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**Department of Natural Resources**

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# Red Dog Mine and Aktigiruq-Anarraaq Extension Project Field Inspection Report

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| **Inspection Date:** | July 24, 2024 |
| **Time:** | 8:30 AM to 3:40 PM |
| **Weather:** | Sunny with clear skis and a slight breeze of 5 to 10 mph with a temperature fluctuating around 68°F. |
| **Agency Personnel:** | DNR: Aaron Kruse and William Groom<br>SOA Department of Law: Dana Burke |
| **Teck Personnel:** | Frank Bendrick and Pam Garrity (H125 Pilot) |
| **Inspection Objectives:** | Site Inspection |

## Operations:

This report will incorporate two separate operations, both of which operate in the same region of Alaska and are subsidiary corporations of Teck Resources Limited. The first is Red Dog Mine, which is located approximately 81-miles north of Kotzebue within the DeLong Mountains of the Western Brooks Range operated by Teck Alaska, Inc. (TAK). The mine's footprint resides primarily on Northwest Arctic Native Association (NANA) lands and one state upland mining lease located on the southeastern edge of the tailings storage facility (TSF). Red Dog Mine is an open-pit truck-and-loader operation, which milled approximately 540,000 tonnes of concentrate in 2023, and is one of the world's largest zinc producers.[1]

Just north of the mine, about 9-miles, is the Aktigiruq-Anarraaq Extension Project (AAEP) operated by Teck America, Inc. (TAI). The exploration project is situated west, along the upper reaches of Ikalukrok tributaries within the Wulik River drainage of the DeLong Mountains. The main deposit resides on state claims with access from the mine crossing between state and NANA lands. This area is a Sub-Arctic environment underlain by permafrost with vegetation generally comprising of dwarf birch, willow, and other lowland type lichens, grasses and mosses typically found near the lower slopes.[2] Currently the AAEP is in the initial stages of developing access to the deposit; however, ongoing exploration and geotechnical drilling continues.

The area around Red Dog Mine is highly mineralized, apparent by the surrounding creeks clouded orange from the natural weathering of sulfides. Regional structural geology is characterized by stacked and

[1] Teck Operations, *Red Dog*, Teck Resources Limited, website available at: https://www.teck.com/operations/united-states/operations/red-dog/ (accessed 11/22/2024)

[2] Teck American Incorporated. (2022). *Reclamation Plan Anarraaq and Aktigiruq Exploration Program*. Appendix B: Phase I – Exploration Access Road and Surface Pad Construction.

folded thrust allochthons with upper sequences containing Jurassic or older mafic and ultramafic igneous, with lower sequences comprised of Devonian through Cretaceous clastic and chemical sedimentary rocks. Stratabound massive sulfides and barren mudstones form the main shale-hosted exhalate deposit, which is superimposed multiple times within thrust fault slices. Mineralization is syngenetic with respect to sediment deposition and is weakly enriched upward in lead relative to zinc.[3] The current mine life of Red Dog is expected to continue through 2031 with existing deposits unless other regional resources are developed to continue operations.[4]

## Field Inspection Plan, Execution and Summary Schedule:

The primary objectives for the Alaska Department of Natural Resources (DNR) personnel were to inspect active disturbance, such as ongoing construction, tailings storage, reclamation, and water management. The inspection plan was designed to allow for selecting additional sites for inspection in an opportunistic fashion, and as time allowed. DNR conducts annual inspections to ensure compliance of both the Red Dog Mine and AAEP Plan of Operations Approvals (F20219958POOA, F20229339POA.01) and Reclamation Plan Approvals (F20219558RPA.2, F20229339RPA.02), respectively, as required under AS 27.19, AS 38.05, 11 AAC 86 and 11 AAC 97. DNR is the lead agency regarding mining activities on state and private land for surface disturbance, water use, and reclamation.

DNR staff arrived via Alaska Airlines charter at the Red Dog airstrip at approximately 4:00 PM, courtesy of TAI on the 23 of July. It's a short bus ride from the airstrip of about 3-miles to the mine's camp where DNR staff attended a safety brief of the mine and its facilities. The following morning DNR staff met with Frank Bendrick to have a brief meeting to review the inspection plan for the mine site and its facilities and to discuss any relevant information before starting the inspection. The inspection began by traveling to the Incinerator Pad/Cold Storage North, adjacent to the eastern edge of the TSF. There, staff met our pilot Pam Garrity who provided a quick safety briefing of the H125 helicopter prior to takeoff.

