Plan of Operations
Anarraaq and Aktigiruq Exploration Program

Phase I - Exploration Access Road and Surface Pad Construction

Volume I

Prepared for:
Alaska Department of Natural Resources
Alaska Department of Environmental Conservation
Northwest Arctic Borough

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Executive Summary

This Plan of Operations (the Plan or PoO) is submitted to the Alaska Department of Natural Resources (ADNR), the Alaska Department of Environmental Conservation (ADEC) and Northwest Arctic Borough (NAB) by Teck American Incorporated (TAI) in support of TAI’s exploration efforts on the Anarraaq and Aktigiruq prospects located approximately 9 miles north of the Red Dog Mine. TAI is seeking formal approval of this Plan from ADNR.

Long-term program goals include identifying a sufficient resource, amenable to underground mining and conventional milling, that warrants advancing the program on a schedule that could allow TAI to develop one or both of these prospects into a producing mine. At the present time there is insufficient technical data to know whether either of these prospects can be developed.

In order to accommodate the program schedule, TAI is permitting the exploration program in two stages. The two-stage approach allows TAI to preserve the schedule of starting access road and surface pad construction in early 2019, while continuing to develop and refine the engineering and environmental management plans for a future underground program planned to start in late 2019 or early 2020. This Plan describes Phase I of the program and seeks approval for certain surface construction activities. A future amendment to this Plan (Phase II) will seek approval for construction of surface support facilities and an implementation of an underground advanced exploration program, including drilling.

This exploration program covers the Anarraaq and Aktigiruq exploration program and is being conducted on State of Alaska mining claims owned and operated by Teck American Incorporated (TAI). Two segments of the road outlined in this Plan are situated on NANA Regional Corporation, Inc. lands. NANA will provide authorization for those road segments separate from this Plan.

This current Plan is being submitted for approval of Phase I activities and seeks approval to construct the exploration access road to the Anarraaq and Aktigiruq exploration area and construct several surface pads that are required for the future construction of surface facilities needed to support a multi-year underground exploration program. For Phase II, TAI will submit a Plan of Operations Amendment, and a number of other permit applications, for approval to construct the surface and underground facilities and for all of the activities associated with the underground advanced exploration program. The future surface facilities and the underground development and exploration activities are briefly described in this Plan for context, not for approval.

TAI is seeking approval of this Phase I Plan of Operations for the following activities on its state mining claims.

1. Constructing ~10.2 miles of access road connecting the Anarraaq and Aktigiruq exploration area to the Red Dog Mine.
2. Constructing ~2.7 miles of secondary roads to connect the exploration access road with the surface facility pads.

3. Constructing surface facility pads that will, after Phase II permitting, be populated with the surface facilities that are required to support a future underground exploration program.

4. Developing material sites on TAI state mining claims to extract road and surface pad construction material.

5. Reclamation planning and a reclamation cost estimate for the access road, secondary roads and surface pads.

The major components of the program included in this Plan are depicted on Figure 1. The described construction activities, including constructing the road and surface facility pads will take approximately 9 – 12 mos. to complete. TAI anticipates starting road construction in the first quarter of 2019, followed by construction of the surface facility pads as soon as the access road construction allows, that same year.

TAI has completed several environmental baseline surveys including surface water-quality surveys, wetlands mapping, cultural resource surveys and aquatic life studies which help define the natural environment along the proposed road and in the exploration area. This Plan of Operations includes a reclamation plan and reclamation cost estimate for the proposed surface disturbance, sufficient to reclaim the surface and leave it in a stable configuration.

TAI is submitting this Plan of Operations to ADNR in order to acquire formal Plan of Operations Approval. TAI is also submitting this Plan of Operations to the Northwest Arctic Borough as part of our Title 9 Permit application. Finally TAI is submitting this Plan to ADEC for a review of the construction rock management plan. Other required permits, including a US Army Corp of Engineers CWA 404 Permit and Temporary Water Use Authorizations are being applied for separately.
## Abbreviations

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<td>AAC</td>
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<td>Army Corp. of Engineers</td>
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<td>APE</td>
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<td>United States</td>
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1.0 INTRODUCTION

This Introduction includes brief descriptions of the location and access to the property, and summarizes TAI's plans for the program.

1.1 Project Overview

Teck American Incorporated is proposing the activities in this Plan as an initial step in evaluating the economic and technical feasibility of mining lead-zinc resources identified near upper Ikalukrok Creek, known as the Anarraaq and Aktigiruq prospects. Potentially, the evaluation of these prospects may lead to the definition of mineable resources that could provide feed to the Red Dog mill.

TAI proposed to (1) develop an access road to the Anarraaq and Aktigiruq area and (2) construct surface pads necessary to support future construction of surface facilities for an anticipated multi-year underground exploration development and drilling program in the future. All of the activities for which TAI is seeking approval will occur on State of Alaska mining claims under 100% ownership of TAI, except for two segments of the access road that will cross NANA land, and for which TAI will receive separate authorization from NANA.

Application for future construction of the surface support facilities as well as the underground advanced exploration activities will be submitted at year-end 2018 or early 2019. Future surface facilities in the Plan amendment will include a 4-season camp, fuel storage facility, maintenance facility, core processing facility, offices, water treatment plant, power generation facility, lined waste rock storage facility and other support buildings. Underground activities will include developing approximately 50,000 ft. of underground exploration ramp and executing approximately 300,000 ft. of exploratory drilling over a multi-year period.

This two-staged construction and permitting approach will allow TAI to finalize the engineering and environmental studies it requires to generate final designs and plans for the surface facilities and underground program (Phase II), without delaying construction of the access road and surface pads (Phase I).

1.2 Location, Access and Property Description

The Property is in portions of 4 townships in the Red Dog District, including T.31N., R.18W., T.31N. 19W., T.32N., R.18W., and T.32N., R.19.W., Kateel River Meridian (Figure 1). There is no existing overland access to the exploration area. We propose constructing a single lane exploration access road. The initial point of the exploration access road will be at the terminus of the fish-weir road at the Red Dog Mine, and extend for approximate 10.2 miles north, along the main stem of Ikalukrok Creek and the West Fork Ikalukrok Creek, to the future underground exploration portal site (Figure 1).
The access road route crosses TAI-owned State mining claims (Table 2, Figure 2), as well as two segments that cross NANA-owned land in T31 and 32N, R18W (Figure 1). NANA will provide written authority to construct the exploration access road and have access to their land under a separate agreement.
Figure 1. Components of the Anarraaq-Aktigiruq Exploration Program Proposed in this Plan of Operations
Figure 2. Project Land Status Map
**Table 1. Mining Claims included in this Plan**

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<td>Kakeel River, T22N R19W S13, SE</td>
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</table>
2.0 DESCRIPTION OF OPERATIONS

This principal activities proposed in this Plan are to construct the exploration access road, secondary roads and the surface pads including:

- Constructing ~10.2 miles of exploration access road starting from the fish weir road at the Red Dog Mine and extending along Ikalukrok Creek to the proposed camp pad site.
- Constructing ~2.7 miles of secondary roads to connect the proposed exploration access road to proposed surface pads described below.
- Constructing surface pads referred to in this Plan as the camp pad, portal pad, north vent-raise pad, south vent-raise pad, main vent-raise pad, waste rock facility pad, and laydown pads one and two.
- Developing at least two material sites (including blasting) on state mining claims to provide sufficient material for road and surface pad construction,
- Temporary storage of up to 9,900 gallons of diesel fuel for construction activities, and
- Reclamation planning and a reclamation cost estimate for the access road, secondary roads and surface pads.

All personnel working on this program will be housed in facilities at the Red Dog Mine. There will be no camp constructed on state mining claims in support of the activities described in this Plan.

2.1 Construction Operations

2.1.1 Construction Schedule

The Construction Schedule is outlined in Table 2. Construction activities are tentatively scheduled to begin in early January 2019. This schedule may change subject to weather, equipment availability, timing and duration of spring freshet or other unforeseen reasons. Initially construction activities will be focused on advancing the access road as fast as practical.

Construction will start at the north end of the existing fish-weir road, and includes construction of the first bridge, across Red Dog Creek.

Ice bridges will be used to allow road construction to advance in winter; bridge installation will lag.

As soon as practical during the second quarter of 2019 construction of the portal and camp pads will proceed, followed by construction of the waste rock facility pad.
Secondary road construction will follow as required through 2020 to provide construction access for the vent-raise pads. The north and south vent-raise pads are not required for at least a year (after the future u/g program is started) so they are likely to be the last pads constructed.

