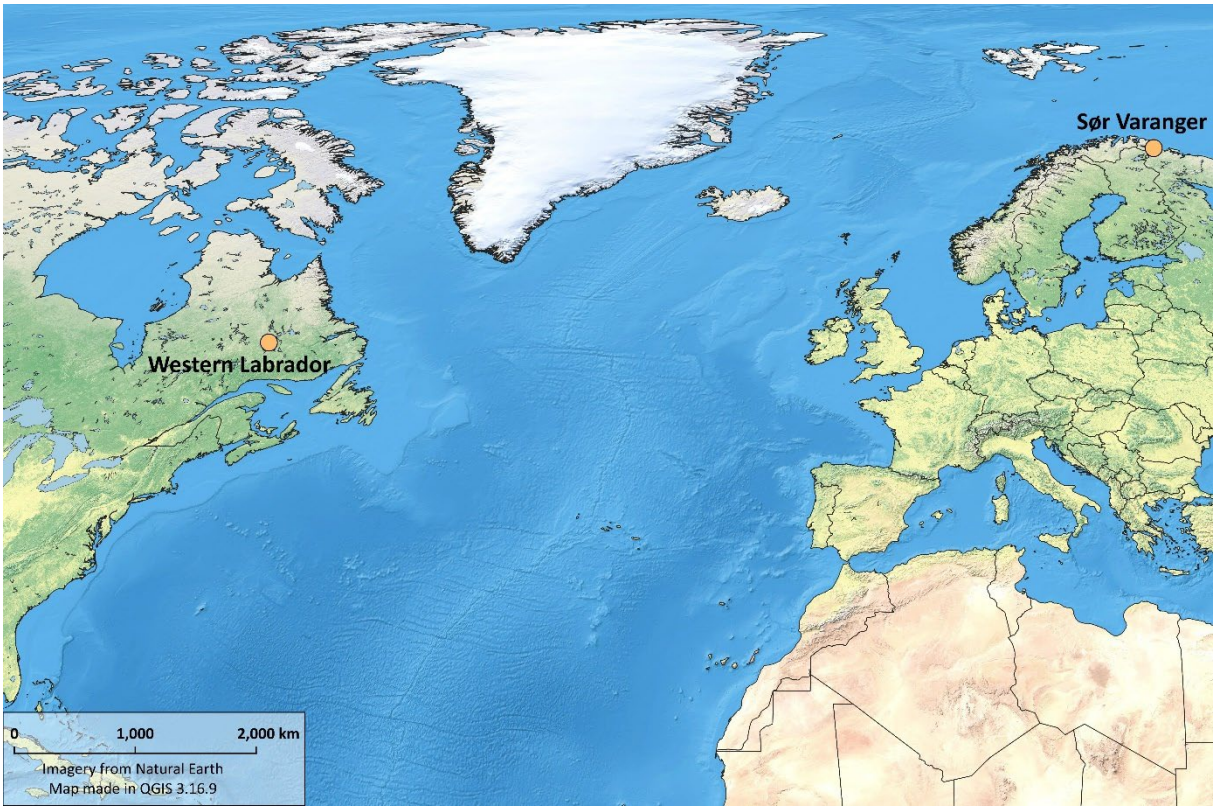

FIGURE 2. Location of western Labrador and Sør Varanger(map by author).

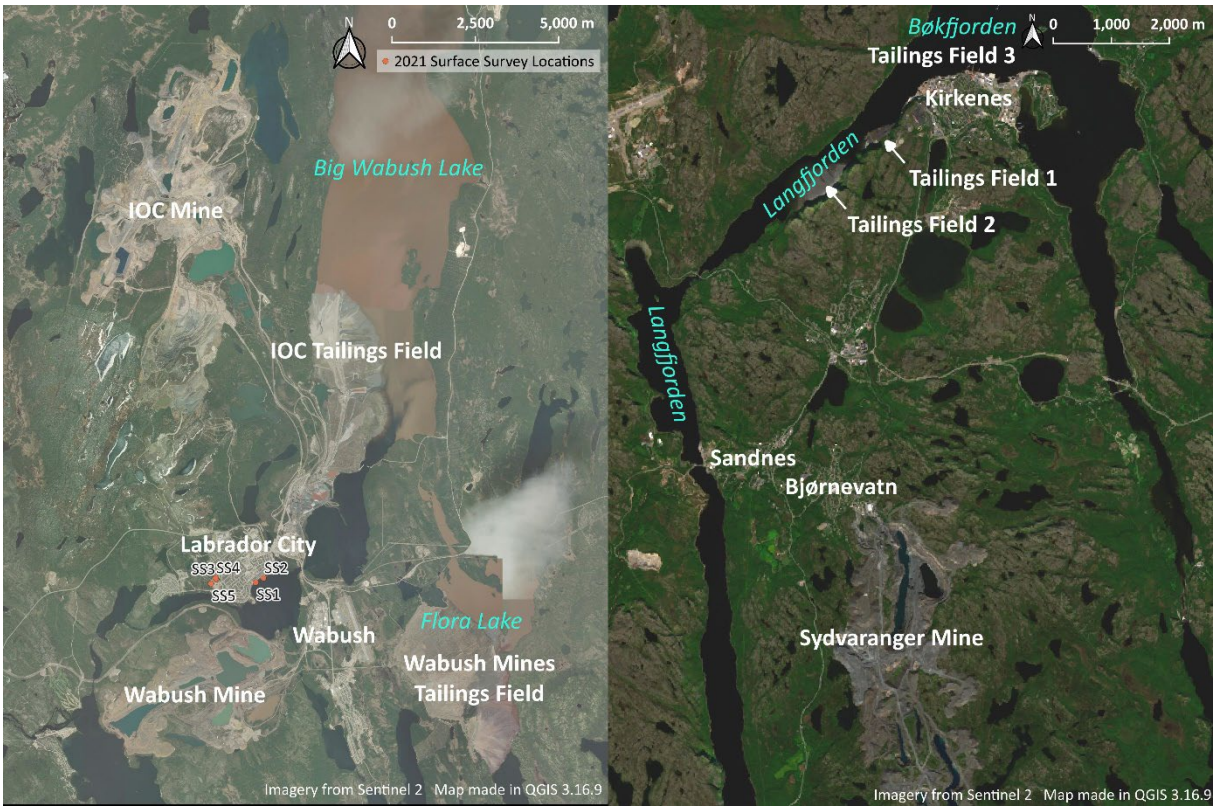

FIGURE 3. Close-up of western Labrador (left) and Sør Varanger (right) and associated mine wastes (maps by author).

FIGURE 4. Mine waste from the last active phase of mining at Sydvaranger (May 2021, photograph by author).

FIGURE 5. 1960s concrete mine tailings tunnel at Sydvaranger (July 2020, photograph by author).

FIGURE 6. One of only two aboveground traces of the 1974 tailings pipe running from the Sydvaranger plant into Bøkfjorden; picture taken on the Kirkenes waterfront (May 2021, photograph by author).

FIGURE 7. Slambanken (July 2020, photographs by author).

FIGURE 8. Tailings field in Flora Lake stretching across the horizon, seen from the town of Wabush (July 2021, photograph by author).

FIGURE 9. Dust from the Scully Mine tailings blowing through Labrador City (June 2021, photograph by author).

FIGURE 10. My first personal encounter with dust in Labrador City (May 2019, photograph by author).

FIGURE 11. Surface survey objects from Labrador City, the solitary iron pellet is on the bottom right (June–July 2021, photographs by author).