The inspection began by flying around the south end of the main waste rock dump (WRD) and Qanaiyaq Pit then north to Aqqaluk Pit. From there, we headed northwest following Ikalukarok Creek upstream along the proposed route for the AAEP access road. Upon reaching the AAEP drilling platforms, the helicopter circled while DNR staff photographed the operation. We then traveled west to document cleanup efforts at the LIK site. The helicopter circled over the landfill, buildings, and equipment left from previous exploration activities. Traveling southwest along the Wulik River, we arrived at the port and circled the facilities before flying northeast along the DeLong Mountain Transportation System (DMTS) back to the mine. DNR took photos of several material sites for road maintenance and water draw locations used for dust suppression.

Ground inspections began in the afternoon by driving northwest along Red Dog Creek to the fish weir. Working our way back to the mine, DNR staff documented treated water discharge into Red Dog Creek and then continued east to the mine sump and then returning to the seepage collection for the main dam. We then headed south to inspect the main WRD, Qanaiyaq Pit, and the oxide and cover material stockpiles. Driving east, DNR staff stopped to document seepage collection from two rivulets downslope from the backside of Qanaiyaq South Pit. Next, we headed to the northern side of Aqqaluk Pit highwall overlooking ongoing mining activities before going south to Bons Reservoir and then back north to the Back Dam, DD2 material site, and around the eastern side of the TSF to the Main Dam.

[3] Williams, A, et al. (2017). *Red Dog; Qanaiyaq; Hilltop; Aqqaluk; Paalaaq*. USGS report: Mine site, 168 of 244 in Northwest Arctic Borough Available at: https://mrdata.usgs.gov/ardf/show.php?labno=DL001 (Accessed 11/15/2024)

[4] Teck Operations, *Red Dog.*

## Findings:

A summary of findings can be found below with a description of active sites that were visited. Detailed route maps with areas of interest, including photos of all inspected sites with observations notes, are in Appendix A.

**1. Inspection of Active Areas of Disturbance and Reclamation**

1.1. Along the flight path for the proposed road of the AAEP we observed cribbing from older geotechnical drill pads within the proposed access route (Photo 1). There was no notable disturbance from the geotechnical drilling locations nor was there any indication of construction activities. Upon reaching state land, five active exploration core drilling sites were observed (Photo 2). Each location had the drill rig and essential support equipment elevated off the ground on decks to reduce impacts to the surface. A small laydown yard of equipment, cribbing, and pipe used in support of exploration activities resides just south of the drilling platforms (Photo 3).

1.2. Upon arriving on top of the main WRD, DNR staff observed a reclamation test plot of approximately 17 acres that was seeded in 2017 (Photos 10 and 11). This area has good vegetative cover that has promoted slope stabilization and soil retention. As a comparison, the southern end of the main WRD was seeded last fall, which demonstrates the rate of vegetative growth (Photo 12). Currently, TAK is continuing the closure of the main WRD using a geosynthetic cover to encapsulate waste rock before topping with growth medium and grading. At the time of inspection, only a small portion of the overall area of the main WRD was left to complete for closure.

Using an aircraft, TAK seeded a large area of the main WRD after final grading was completed. Unfortunately, most of the seeds were not able to germinate before washing away from an abnormally large rain event. This caused rills within the prepared growth medium all along the western slope, which increased in channel size as the water moved downslope (Photo 18). The lined ditch running parallel to the base of the western side of the WRD without vegetation contained a considerable amount of eroded soil demonstrating the unstable condition along the slope (Photos 19 and 20).

11 AAC 97.200(a)(1) outlines the criteria for a stable soil condition to "…return waterborne soil erosion to pre-mining levels within one year after the reclamation is completed, and that can reasonably be expected to achieve revegetation, where feasible, within five years after the reclamation is completed…." It is also noted under AS 27.19.020 that, "A mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation leave the site in a stable condition." Current conditions do not meet these standards; however, Mr. Bendrick explained that he was working on implementing best management practices (BMPs) to remediate these issues.

1.3. DNR staff observed the Qanaiyaq Pit which is currently being filled with waste rock (Photo 13). Most of the pit has already been infilled and graded in preparation for closure (Photo 14). The remaining high walls will be stabilized and left in place as part of the final reclamation for the site. DNR staff was not able to visit the Qanaiyaq South Pit due to an active blasting area.