Table 2. Tentative Construction Schedule

| Tentative Construction Schedule - Anarraaq and Aktigiruq Exploration Program - Phase 1 |
|---------------------------------|---|---|---|---|---|---|---|---|
|                                 | Q1'19 | Q2'19 | Q3'19 | Q4'19 | Q1'20 | Q2'20 | Q3'20 | Q4'20 |
| Exploration Access Road         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Portal pad                      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Camp Pad                        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Secondary Roads                 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Waste Rock Facility Pad         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Lie Road Pad 1                  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Lie Road Pad 2                  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Main Vent-Raise Pad             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| South Vent Raise Pad            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| North vent-Raise Pad            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

2.1.2 Access Road and Secondary Road Construction

Beginning with a bridge crossing on Red Dog Creek the road will be constructed for approximately 10.2 miles from the north end of the fish-weir road below the Red Dog Mine tailings storage facility. The access road, as designed, will extend north, along Ikalukrok Creek, to the proposed camp pad site (Figure 1).

Construction is planned to begin in the first quarter of 2019 with the intent to complete a travelable pioneer road prior to spring freshet the same year.

Following a short break in construction activities during spring freshet, construction will resume with a focus on completing roads and the surface facility pads.

Access road construction will start with snow removal. Geotextile will be placed where there is evidence of moisture-rich frozen soils that may be subject to thermal instability. TAI anticipates that geotextile will be placed under approximately 50% of the road. The organic layer in this northern clime is minimal but, where practical, it will be stockpiled for later use, as growth media during reclamation. TAI does not anticipate stockpiling significant volumes of topsoil.

The access road will be of a cut and fill design as shown on Figure 3. Sufficient fill will be placed to build up the road surface to meet the road design specifications. In 2017 TAI collected three samples from proposed road cuts along the road alignment. All of the samples consisted of Middle Siksikpuk formation (shale) and are non-PAG (SRK, 2018). TAI anticipates excavating some PAG material along road and pad cuts and is prepared to manage those materials as described in Section 2.3.
The road will have a driving surface up to 19 ft.-wide. Pullouts, for passing, will be constructed periodically along the road.

Road construction will require approximately 544,000 yd$^3$ of fill which will be obtained from cut sections of the road, material sites developed along the road, and the existing DD-2 material site at the Red Dog Mine. The new material sites are discussed in Section 2.1.3.

TAI will obtain material sale contracts from DNR/Lands for any material sites on state land before, and if, that material will be used for construction on NANA land. Presently there are no plans to use material from State land on NANA land.

The engineering drawings for the access road, secondary roads and surface pads are included in Appendix A. The typical equipment that will be used for road construction is listed in Table 3.

Ditches and other BMP's will be deployed and maintained along roads to control storm water runoff to WOTUS.

Six steel span bridges will be installed as part of the road construction for creek crossings, including the fish-bearing streams and approximately 27 24- to 48-inch culverts will be installed for smaller drainage crossings. A typical bridge section is shown in Figure 4. Locations include crossings on Red Dog Creek (1), Ikalukrok Creek (3), Grayling Jr. Creek (1) and West Fork Ikalukrok Creek (1). Of these, the Red Dog Creek and Grayling Jr. Creek crossings and the first Ikalukrok Creek crossing are in fish-bearing streams and require Title 16 fish passage and habitat permits from ADFG. Those are being applied for separate from this PoO.

Approximately 2.7 miles of secondary roads will be constructed to connect the exploration access road to the surface pads as shown on Figure 5. These roads will have a driving surface up to 19 feet wide and will also utilize the same cut and fill methods employed on the access road. Ditches and other BMP's will be deployed and maintained along roads to control storm water runoff to WOTUS.

The road route has been designed by incorporating all of the available information including new information generated by TAI. However, TAI foresees the potential for having to adjust the road alignment if field conditions are significantly different than they are presently understood to be. In this Plan, TAI is stressing the flexibility to modify the road route (i.e. “field-fit”) as it is being constructed, in response to unforeseen field conditions as they are encountered during construction.
Figure 3. Access Road Typical Cut (top) and Fill (bottom) Sections

Figure 4. Typical Bridge Details for Access Road
This includes the locations of bridge crossings which might be adjusted in response to local conditions including depth to bedrock, competence of bedrock or certain stream conditions. We look to ADNR mining to offer some guidance on practical limits on that flexibility in the Plan approval.

### 2.1.3 Material Site Development

Under authority of AS 38.05.565(a)(3) ADNR has previously authorized extraction of construction materials on state mining claims for use in road, airport and other construction needs at no cost to the claim owner, providing that the materials are used on the claims. On this basis TAI is soliciting approval in this Plan of Operations to develop the material sites on TAI state mining claims as described below and use the extracted material for road and pad construction on TAI claims, at no cost to TAI. TAI does understand that separate approval is required to extract material from material sites on state land and use it on non-state land.

TAI has identified four potential material sites for extraction of road and pad construction material. These are depicted on Figure 1. Two of the material sites (AA-MS-1, AA-MS-2) are located on state land where TAI also owns valid state mining claims. Two others (AA-MS-3, AA-MS-4) are on NANA land. Authorization to develop material sites on NANA land will be obtained from NANA, and those material sites will provide fill for the portion of the access road on NANA land and State land.

Table 3. Typical Construction Equipment for Road and Pad Construction

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity, Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haul trucks</td>
<td>4, Cat 772/773</td>
</tr>
<tr>
<td>Pay loader</td>
<td>2, Cat 988H</td>
</tr>
<tr>
<td>Pay loader</td>
<td>1, Cat 966</td>
</tr>
<tr>
<td>Rock truck</td>
<td>1, Cat 740</td>
</tr>
<tr>
<td>Bull dozer</td>
<td>1, Cat D10</td>
</tr>
<tr>
<td>Excavator</td>
<td>1, Cat 375</td>
</tr>
<tr>
<td>Excavator</td>
<td>1, Cat 385</td>
</tr>
<tr>
<td>Water truck</td>
<td>1, Cat Water Buffalo</td>
</tr>
<tr>
<td>Grader</td>
<td>1, Cat 16H</td>
</tr>
<tr>
<td>Vibratory roller</td>
<td>1, Cat</td>
</tr>
<tr>
<td>Drills/Compressors</td>
<td>3, Ingersoll Rand CM-2000</td>
</tr>
<tr>
<td>Manlift</td>
<td>2</td>
</tr>
<tr>
<td>Welding machines</td>
<td>3, portable</td>
</tr>
<tr>
<td>Heaters</td>
<td>4, portable diesel-fired</td>
</tr>
<tr>
<td>Light plants</td>
<td>14, portable</td>
</tr>
<tr>
<td>Pickup trucks</td>
<td>12</td>
</tr>
<tr>
<td>Service truck</td>
<td>3</td>
</tr>
<tr>
<td>Tire truck</td>
<td>1</td>
</tr>
<tr>
<td>Boom truck</td>
<td>1</td>
</tr>
<tr>
<td>Flatbed truck</td>
<td>1</td>
</tr>
<tr>
<td>Powder truck</td>
<td>1</td>
</tr>
<tr>
<td>Tractor trailer</td>
<td>1</td>
</tr>
<tr>
<td>Fuel truck</td>
<td>1</td>
</tr>
</tbody>
</table>

The sites are all on uplands and the material consists of variably-weathered shale, chert, limestone and/or limey sandstone. Material would be blasted, excavated and passed through a stationary grizzly before being hauled for use in road and pad construction. Additional material will be obtained from the DD-2 material site (NANA land) at the Red Dog Mine. In 2017, TAI collected surface outcrop grab samples from the general area of the four proposed material sites and submitted them for Acid Base Accounting (ABA) geochemical analyses. That data indicate that the material is non-acid generating (“non-PAG”) to uncertain (Figure 6). Some of the samples are being subjected to kinetic test work (humidity cells) to confirm our understanding of any acid-generating potential of these rocks. In addition, TAI will perform additional sampling and characterization of these material sites in summer 2018. The report that describes the 2017 ABA data is included in Appendix E. Table 4 also summarizes the samples that were collected for ABA analyses in 2017.
Some minor adjustments may be made to the locations of the proposed sites, based on additional information, prior to the start of construction. TAI may not need to develop all four proposed sites and, if necessary, may identify one or more alternative sites prior to or during construction. All alternative sites will be approved by ADNR prior to any surface disturbance.

According to 11 AAC 96.010 (a)(1)(A) an activity involving the use of explosives and explosive devices, except firearms, requires a permit or other written authorization from ADNR. TAI will use drill and blast techniques to develop at the material sites to provide construction material for the roads and surface pads. TAI is formally requesting approval for these blasting activities through the approval of this Plan of Operations. Anfo will be used as a blasting agent for developing the material sites. The Anfo will be stored at the Red Dog Mine.
<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sample Location</th>
<th>Geologic Formation</th>
<th>Sampling Type</th>
<th>Sampling Area (m²)</th>
<th>Lithology</th>
<th>Neutralizing Potential (NP)</th>
<th>Acid Potential (AP)</th>
<th>NP/AP</th>
<th>TIC/AP</th>
<th>Classification</th>
</tr>
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<tbody>
<tr>
<td>2768201</td>
<td>Material Site 1</td>
<td>Kogruk</td>
<td>Outcrop</td>
<td>5</td>
<td>Chert</td>
<td>4</td>
<td>0.31</td>
<td>12.8</td>
<td>28.03</td>
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<td>2768202</td>
<td>Material Site 1</td>
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<td>Outcrop</td>
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<td>2444.8</td>
<td>1209.85</td>
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<tr>
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<td>Material Site 2</td>
<td>Lower Siksikpuk</td>
<td>Outcrop</td>
<td>10</td>
<td>Silicious shale</td>
<td>6.3</td>
<td>3.69</td>
<td>1.71</td>
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<td>Material Site 2</td>
<td>Lower Siksikpuk</td>
<td>Subcrop</td>
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<td>Silicious shale</td>
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<td>2</td>
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<td>Lower Siksikpuk</td>
<td>Talus</td>
<td>5</td>
<td>Silicious shale</td>
<td>3.5</td>
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<td>1.24</td>
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<td>Material Site 3</td>
<td>Lower Siksikpuk</td>
<td>Subcrop</td>
<td>5</td>
<td>Silicious shale</td>
<td>2.3</td>
<td>2.79</td>
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<td>Outcrop</td>
<td>5</td>
<td>Shale</td>
<td>0.3</td>
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<td>0.03</td>
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<tr>
<td>2768210</td>
<td>Road Alignment</td>
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<td>Outcrop</td>
<td>3</td>
<td>Shale</td>
<td>0.3</td>
<td>2.13</td>
<td>0.14</td>
<td>0.06</td>
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</tr>
<tr>
<td>2768211</td>
<td>Road Alignment</td>
<td>Middle Siksikpuk</td>
<td>Outcrop</td>
<td>10</td>
<td>Shale</td>
<td>3.5</td>
<td>0.31</td>
<td>11.2</td>
<td>0.04</td>
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<td>2768212</td>
<td>Road Alignment</td>
<td>Middle Siksikpuk</td>
<td>Outcrop</td>
<td>20</td>
<td>Shale</td>
<td>4.5</td>
<td>0.31</td>
<td>14.4</td>
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<tr>
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<td>Material Site 3</td>
<td>Lower Siksikpuk</td>
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<td>Chert</td>
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<td>Portal</td>
<td>Ikalukrok shale</td>
<td>Outcrop</td>
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<td>Silicious shale</td>
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<td>Material Site 4</td>
<td>Okpiktnukk</td>
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<td>12.16</td>
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<td>Okpiktnukk</td>
<td>Subcrop</td>
<td>3</td>
<td>Sandstone</td>
<td>2</td>
<td>1.55</td>
<td>1.29</td>
<td>0.35</td>
<td>Uncertain - low S, but siliceous</td>
</tr>
</tbody>
</table>

Table 4. Description of Surface Samples along Road, at Material Sites and Portal (SRK 2018)
Based on current road and pad designs, TAI anticipates needing approximately 544,000 yd$^3$ of fill to construct the road and pads. Approximately 156,000 yd$^3$ of that fill requirement will come from material removed from cut-sections of the road. The remaining approximately 389,000 yd$^3$ will be extracted from the material sites.

The material sites are described below and the ABA data for samples from the sites are included in Table 4 and the ARD potential is illustrated on Figure 6:

AA-MS-1

This site will be located at approximately milepost (MP) 0.5 on the proposed access road. The material has been mapped as limestone of the Kogruk formation and the ARD potential is non-PAG.

AA-MS-2

This site will be located at approximately MP 3.3 on the proposed access road. The material has been mapped as Lower Siksikpuk formation consisting of shale and chert and ARD potential is as Uncertain. This site may not be developed because the geology is quite complex and appears to be a mix of lithologies that are both non-PAG and PAG that are so thin-beded that extracting the non-PAG units and leaving the PAG units may be impractical.

AA-MS-3

This site will be located at approximately MP 4.2 on the proposed access road. The material has been mapped as Lower Siksikpuk formation consisting of shale and chert and the ARD potential is Uncertain.

AA-MS-4

This site will be located at MP 7.2 on the proposed access road. The material has been mapped as sandstone from the Okpikruak formation and the ARD potential ranges from non-PAG to Uncertain.

2.1.4 Surface Pad Construction

The general arrangement of the surface pads is illustrated in Figure 7 and includes the portal pad, camp pad, laydown pads 1 & 2, waste rock facility pad, and north-, south- and main vent-raise pads. The pads are connected to the exploration access road by secondary roads.

The portal, camp, vent-raise and laydown pads will consist of at least 3 feet of fill from one of the material sites, capped with material suitable to create a driving surface. These pads will be constructed on uplands (except for a portion of the north vent-raise pad which includes some WOTUS), where settling and thermal instability is not a concern. As a result we do not anticipate the need for geotextile placement under the fill for pad construction with the exception of the waste rock facility pad which has extra engineering requirements to support the load from waste rock in the future. As with the access road, any salvageable topsoil will be segregated.
during construction for later use in reclamation, but little salvageable soil is anticipated in these sub-alpine uplands.

The camp pad and portal pads are illustrated in Figure 8. They are more or less contiguous, will have combined dimensions of approximate dimensions of 500 feet by 2,000 feet, occupying an area of approximately 23 acres. In the future, the camp, portal, power generating facility, equipment maintenance facility, fuel storage facility, water treatment plant and core logging facilities will be constructed on these pads.

Laydown pads 1 and 2 are illustrated on Figure 9. The two laydown pads are intended for future storage of drill core, drilling and mining equipment and supplies, some of which will be stored in stacked connex containers. Laydown pad 1 will have approximate dimension of 875 ft. by 625 ft. comprising an area of approximately 12.5 acres. Laydown 2 will have approximate dimensions of 800 ft. by 700 ft. comprising approximately 12.9 acres.

The waste rock facility (WRF) pad is illustrated in Figure 10. The WRF pad will have approximate dimensions of 1,000 ft. by 800 ft. comprising approximately 18.4 acres plus and additional area of 400 ft. by 500 ft. (0.5 acres) for a water collection pond at the base of the WRF. The preliminary design of the engineered facility includes a water collection sump inside the facility as well as an “event” pond just below the facility to capture runoff. We may be constructing the precursor to these features this summer to serve as BMP’s for managing storm water in advance of more fully constructing the facility in future years. Eventually TAI will construct a lined waste rack facility here that will include contact water storage and underdrains to allow natural drainage to pass under the lined facility. Request for ADNR approval to construct the waste rock facility will be included in the future amendment to this Plan. The design of the waste rock facility and the waste rock management plan are subject to review by ADEC and no waste rock will be placed until we have the full approvals from ADEC to do so.

The three vent-raise pads are necessary to support future access to the ventilation raises and the main vent raise will also eventually be the staging area for the fresh air heater. The three pads are depicted in Figure 11. The vent-raise pads range in size from approximately 4.6 acres (main vent-raise pad) to 9.6 acres in size (north vent-raise pad). Although the vent-raise pads will be approved and constructed as part of this Plan, the vent-raises themselves will be permitted as part of the underground exploration program, through the future amendment to this Plan.
Figure 7. Footprint of Proposed Pads and Secondary Access Roads
Figure 8. Camp and Portal Pads

Figure 9. Laydown Pads 1 and 2
Figure 10. Waste Rock Facility Pad

Figure 11. Vent-Raise Pads
2.2 Temporary Water Use

TAI and/or its construction contractors will be relying on water application to suppress dust during construction of the access road and surface pads. Small volumes of water will also be required for concrete work at the bridges abutments. Water will be sourced from one or more streams along the access road. In addition to continued use of existing authorizations, TAI will apply for authorizations for temporary water use (TWUA) from ADNR per 11 AAC 93.035 (a) (b) and 11 AAC 93.220 as soon as additional sources are identified. We anticipate applying for water use authorization for as many as five new sources along the proposed access road.

2.3 Construction Rock Management

In the process of constructing the access road, pads and developing the material sites TAI anticipates having to manage potentially acid generating rock. The following discussion describes what best management practices will be applied that will allow TAI to proceed with construction activities while managing any PAG and being protective of the environment. Through this Plan of Operations TAI is seeking ADEC’s review of and approval of these rock management BMP’s under 18 AAC 60.005(e).

The BMP’s proposed below will be supplemented following the 2018 field season when TAI intends to perform significant sampling of these PAG units along the road alignment in order to better define their limits and enable better management of the material during construction and define long-term disposal plans for stored PAG material. The supplemental rock management plan will also be submitted to ADEC for review and approval in advance of the initiating construction activities that are scheduled to begin in January 2019.