1.4. On the northern side of the mine is the Aqqaluk Pit where current excavation and blasting is taking place. DNR staff traveled to the north end of the pit to view ongoing operations from an overlook point above the highwall (Photo 17). Surveying was also observed at this location for proposed pit expansion.

1.5. The DD2 is an active material site with several stockpiles for construction material adjacent to the southwestern edge of the TSF. All active excavation observed was at the western extent, above and behind the older pits which have since filled with water (Photos 23 and 24).

**2. Water Management**

2.1. The weir installed downstream from the treated water discharge point on Red Dog Creek was inspected. Sheeted cover material over the wire bound rock weir has begun to degrade with some pieces dislodged from their original fitted positions (Photo 4). Water flow over the weir was consistent over two thirds of its length. No major degradation of its designed function is noted.

2.2. The treated water discharge point on Red Dog Creek had a steady flow of clear water. Water clarity can be seen in Photo 5 between the upstream flow of the creek and the discharge point. A distinct boundary between the natural mineralized background water and treated water is noticeable within this mixing zone.

2.3. The mine sump (Photo 6) had water flowing into it generated by active pumping from both Aqqaluk Pit, and the Main Pit Lake. All ponded water within the sump's reservoir is pumped directly into the TSF. Water capacity within the sump's impoundment was slightly higher than observed in previous inspections due to a recent major rain event (Photo 7).

2.4. Seepage collection below the Main Dam was almost devoid of any standing water. There were a few centralized areas with puddling and a small area of standing water in the southwestern corner within the impoundment (Photos 8 and 9). On previous inspections, 2022 and 2023, water within the seepage collection has been minimal to none with standing water in the same locations.

2.6. Two rivulets were documented draining from the back side of Qanaiyaq South Pit. DNR staff only photographed the confluence point of both seeps at Hilltop Creek (Photo 15) and documented that water from these drainages were separated from Red Dog Creek and was actively diverted into the mine as part of its water management (Photo 16). The uphill Kaviqsaq seep has been diverted from its natural drainage through a pipe to its current collection point. DNR staff were not able to hike to the source of the piped water due to a lack of bear protection.

2.7. DNR staff stopped at Bons Reservoir to take some photographs of the freshwater supply for the mine. A steady rate of water cascaded over the falls of the spillway from the reservoir (Photo 21). All outbuildings onsite were in good condition and no issues were noted at the dam (Photo 22).

## Violations:

No violations of the stipulations outlined in Red Dog Mine and AAEP Plan of Operations Approvals (F20219958POOA, F20229339POA.01) and Reclamation Plan Approvals (F20219558RPA.2, F20229339RPA.02), respectively, were observed during this inspection.

## Conclusion and Recommendations:

It is recommended that TAK evaluates some of the reclamation design requirements for the main WRD, specifically for better water management along slopes to prevent rills or other types of soil erosion. It is also recommended that preparation of the growth medium be done in such a manner to help retain seeds to promote germination to mitigate erosion, especially from events such as high winds or abnormal precipitation. As part of the reclamation, seeding should be done as, "…contemporaneously as practicable…" as outlined by AS 27.19.020. This may have reduced the overall area that was affected if each section was seeded once completed.

Overall, both TAI and TAK facilitates their exploration, construction, and mining activities in a manner which prevents unnecessary and undue degradation of NANA land, State land and State water resources. All observed activities conform with the Plan of Operations and Reclamation Plan Approvals and current activities meet the states requirements under AS 27.19.020 and 11 AAC 97.200, with exception of the previously mentioned. DNR finds Red Dog Mine and AAEP operations are in good condition and consistent with industry standards.