Access and secondary road construction – TAI has identified cut segments of the proposed roads where bedrock will be blasted and removed to achieve the road design grade. Those cut segments have been compared with TAI’s regional geologic map to identify cut segments that have the potential to produce PAG rock when they are excavated. TAI’s initial assessment is that approximately 20% of the cut material will come from bedrock generally known to be PAG and up to 60% of the cut material is of Uncertain status that may, or may not, have the potential to generate acid. TAI will do the following with the object of managing PAG and Uncertain rock from these cuts during construction:

- Perform additional characterization rock sampling during the 2018 field season along the proposed road alignment with the objective of better defining the extent and character of the PAG- and Uncertain-categories of rock in the proposed cuts.
- Develop PAG segregation criteria (visual or analytical?) that can be implemented in the field during construction.
- Submit a supplemental rock management plan to ADEC for review and approval prior to initiating construction.
- During construction, a qualified geologist will visually examine the cut material and make a determination whether or not it is suitable for construction (i.e. non-PAG).
Cut material designated as PAG will be segregated, removed from the cut and hauled to a temporary storage area.

Non-PAG fill will be used in all aspects of road construction.

Long-term disposal plans for the stored PAG material will be developed and submitted to ADEC for approval.

Material sites – TAI has identified potential material sites that generally coincide with geologic units that are determined to be non-PAG or uncertain. However the proposed material site boundaries may also encompass enclosing rocks that are Uncertain or PAG. TAI will do the following with the object of managing PAG and Uncertain rock at these material sites during construction:

- Perform additional characterization sampling during the 2018 field season within the boundaries of select material sites to better define the contacts between PAG and non-PAG units.
- Develop segregation criteria (visual or analytical?) that can be implemented in the field during excavation of the material sites.
- Submit a supplemental rock management plan to ADEC for review and approval prior to initiating construction.
- During construction, a qualified geologist will visually examine the material sites as they are developed to help insure that the proper non-PAG geologic units are excavated and PAG units are not.
- Non-PAG fill will be excavated and used in all aspects of road construction.
- Contingency plans will be developed to address long term disposal of PAG material in the event that small amounts of this material are encountered during actual excavation and included in a supplemental rock management plan for ADEC review and approval prior to initiating construction.

Surface pads – TAI has identified that the proposed location of the camp, portal and waste rock facility pads coincide with geologic units that are generally considered to be PAG or Uncertain. The final designs for these pads are not complete but TAI will avoid repurposing any PAG or Uncertain cut material from these sites as fill. TAI will do the following with the object of managing PAG and Uncertain rock from these pads during construction:

- Perform additional characterization rock sampling during the 2018 field season within the proposed pad areas with the objective of better defining the extent and character of the PAG- and Uncertain-categories of rock in these areas.
- Develop PAG segregation criteria (visual or analytical?) that can be implemented in the field during construction.
- Submit a supplemental rock management plan to ADEC for review and approval prior to initiating construction.
- During construction, a qualified geologist will visually examine the cut material and make a determination whether or not it is suitable for construction (i.e. non-PAG).
• Cut material designated as PAG or Uncertain will be segregated, removed from the pad cut and hauled to a temporary storage area.
• Non-PAG fill will be used in all aspects of the pad construction.

2.4 Storm Water Management

Storm water will be managed in accordance with ADEC regulations under the Multi-Sector General Permit (2015 MSGP, AK 060000) during the road and surface pad construction. Storm water management will part of the road construction contractor’s contractual obligation with TAI. The construction contractor will develop a Storm Water Pollution Prevention Plan (SWPPP) in advance of beginning construction and be responsible for all aspects of storm water management, including monitoring, during the construction period. Storm water BMP’s including settling basins, velocity dissipaters, silt fences, wattles, etc. will be constructed/installed and maintained by the contractor during construction. TAI will submit a Notice of Intent (NOI) to ADEC to operate under the terms of the MSGP and include the SWPPP in that NOI submittal.

2.5 Fuel Management

Fuel for the access road construction activities will be sourced from one of the bulk storage tanks at the Red Dog Mine under an agreement with the mine. Fuel storage at the mine and the port are covered under the mine’s Spill Prevention, Control and Countermeasure (SPCC) Plan and C Plan.

During road construction, fuel will be hauled in fuel truck(s) directly to the equipment in the field for refueling. Once the access road construction progresses, a temporary fuel storage tank will be placed at a practical location along the access road and the fuel haul truck will refuel construction equipment along the road from there. Fuel storage and management for the construction described in this Plan of Operations will be included in a new SPCC Plan which will be in-place before access road construction starts.

2.6 Minimization of Fish and Wildlife Impacts

Regulation 11 AAC 86.800(9) requires that a Plan of Operations describe the actions to be taken to avoid or minimize detrimental effects on fish and wildlife and their habitats;

TAI has taken several steps to minimize these impacts. TAI has engaged ADFG for more than 20 years in the Red Dog Mine area including Ikalukrok Creek to study the distribution and health of aquatic systems including anadromous and resident fish. Those data are briefly discussed in Section 3.0 of this Plan. As a step toward protection of fish and their habitat TAI will install six steel-span (Bailey) bridges where the exploration access road crosses the larger streams, including the first three crossings (Red Dog Creek, Grayling Jr. Creek and the first Ikalukrok Creek crossing) that are known to support Arctic Grayling and Arctic Char. The bridge
construction will be performed during winter months and the bridge abutments will be constructed above ordinary high-water levels and without modifying the natural stream channels. The use of the bridges, rather than placement of culverts, and our approach to construction will minimize effects to the natural stream channels and allow fish passage for the duration of the program. ADFG will be reviewing the bridge designs of the bridges across fish bearing streams as part of the Title 16 permitting process.

TAI has collaborated with the Red Dog Mine environmental staff to develop procedures for exploration access road users to minimize impacts to caribou from vehicular traffic on the road. The DRAFT road procedures are included in Appendix D. The Red Dog Mine has developed a similar plan for use along the DMTS road to the port, which includes temporary road closures or halted traffic to accommodate caribou movements. That Red Dog Mine plan served as the basis for the exploration access road caribou procedures. TAI also reviewed the ADF&G presentation on their caribou migration study, which deemed the A&A road to be of insignificant effect.

TAI also recognizes that it has certain obligations to avoid disturbance and taking of Bald Eagles, Golden Eagles and migratory birds under the various acts that protect these species.

TAI will make note of any Golden Eagle activity in the area during construction activities and take all practical steps to reduce disturbance of the birds. TAI will contact USFWS if an active Golden Eagle nest site is identified.

As part of its permitting process with the USACE for its CWA Section 404 permit, the USACE will consult with USFWS about compliance with the Endangered Species Act. At this time TAI understands that there are no endangered species in the program area, so no mitigation measures are required to comply with the act.

TAI assumes that migratory birds may nest in the program area. TAI’s winter road construction schedule will eliminate the risk of impacting the nests of migratory birds in the program area during the months when snow covers the ground. TAI has scheduled the access road and pad construction for the winter months to the greatest practical extent. Disturbed ground is less desirable to ground-nesting birds which otherwise rely on the tundra cover to disguise and construct their nests. If the actual schedule of activities indicates that disturbance of native ground will be necessary during the typical nesting periods for the migratory birds, TAI will place “bird tape” to discourage birds from nesting in areas designated for disturbance during the nesting season.

### 2.7 Request to Restrict Public Access

TAI is requesting herein that the Director (of ADNR Mining, Land and Water) allow TAI to restrict public access to the roads and surface pads of this program for public safety per 11 AAC 86.800 (b) (12) which requires an applicant to include such a request for any site the operator (applicant) wants the division to close to public access in order to protect public safety or to prevent unreasonable interference with the rights of the operator. Heavy equipment operations, diesel air emissions and storage and use of explosives on the surface warrant such a restriction.
The risk to public safety from our operations will start with the initiation of construction activities and continue for the life of this program including Phase II when we construct surface facilities and proceed with underground exploration. The Director has the authority to allow this public access restriction under 11 AAC 86.145 (a)(1).
3.0 ENVIRONMENTAL BASELINE STUDIES

3.1 Surface Water Quality

Red Dog Mine staff have been collecting surface water quality samples from 22 sites in the Wulik River and Ikalukrok Creek drainages as shown on Figure 12. Data are available from all 22 sites since 2014 and from select sites (i.e. Cub Creek and others) since as early as 2000. The analytical data are included in Appendix E. Stations # 4 – 9, shown on Figure 12, are in drainages coincident with the proposed exploration surface facilities, the upper portion of the access road and all of the secondary roads. The data have been shared with TAI to contribute to defining the baseline environmental conditions in these drainages prior to any disturbance associated with the program.

We have examined the data for stations #4 – 9 and offer the following characterization of the surface water quality. Samples were generally taken on a monthly or bi-monthly basis from May to October each year for those years shown in parenthesis, below:

- Station #4 - East Fork Ikalukrok 208 (2000 to 2002; 2015 to 2017)
- Station #5 - Ikalukrok 207 (2000 to 2017)
- Station #6 - Cub Creek (2000 to 2002; 2015 to 2017)
- Station #7 - West Fork Ikalukrok 205 (2000 to 2002; 2015 to 2017)
- Station #8 - Ikalukrok 206 (2000 to 2002; 2015 to 2017)
- Station #9 - Madison Creek (2014 to 2017)

An assessment of the following parameters was performed for the data from the six stations:

- Total dissolved solids (TDS)
- pH
- Total and dissolved aluminum (Al), arsenic (As), cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), selenium (Se) and zinc (Zn)

Water quality sample results for these parameters were compared to the following water quality criteria:

- Alaska Department of Environmental Conservation Water Quality Standards 18 AAC 70 (effective April 6, 2018); and Alaska Water Quality Criteria for Toxic and
- Other Deleterious Organic and Inorganic Substances for Freshwater Aquatic Life (December 12, 2008)
Figure 12. District Surface Water Quality Monitoring Stations

The Alaska water quality criteria are based on hardness for cadmium, copper, lead and zinc. For this assessment, the average hardness value for the data for each station was used to calculate water quality criteria; some sampling events did not provide a hardness value.
The water quality characteristics of the six stations are summarized below:

**TDS**
TDS values were below the Alaska water quality criteria in most cases apart from two exceedances at Ikalukrok 207 and one at Cub Creek (Figure 12). A particularly anomalous value of 19,100 mg/L was observed in February 2001 at Ikalukrok 207, concurrent with elevated levels of cadmium, copper, iron, lead and zinc. As these values were isolated to the one monitoring event, they are somewhat suspect and may be due to laboratory error or an anomalous event.

**pH**
Values of pH were consistently low at four monitoring stations: West Fork Ikalukrok, Ikalukrok 207, Madison Creek and Cub Creek. Over 90% of the samples were below the minimum pH criteria of 6.5 at Madison Creek and Cub Creek (Figure 12). At Cub Creek, pH values between 2.5 and 4 were consistently measured from the start of sampling.

**Aluminum and Zinc**
Baseline aluminum and zinc values were high at all six monitoring stations with >90% of samples exceeding criteria at three locations (West Fork Ikalukrok 205, Cub Creek and Ikalukrok 207) for aluminum and >89% of samples exceeding criteria at four locations (Madison Creek, West Fork Ikalukrok 205, Cub Creek and Ikalukrok 207) for zinc, respectively. East Fork Ikalukrok had the least number of exceedances in aluminum and zinc, with only 8.5% of values greater than the aluminum criteria and 20.3% greater than the zinc criteria.

**Selenium and Arsenic**
Few exceedances were detected for selenium and no samples exceeded the criteria for arsenic. Selenium exceedances were isolated to the suspect anomalous event in February 2001 at Ikalukrok 207 and Cub Creek, where 1.3% of samples exceeded the selenium criteria.

**Cadmium, Copper, Lead and Iron**
Elevated levels of cadmium were consistently detected at Cub Creek and Ikalukrok 207 with isolated exceedances recorded at West Fork Ikalukrok and Ikalukrok 206. Consistent copper exceedances were also detected at Cub Creek, Ikalukrok 207 and West Fork Ikalukrok 205 with 89.2%, 61.3% and 72.0% of values exceeding criteria, respectively. Isolated exceedances for copper were detected at Ikalukrok 206 and East Fork Ikalukrok 208. Lead values were constantly high at Cub Creek with 94.9% of values exceeding the criteria. Several lead exceedances were also measured at Madison Creek and Ikalukrok 207, with 2.4% and 3.6% exceeding criteria, respectively (Figure B 9). Elevated iron concentrations were detected at four monitoring stations with more than 90% of samples exceeding criteria at Cub Creek and

In summary, the Cub Creek monitoring station consistently exceeded the criterion for most measured parameters, except for TDS, arsenic and selenium. Of interest is that ADFG speculate that Cub Creek, which often has a rusty color, may be what limits the presence of fish.
in Ikalukrok Creek above the confluence with the East fork Ikalukrok Creek (Al Ott, ADFG, 2018).

Ikalukrok 207 also had notable exceedances in the same parameters, but with a lower incidence rate than Cub Creek. Aluminum and zinc were consistently high at all monitoring stations. pH remained below the lower level criteria of 6.5 in the majority of samples taken from all monitoring stations, excluding Ikalukrok 206 and East Fork Ikalukrok, Ikalukrok 207 and isolated exceedances at Ikalukrok 206 and East Fork Ikalukrok 208.

Due to the lack of industrial presence in the area, the exceedances of the Alaskan water quality criteria are interpreted to be naturally occurring.

Teck American will continue to collect water quality samples at stations #4-9 in the future. In addition TAI are adding 3 stations to the list of surface water quality monitoring stations (see Figure 13) to provide more information for select drainages in closer proximity to the surface pads and facilities that are needed for the program.

![Figure 13. Existing and Proposed New Surface Water Quality Monitoring Stations in Proximity to Proposed Anarraaq and Aktigiruq Exploration Program Infrastructure](image)

### 3.2 Aquatic Life Surveys

The Alaska Department of Fish and Game (ADFG) have been performing aquatic studies in the greater Red Dog Mine area since 1991, including sites on Ikalukrok Creek. That work has been directed at three fish species including Dolly Varden, Arctic Grayling and Chum Salmon and also included monitoring of Periphyton. The work has included identification of wintering, spawning and rearing habitats, fish tissue sampling (for metals) and fish counts. All of the
public ADFG reports detailing the aquatics survey work are available on their website http://www.adfg.alaska.gov/index.cfm?adfg=habitat_publications.main

In addition, some aquatic study work was performed as part of the baseline environmental effort in 1980 and 1983, prior to constructing the Red Dog Mine.

The distribution of fish, based on the work performed by ADFG to date, has been incorporated into the Alaska Anadromous Water Catalog which shows that Dolly Varden rear in Ikalukrok Creek as far upstream as the confluence with the East Fork Ikalukrok Creek as illustrated on Figure 14. ADFG (Al Ott, personal communication, 2018) described that they have not observed fish in the Ikalukrok above that confluence, possibly due to the poor water quality suggested by the high iron concentrations visible in the rusty water that flows into the Ikalukrok from Cub Creek. In addition Arctic Grayling have been documented in Ikalukrok Creek up to and including Grayling Junior Creek. Their presence has not been established in the Ikalukrok above the confluence with Grayling Jr. Creek (Audra Brasie, ADFG, personal communication, 2018). https://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.interactive

3.3 Wetlands Surveys

TAI contracted WHPacific Inc. (now Kuna Engineering) to complete wetlands mapping along potential exploration access road corridors in 2015 and 2017. The 2017 WHP report is included in Appendix E. The “west” corridor in the initial study was dropped from further consideration in 2017 and this summary focuses on the wetlands mapping associated with the proposed exploration access road corridor. A total of 243 acres of wetland in 95 areas and 62 streams were identified in the 2017 wetlands survey area. This represents approximately 12% of the total survey area, however, the exploration access road will occupy a small fraction of the survey area and will permanently impact only a small fraction of the wetlands identified as described in more detail below. All streams flow to the Wulik River and into the Chukchi Sea, and are therefore considered perennial or relatively permanent tributaries of navigable water

WHP (2017) concluded that based on surface or subsurface hydrologic connections to the stream system, they expect that wetlands abutting or adjacent to jurisdictional waterways would fall under federal jurisdiction. TAI is using the WHP wetlands mapping data to support the CWA Section 404 wetland fill permit application with the USACE. TAI has taken steps to avoid and minimize impacts to wetlands through; 1) de-selecting a western road corridor option, largely due to the predominance of wetland along that route, and 2) using span bridges on the larger stream crossing on the preferred exploration road route, and 3) siting proposed surface facilities on uplands to the greatest practical extent. Approximately 16.1 acres of wetlands and 5,031 linear feet of WOTUS will be impacted by the road and surface pads constructed for the program. TAI will acquire approval of its 404-permit application from the USACE before initiating the road construction described in this Plan.
3.4 Cultural Resources (Archaeological) Surveys

In 2017, TAI contracted with WHPacific, Inc. to conduct a cultural resources survey of the proposed Anarraaq and Aktigiruq exploration access road corridor and areas of possible disturbance associated with the proposed surface facilities. The cultural resource survey included background research and pedestrian (field) surveys for cultural resources. No pre-historic/historic structures are present in the program area and therefore no historic-period buildings survey was conducted.
The pedestrian survey resulted in the identification of five prehistoric sites (DEL-00271, DEL-00551, DEL-00552, DEL-00553, DEL-00554), two prehistoric isolated finds (DEL-00555, DEL-00557), and one historic isolated find (DEL-00556). DEL-00271 was previously recorded and expanded during this survey. Site boundaries were delineated by the visible horizontal extent of surface artifacts. DEL-00271 is recommended as eligible for the National Register of Historic Places. The remaining four sites (DEL-00551, DEL-00552, DEL-00553, and DEL-00554) are listed in the WHP report as unevaluated for the National Register of Historic Places. Additional information is needed for these four sites. Isolated finds are not considered for listing on the NRHP and therefore are not evaluated in the report. WHP recommended that all sites and isolates be avoided by surface disturbance activities. If this is not possible additional investigations may be required to make eligibility recommendations. The road alignment has been selected to avoid these sites.