Report prepared by: Aaron Kruse

Cc via email:

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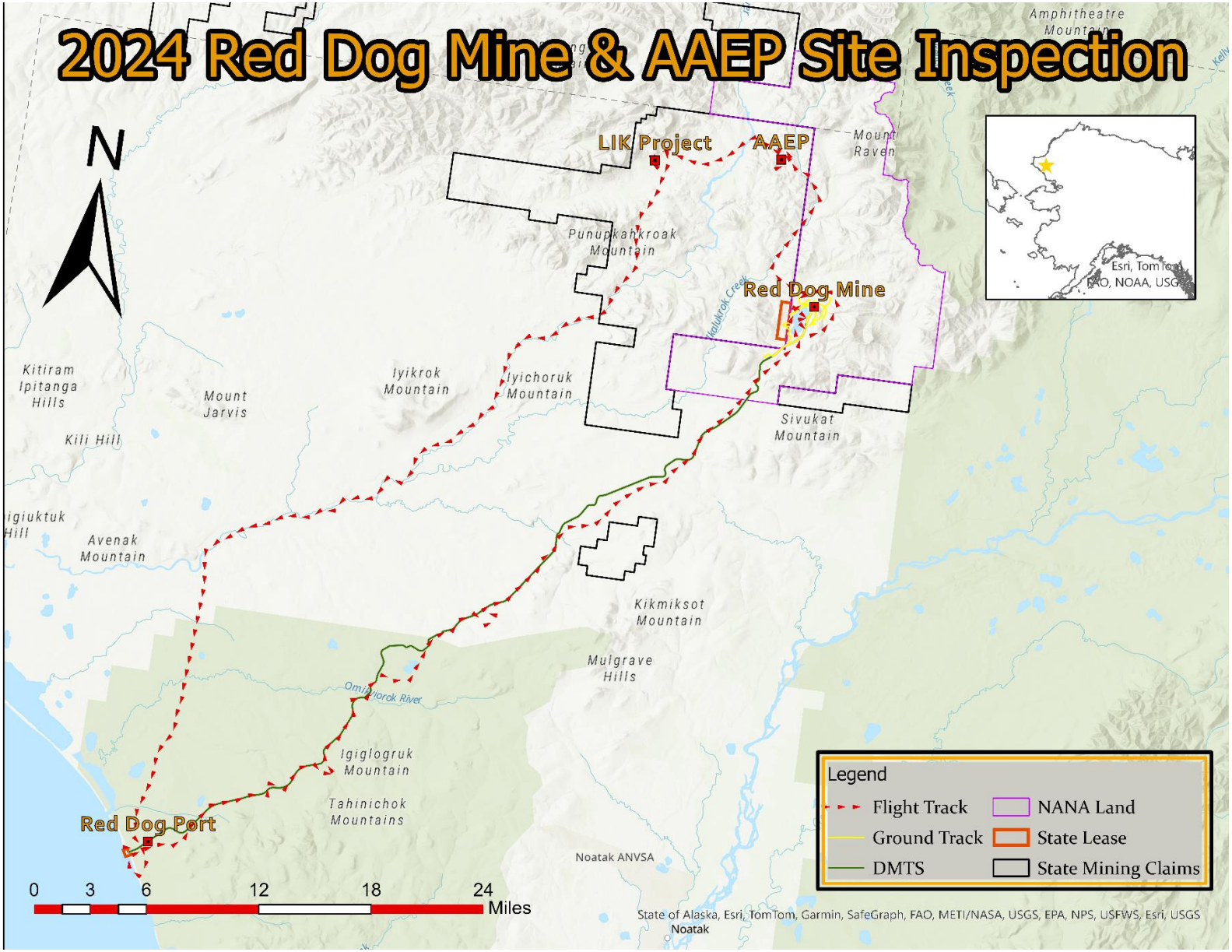
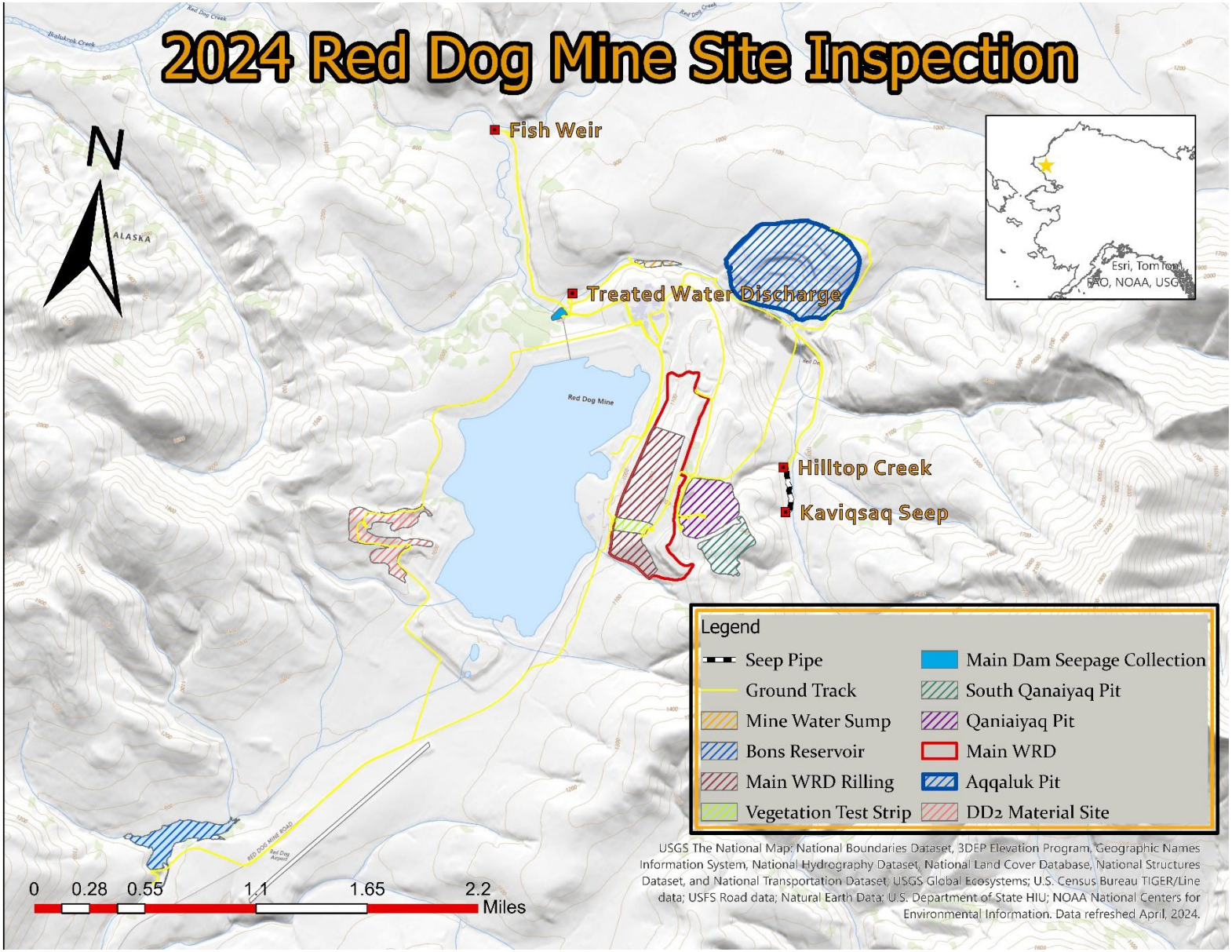
# Appendix A