Summaries of the sites and isolated finds, excerpted from the WHP report, are included below. The report is included in Appendix E. The access road and other proposed surface disturbance has been designed to avoid these sites which are shown on Figure 15.

DEL-00271

Site DEL-00271 consists of a low density prehistoric lithic scatter covering a 135 m by 25 m area totaling 3,327 sq. meters (0.76 acres). The site is of unknown cultural and temporal affiliation. Identified on site is a low density lithic scatter and one concentration of pressure flakes. Site DEL-00271 was previously recorded in 1986 during work in the region. Site DEL-00271 likely represents the remains of a short-term activity area. Site activities likely included the processing of hard or fibrous materials and the modification of bifacial tools brought to the site. The minimal amount of cortex identified on artifacts indicates that lithic materials were brought to the site in an already reduced state. The site location likely offered its occupants easy access to water and relatively rich hunting and gathering grounds along Ikalukrok Creek.

DEL-00551

DEL-00551 consists of a moderately dense prehistoric lithic scatter four tools and 33 pieces of debitage covering a 73 m by 55 m area measuring 3,236 sq. meters (0.8 acres). The site is of unknown cultural and temporal affiliation. No features or artifact concentrations were observed. Lithic materials types observed in the debitage were a gray and white chert and a brown chert. These colors are typical of the locally available chert cobbles. DEL-00551 likely represents the remains of a short-term activity area or camp where activities included biface modification, tool production, and core reduction. The site location likely offered its occupants easy access to water and relatively rich hunting and gathering grounds along Ikalukrok Creek.
DEL-00552

DEL-00552 is a low density prehistoric lithic scatter covering an 8 m by 7.5 m area totaling 49 sq. meters (0.01 acres). The site is of unknown cultural and temporal affiliation. No features or artifact concentrations were observed. Four pieces of lithic debitage were recorded at this site. All flakes are a light gray chert with two core reduction flakes and two biface reduction flakes. One core flake is a large platform rejuvenation flake. DEL-00552 likely represents the remains of a short-term activity area where activities included biface modification and core reduction. The site location likely offered its occupants easy access to water and relatively rich hunting and gathering grounds along Ikalukrok Creek.

DEL-00553

Site DEL-00553 consists of a moderately dense prehistoric lithic scatter covering a 27.5 m by 18.5 m area totaling 367 sq. meters (0.09 acres). The site is of unknown cultural and temporal affiliation. No features or artifact concentrations were observed. WHP archaeologists recorded six pieces of debitage at this site. Two biface reduction flakes of a dark metasediment. The remaining four flakes are chert core reduction flakes (n = 3) and one chert flake fragment. Site DEL-00553 likely represents the remains of a short-term activity area where activities included biface modification and core reduction. The site location likely offered its occupants easy access to water and relatively rich hunting and gathering grounds along Ikalukrok Creek.

DEL-00554

Site DEL-00554 consists of a moderately dense prehistoric lithic scatter covering a 5.5 m by 4.5 m area totaling 7.2 sq. meters (0.004 acres). The site is of unknown cultural and temporal affiliation. No features or concentrations were observed. DEL-00554 is a low density lithic scatter of nine artifacts. All recorded artifacts were from a single dark metasediment core. Seven flake fragments, a core reduction flake, and an incomplete core reduction flake are present on site. This collection is representative of core reduction activities. Site DEL-00554 likely represents the remains of a short-term activity area where activities including core reduction. The site location likely offered its occupants easy access to water and relatively rich hunting and gathering grounds along Ikalukrok Creek.

Isolated Finds

The isolated finds on this project include 10 prehistoric lithic artifacts (DEL-00555 and DEL-00557) and one pair of historic metal reindeer bells (DEL-00556). The reindeer bells (DEL-00556) are a unique find and represent a connection to a particular episode of Alaskan history: the Alaska Reindeer Service (ARS). The first reindeer arrived from Siberia in 1892 with first Siberian and later Scandinavian reindeer herders brought in to train Native Alaskans through the proposed apprenticeship
system. While the program made some progress its purported purpose of providing Native Alaskans with an alternative sustainable resource met roadblocks in its early years as the goal of majority Native ownership was not met and few Native herders had herds large enough to be economically viable. The program was investigated in 1905 and by 1914 herd ownership had transferred to majority Native ownership. Concerns of non-Native ownership led to the Reindeer Act in 1937, prohibiting ownership of reindeer in Alaska by non-Natives. Poor government management, changes in herd management, overgrazing, and predation contributed to a decline in reindeer population from a peak of 127,000 animals in 1927, to 25,000 in 1950. The fact that the reindeer bells of DEL-00556 appear to be handmade and within the territory of the ARS program makes it likely that they date to the earlier years of the program approximately from ca. 1892, when the first reindeer were introduced, and 1927 when the reindeer population peaked.
Figure 15. Cultural Sites and Isolated Finds along the Anarraq-Aktigiruq Exploration Road Corridor.
4.0 REGULATORY REQUIREMENTS

4.1 State of Alaska Regulations

4.1.1 Regulations for Surface Use of Mining Claims

The following is a discussion of the regulations that apply to allowable surface uses of the State mining claims and the approvals necessary for them that apply to this Plan of Operations.

According to 11 AAC 86.145 (a)

(1) A (mining claim) locator does not have exclusive use of the surface of the location. A locator may use the surface of the location only to the extent necessary for the prospecting for, extraction of, or basic processing of mineral deposits. A locator may not restrict public access to or other uses of the surface unless approved in writing by the director. The director may allow the locator to restrict public access or other surface uses of the location only to protect public safety or prevent unreasonable interference with the rights of the locator.

(2) The building, placing, or use of surface structures or other surface improvements, including airstrips and roads, within the boundaries of a mining property must be approved by the director in writing through a plan of operations, land use permit, or other written authorization. The director will only approve surface structures or other surface improvements that are necessary to carry out authorized operations. Factors to be used by the director in approving the surface structures, other surface improvements, or uses include: access to the property, remoteness of location, security of the operations, planned level of operations, existing authorized surface uses, and the current level of activity.

TAI is requesting that the Director (of ADNR Mining, Land and Water) allow TAI to restrict public access to the roads and surface facilities of this program for their safety per 11 AAC 86.800 (b)(12). Heavy equipment operations, diesel air emissions and use of explosives on the surface warrant such a restriction. The Director is given the authority to allow this access restriction under 11 AAC 86.145 (a)(1).

Regulation 11 AAC 86.145 (a)(2) is the legal underpinning for this Plan of Operations. This Plan is being submitted in order meet the requirements of this regulation by obtaining the approval of the director, in writing, for all of the surface improvements we propose constructing on TAI State mining claims.

According to 11 AAC 96.010 (a)(1)(A) an activity involving the use of explosives and explosive devices, except firearms, requires a permit or other written authorization. TAI anticipates using explosive to quarry road construction material from at least 4 material sites and may require explosive for some of the road cut construction. TAI is applying for written authorization for use of explosive for these purposes through the approval of this Plan of Operations.
### 4.1.2 Material Sales Statutes

AS 38.05.565(a)(3) allows DNR to negotiate the sale or "otherwise dispose of" materials from sources or sites to "a holder of a permit, land lease, or right-of-way issued by the department" if the materials are necessary and incidental to the primary purpose of the permit, land lease, or right-of-way, and the materials are put to beneficial use in a way that alters the character, usefulness, or availability of the materials in their native form. This provision allows DNR to authorize the sale of materials under the terms of the permit but does not require that the materials be sold.

AS 38.05.565(b) states that if the materials are moved within and not removed from the boundaries of a permit, land lease, or right-of-way issued by DNR without altering the character, usefulness, or availability of the materials in their native forms, the applicant cannot be required to purchase the materials.

ADNR-Mining routinely uses this statute to authorize extraction of materials on state mining claims for road, airport and other construction, so long as the materials are used on the claims. On this basis TAI is soliciting approval in this Plan of Operations to develop a number of material sites (discussed in Section 2.1.2) on TAI state mining claims for road and pad construction on TAI claims, at no cost for those materials to TAI.