## Inspection Maps and Observations of Note




Map 1: Flight route over all sights visited during the field inspection.




Map 2: Red Dog Mine footprint with referenced sights visited during inspection. Note: Polygons are an estimation of area and may not be to scale.

# Field Inspection Observations of Note with Photos in Sequence of Inspection

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| Photo 1: Geotech drilling platforms left in place along the proposed access road for AAEP. |  |
| Photo 2: AAEP active drill sites located on the main deposit within state land. |  |

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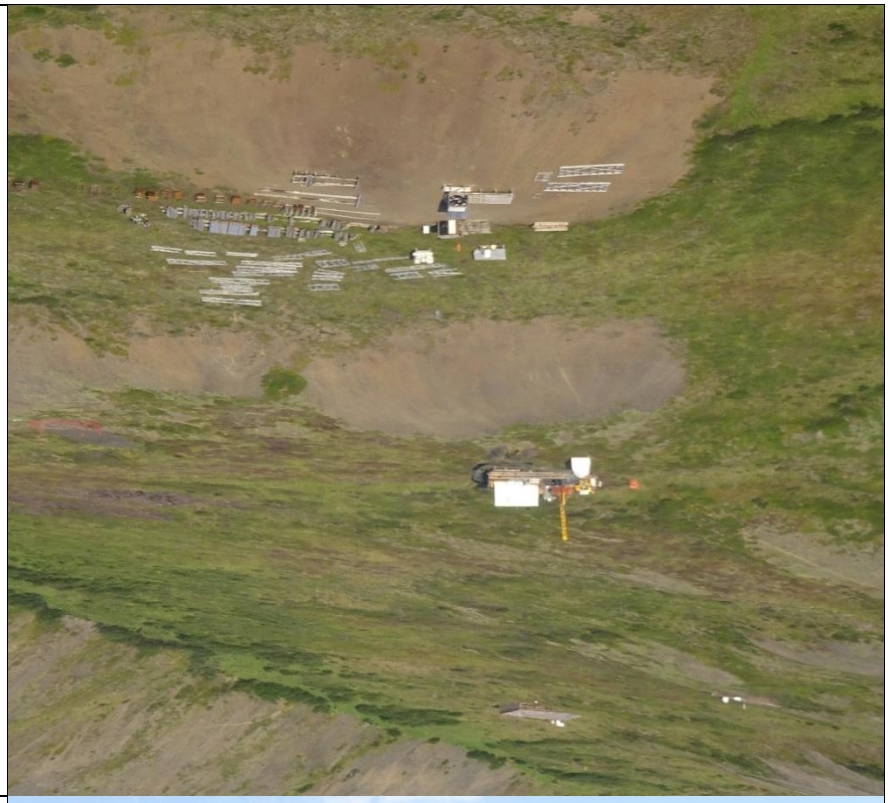
| Photo 3: Small laydown yard to support AAEP exploration drilling. |  |
| Photo 4: Fish weir located downstream from the mill discharge point on Red Dog Creek. Notice some of the sheeted material has dislodged. On previous inspections, the entire weir was covered. |  |

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| Photo 5: Treated water discharge flowing into Red Dog Creek. Notice the change in water clarity between the mineralized background water flowing into this mixing zone. |  |
| Photo 6: Main mine sump with water actively flowing in. This water is pumped from collection points within the mine to the TSF. |  |

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| Photo 7: View of the mine sump impoundment. The water volume is above what has been observed during previous inspections. Red Dog Creek diversion runs adjacent to the mine sump returning to its original channel just downstream of the sump impoundment. |  |
| Photo 8: View of the Main Dam Seepage Collection Impoundment looking north. Overall upkeep and maintenance of the facility is exceptional. |  |

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| Photo 9: Standing water within the southwestern corner of the Main Dam Seepage Collection area. Standing water has been observed in this location during several inspections. |  |
| Photo 10: Main WRD reclamation test plot seeded in 2017 looking north. DNR staff observed good soil retention and distribution of vegetation. No obvious erosion noted on the vegetated area. |  |

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| Photo 11: Southwestern view of WRD reclamation test plot. |  |
| Photo 12: View looking south at the main WRD that was seeded in the fall of 2023. Just to the right is the plot that was seeded in 2017. Notice the rate of growth and dispersion. |  |

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| Photo 13: Active waste rock used to fill Qanaiyaq Pit. High walls may be left in place under state regulations. |  |
| Photo 14: Graded area, looking southwest, of Qanaiyaq Pit. Access to Qanaiyaq South Pit was closed due to active blasting. |  |

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| Photo 15: Water draining off the back side of South Qanaiyaq Pit. Piped water is from an upstream point that has been diverted. Photo shows the confluence for both drainage points. |  |
| Photo 16: Water captured from the drainage off the back side of South Qanaiyaq Pit. Ditch (Center) is part of the mine water management. Upper right of photo is Red Dog Creek that is separate from the managed mine water. |  |

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| Photo 17: Aqqaluk pit looking southwest. Lower right is active excavation for northward pit expansion. |  |
| Photo 18: View of rills along main WRD after high precipitation event. Channeling becomes more defined downslope. Recommend using BMPs to re-establish site for seeding. |  |

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| Photo 19: View of ditch that runs adjacent to main WRD. Notice the amount of topsoil that has accumulated within it from erosion. |  |
| Photo 20: View of the ditch looking north, 180˚ degrees from Photo 19. No topsoil debris accumulation in ditch from erosion. Right side of photo is the 17-acre reclamation seeded in 2017. |  |

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| Photo 21: View from atop Bons Reservoir dam looking at the spillway. Below is a pump station for the dam. |  |
| Photo 22: Bons Reservoir dam (center) and freshwater pump station for mine (above). |  |

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| Photo 23: DD2 material site stockpiles. |  |
| Photo 24: Pits of DD2 have infilled with water which lie adjacent to the southwest side of the TSF. The main WRD (background) can be seen for perspective. Most of the surface area of the WRD has been graded with growth medium. |  |