### 4.1.3 Temporary Water Use Regulations

Per 11 AAC 93.035 (a) (b) and 11 AAC 93.220, a temporary water use authorization must be received from ADNR prior to:

1. the consumptive use of more than 5,000 gallons of water from a single source in a single day; or
2. the regular daily or recurring consumptive use of more than 500 gallons per day (gpd) from a single source for more than 10 days per calendar year; or
3. the non-consumptive use of more than 30,000 gallons per day (0.05 cubic feet per second) from a single source; or
4. any water use that may adversely affect the water rights of other appropriators or the public interest.

TAI and/or its construction contractors will be relying on the application of water for dust suppression during construction of the access road and surface pads. Water will be sourced from one or more streams or ponds along the road alignment. As soon as those sources are identified TAI will apply for authorizations for temporary water use from ADNR in addition to our currently active TWUA’s.

### 4.1.4 Plan of Operations Regulations

According to 11 AAC 86.800, an approved Plan of Operations can take the place of a land use permit or a miscellaneous land use permit that would be required under Title 11 for unleased lands. The lands included in this POO are unleased State lands held through valid State mining
claims, or private land. Per 11 AAC 86.800(f) - For the operator's convenience, the proposed Plan of Operations may include information needed to apply for approvals from other departments or local and federal agencies under other applicable laws and regulations, such as effects of the operation on air and water quality, disposal of toxic wastes, effects on navigation, and effects on anadromous fish habitat. Regulation 11 AAC 86.800 (b) specifies the types of information that must be included in a Plan of Operations as follows:

(b) The plan must show how the operator proposes to comply with performance standards, stipulations, or conditions applicable to the prospecting permit or lease. The proposed plan of operations must address the areas to be mined, location and design of settling ponds, tailings disposal, overburden storage, permanent or temporary diversions of water, access routes, reclamation plans, and other actions necessary to conduct the operation. The plan must include statements and maps or drawings setting out the following, as applicable:

(1) the sequence, schedule, and duration of the proposed operations;
(2) size and purpose of the operations;
(3) number of pieces of equipment and people working on the program;
(4) amount of material to be handled, processed, or removed, and how the material will be processed;
(5) method of tailings disposal;
(6) area of timber to be cleared, amount to be used, and clearing methods;
(7) overland access routes to be used, and whether new roads, landing strips, or other new transportation facilities will be needed;
(8) reclamation that will be carried out, including a timetable for each step in the reclamation, an estimate of the cost, and a description of the measures to ensure that all debris is disposed of in a sound manner;
(9) the actions to be taken to avoid or minimize detrimental effects on fish and wildlife and their habitats;
(10) amount and source of water to be used;
(11) location and size of camp facilities;
(12) any site the operator wants the division to close to public access in order to protect public safety or to prevent unreasonable interference with the rights of the operator;
(13) how the operator's plans for compliance with other applicable laws and regulations, including size and location of required facilities or improvements, will affect resources under the jurisdiction of the department; and
(14) any additional information required by the director to assist in evaluating the proposed plan of operations.
As this Plan does not propose any mining, and because there is no timber in the program area, TAI submits that 86.800(B)(4),(5) and (6) are not applicable to this Plan. All others are addressed in this Plan.

4.1.5 Reclamation Plan and Reclamation Bonding Statutes and Regulations

A requirement of 11 AAC 86.800(b)(8) is for “statements, maps and drawings setting out the reclamation that will be carried out, including a timetable for each step in the reclamation, an estimate of the cost and a description of the measures to ensure that the debris is disposed of in a sound manner.” Additionally, ADNR also regulates project reclamation planning and the requirement for financial assurances (Reclamation Bonding) under AS 27.19 and 11 AAC 97. Specifically, 11 AAC 97.200 sets certain performance standards for reclamation that require a site to be reclaimed to a stable condition relative to erosion (after one year) and to naturally revegetate after 5 years, as well as requiring segregation of native topsoils for reclamation and other requirements. 11 AAC 97.210 addresses the removal of buildings, debris and structures on state land, including the option of leaving buildings and structures if the surface owner or land manager approves it. 11 AAC 97.220 requires that openings of all shafts, adits, tunnels and air vents to underground mine workings shall be stabilized and properly sealed to protect the public, wildlife and the environment. 11 AAC 97.240 requires that a miner shall reclaim a mined area that has potential to generate acid rock drainage (acid mine drainage) in a manner that prevents the generation of acid rock drainage or prevents the offsite discharge of acid rock drainage. Additional requirements for the Reclamation Plan are prescribed in 11 AAC 97.300.

Reclamation bonding is regulated under 11 AAC 97.400 and requires posting: 1) performance bond accompanied by a corporate surety bond under 11 AAC 97.405, or 2) a personal bond accompanied by a letter of credit, deposit of gold or cash under 11 AAC 97.410, or 3) posting a bond with another government agency subject to a cooperative management agreement, or 4) post a general performance bond that (A) is written in favor of an agency of the State of Alaska; (B) requires reclamation to standards no less effective than those of AS 27.19 and this chapter; (C) is in an amount no less than $750 per acre of mined area or area to be mined.

Another option for meeting financial assurance obligations for reclamation is the state mine reclamation trust fund established under AS 37.14.800. This is a state-managed trust fund that companies can contribute to as a means of later withdrawing funds to meet their reclamation obligations. Currently no active mines participate in the trust fund.

This Plan of Operations includes a Reclamation Plan which meets the regulatory requirements for a reclamation plan and it is described in some detail in Section 5.0 and included in its entirety in Appendix B.

4.1.6 Storm Water Regulations

Storm water is regulated by ADEC under the APDES Program, delegated to the State by the EPA. Storm water management for the program will be managed under the Multi-Sector
General Permit (MSGP AK060000) for storm water. Storm water discharges associated with industrial activities are defined by 40 CFR 122.26(b) (14) (i-ix and xi). To ensure protection of water quality and human health, the permit establishes control measures and best management practices (BMP’s) that must be used to control the types and amounts of pollutants that can be discharged from certain industrial activities. This general permit is intended to regulate storm water (rain, snow, and snowmelt) runoff which has the potential to cause contamination.

To obtain authorization to operate under the MSGP the permittee must develop a Storm Water Pollution Prevention Plan (SWPPP) submit the SWPPP to ADEC with a Notice of Intent (NOI) to operate under the MSGP and pay the authorization fee in accordance with 18 AAC 72.

TAI is requiring its road construction contractor to be responsible of developing the SWPPP, constructing and maintaining storm water BMP’s and otherwise managing storm water during construction activities during Phase I of this program. TAI will submit the SWPPP with the NOI and authorization fee prior to the start of road construction activities.

4.1.7 Fish Passage Statutes and Regulations

The Anadromous Fish Act (AS 16.05.871 - .901) requires that an individual or government agency provide prior notification and obtain permit approval from ADFG before altering or affecting “the natural flow or bed” of a specified waterbody, or fish stream. All activities within or across a specified anadromous waterbody require approval from Habitat, including construction; road crossings; gravel removal; mining; water withdrawals; the use of vehicles or equipment in the waterway; stream realignment or diversion; bank stabilization; blasting; and the placement, excavation, deposition, or removal of any material.

The location of specified anadromous waterbodies is contained in the “Catalog of Waters Important for the Spawning Rearing or Migration of Anadromous Fishes.” The Anadromous Waters Catalog is updated annually and adopted into regulation (5 AAC 95.011) after public review; it is the legal record of known anadromous fish streams in the state.

The Anadromous Waters Catalog illustrates that the Ikalukrok Creek is rearing habitat for Dolly Varden up to the confluence with the East Fork Ikalukrok Creek.

The Fishway Act (or Fish Passage Act AS 16.05.841), requires that an individual or government agency notify and obtain authorization from the Alaska Department of Fish and Game, Division of Habitat for activities within or across a stream used by fish if it is determined that such uses or activities could represent an impediment to the efficient passage of resident or anadromous fish.

In addition to the presence of Dolly Varden in Ikalukrok Creek, other data from ADFG (Al Ott, 2018) have established the presence of Arctic Grayling in Ikalukrok Creek and some of its tributaries including Grayling Junior Creek.

TAI will submit a Title 16 permit application and comply with both the Anadromous Fish Act and the Fish Passage Act as required at stream crossings.
4.1.8 Oil Discharge Prevention Regulations

Oil discharge prevention and response planning may be required for this program under 18 AAC 75. The trigger for an Oil Discharge Prevention Contingency Plan (ODPCP) is 5,000 bbl of crude oil or 10,000 bbl of refined product. If the Alaska Department of Environmental Conservation (ADEC) determines that the construction program is not part of the ODPCP-regulated facility (Red Dog Mine), it will be considered to be a Class 2 facility (storage capacity of 1,000 to 420,000 gallons non-crude oil) and will be required to register under the Class 2 regulations (18 AAC 75.835 – 18 AAC 75.849).

TAI will collaborate with ADEC in the determination of whether the Anarraaq and Aktigiruq exploration program is considered part of the regulated mine facility for the purposes of triggering addition to the mine’s ODPCP.

4.1.9 Solid Waste Regulations

Potentially acid-generating rock generated during the construction of the roads and pads proposed in this Plan are being regulated under 18 AAC 60.005(e) which states that:

If a person treats a waste and demonstrates to the department's satisfaction that the potential for a release of hazardous constituents is eliminated by the treatment and the treated waste will not present a threat to the public health, safety, or welfare or to the environment, the department will allow the treated waste to be managed as an inert waste under 18 AAC 60.460 or an exempt waste under (c) of this section. The operator of the treatment works must

(1) secure the approval of the department before handling the waste as inert or exempt under this subsection; and

(2) keep records demonstrating that all waste managed under this subsection was treated in the manner on which the approval was based.

TAI will seek to meet 18 AAC 60.005(e)(1) by submitting this Plan of Operations to ADEC for a Plan Review. This Plan of Operations includes a description of the construction rock management practices that TAI will implement during construction to eliminate the potential of a release of hazardous constituents to the environment. Meeting the demonstration, department approval and record keeping requirements of 18 AAC 60.005(e) will allow TAI to manage construction rock as an exempt inert waste under 18 AAC 60.005(c)(14).

TAI is seeking a formal review and approval by ADEC of the rock management practices (BMP’s) discussed in Section 2.3 of this Plan. The practices will also be supplemented prior to the start of construction activities with additional information generated during the 2018 field season.
4.2 Federal Government Regulations

4.2.1 Wetlands Regulations

Section 404 of the Clean Water Act (CWA) established a program to regulate the discharge of dredged and fill material into waters of the United States (WOTUS), including jurisdictional wetlands. Under this program no discharge of dredged or fill material may be permitted if: a practicable alternative exists that is less damaging to the aquatic environment or the WOTUS would be significantly degraded. Proposed activities are regulated through a Department of the Army (DA) permit review process by the U.S. Army Corps of Engineers which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines. DA Permit applicants must show that, to the extent practicable, TAI has taken steps to avoid and minimize impacts to wetlands. Compensatory mitigation may be required for any unavoidable impacts. An individual DA permit is required for projects with potentially significant adverse impacts to WOTUS, but discharges that will have only minimal adverse effects may be authorized under a general permit. Other agencies with DA permit review and/or decision roles include the Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). The State of Alaska has also a role through the CWA Section 401 water quality certification program.

TAI is applying for an individual CWA Section 404 permit for the impacts to wetlands stemming from the exploration access road and surface pad construction. The State of Alaska will also have to certify that the 404 permit complies with CWA Section 401 and is protective of water quality.

4.2.2 Oil Pollution Prevention Regulations

The federal program is regulated under 40 CFR 112, the Spill Prevention, Control and Countermeasure (SPCC) rule. Facilities that store 1,320 gallons or more of oil-based products in containers with volumes of 55-gallons or more, are subject to the SPCC Rule. The planned construction operation will require oil-based storage in excess of 1,320 gallons and therefore, a SPCC Plan is required. In addition, because storage of more than 10,000 gallons of fuel and/or oil-based products is likely, the SPCC Plan must be developed and stamped by a professional engineer.

TAI will develop a SPCC Plan specific to the construction activities and will amend the plan as needed during the construction effort to reflect actual operating conditions.

4.2.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. The migratory bird species protected by the Act are listed in 50 CFR 10.13. TAI adherence to the Migratory Bird Treaty Act is discussed in Section 2.4
4.2.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

"Disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

Neither Bald nor Golden Eagles have been formally identified in the program area. The area is within the range of the Golden Eagle. TAI's compliance with the Bald and Golden Eagle Protection Act is described in Section 2.4

4.2.5 Endangered Species Act

The purpose of the Endangered Species Act (ESA) is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the U.S. Fish and Wildlife Service (USFW) and the Commerce Department's National Marine Fisheries Service (NMFS). The Service has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife such as whales and anadromous fish such as salmon.

Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened. For the purposes of the ESA, Congress defined species to include subspecies, varieties, and, for vertebrates, distinct population segments.

There are no endangered species known to exist in the program area. However, as part of the permitting process with the USACE, they will consult with the USFW to confirm whether ESA-species exist in the area and whether any mitigation measures are appropriate.
4.3   Local Regulations

4.3.1   Northwest Arctic Borough

The Northwest Arctic Borough (NAB) is a permitting agency at the borough level. The borough exercises land use planning and related zoning powers under the terms of state law and the borough home rule charter. This is codified under Title 9 and available for reference on the web at http://codepublishing.com/ak/nwarcticborough.html. Title 9 addresses zoning and land use and provides the NAB with the authority to guide, control, regulate and/or preclude future development of land within the borough in accordance with the land use policies stated in Title 9 and the NAB Comprehensive Plan.

Title 9 permit applications are due before initiating any land use activity.

The Anarraaq and Aktigiruq exploration program is situated within the NAB Resource Development District, and under NAB code, the exploration activities require a Master Plan permit. TAI is performing exploration under NAB Title 9 Minor Use Permit No. 104-03-16. This permit has a term of 2 years and expires at year-end 2018. TAI will apply for a new permit for the activities we are proposing for 2019, including the activities in this Plan.
5.0 RECLAMATION AND FINANCIAL ASSURANCE

Teck American Incorporated is obligated to reclaim impacts that result from its exploration activities. A description of the reclamation plan is required under 11 AAC 86.800 as part of the Plan of Operation. TAI has developed this reclamation plan described below and included in its entirety in Appendix B.

5.1 Reclamation Plan

The reclamation plan for the Anarraaq and Aktigiruq exploration program includes the following major components:

- Reclamation of the Anarraaq and Aktigiruq exploration access and secondary roads
- Reclamation of the material sites along the access road, and
- Reclamation of the surface pads.

Road reclamation will include removal of all bridges and culverts, ripping or scarifying the road surface to encourage moisture and seed retention, and reseeding the road with an approved seed mixture to stabilize the surface and encourage recruitment of native vegetation. Water bars and crowns will be constructed on the road surface as required during reclamation to discourage erosion, redirect runoff and discourage ponding. The surface pads and material sites will be dressed, as necessary, to discourage ponding by directing runoff without encouraging erosion. The surfaces will be ripped or scarified to discourage erosion and encourage moisture and seed retention. The scarified surface will be reseeded with an approved seed mixture for stabilization while native revegetation recruitment occurs over the longer term. The eventual goal is to have stable native vegetation through natural recruitment of native species from the surrounding undisturbed lands. In the arctic environment with its short growing season and immature soils it is expected to take several years before there is measurable natural plant recruitment. Boulders and or signage will be placed along highwalls around the material sites for public safety.

It is noted that owing to the arctic environment, the native organic soil horizon (i.e. “organic mat”) and native vegetation is sparse, and it is therefore generally impractical to segregate and stockpile the organic matt during winter road construction. It will be stockpiled wherever practical. As a result, the Reclamation Plan does not include stockpiling the organic layer or other growth media during construction, or the transportation and application of growth media to the scarified road surface during reclamation.

Reclamation sequencing would start with the surface pads at the ends of secondary roads. Following reseeding of the surface pads, road reclamation would start at the north end and surface dressing and reseeding would take place in segments as culverts and bridges are removed and the entire reclamation effort “retreats” towards the last bridge across Red Dog
Creek at the southern terminus of the access road. Removal of the bridge across Red Dog Creek and reseeding the ground surface where the bridge abutments were, will be the final reclamation activities.

Once the road is reclaimed and no longer passable, TAI will submit a Notice of Termination signifying the end of the operations under the MSGP for stormwater. TAI has included costs in the reclamation cost estimate for seasonal aerial inspections along the reclaimed road for locations that might not have stabilized and appear to be contributing to storm water quality exceedances. TAI has also included labor costs for periodically addressing these spots for a period of 5 years following reclamation of the road. Once the road is closed and reclaimed, mitigation measures for storm water issues are limited to what can be accomplished with hand tools or helicopter-portable equipment.

### 5.2 Financial Assurance

TAI has developed a cost estimate for the activities described above and in the Reclamation Plan in Appendix B. The total cost estimate for reclamation and post reclamation monitoring for a 5-year period is $5,093,646, including Indirect Costs consistent with ADNR guidance on reclamation cost estimation. TAI intends to post a financial assurance in a form acceptable to the State regulatory agencies prior to initiating work under this Plan of Operations.
6.0 REFERENCES


