Landfill Management Plan
Ulu Gold Project

Kitikmeot Region, Nunavut

March 2020

BLUE STAR GOLD CORP.

PLAIN LANGUAGE SUMMARY

This Plan describes activities associated with construction and management of the non-hazardous waste landfill within the Ulu Gold Project area in Kitikmeot region of Nunavut.

REVISION HISTORY

Revision #	Date	Section	Summary of Changes	Author	Approver
1	March 2020	-	New document	SRK Consulting	P. Kuhn

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Scope 1
1.1 Objectives 1
1.2 Site Description 1
1.3 Overview 2
1.4 Plan Implementation 2
2.0 ROLES AND RESPONSIBILITIES 4
2.1 Staff, Contractors, Suppliers and Visitors 5
2.2 Managers and Supervisors 5
2.3 Remediation Project Manager 5
2.4 Site Engineer 6
3.0 OPERATION AND MAINTENANCE 6
3.1 Suitable Waste Disposal 6
3.2 Non-Acceptable Waste 7
3.3 Placement Method and Compaction 7
3.4 Use of Material Containing Petroleum Hydrocarbon Contamination 8
3.5 Construction Material 8
1.2 Water Management 9
3.6 Unauthorized dumping 9
3.7 Signage 9
4.0 CLOSURE 9
5.0 INSPECTIONS AND MONITORING 10
5.1 Surface Water Monitoring 10
5.2 Cover Performance Monitoring 10
6.0 TRAINING 10
7.0 REPORTING AND DOCUMENTATION 10
7.1 Reporting 10
7.2 Documentation 11
8.0 REFERENCES 12

LIST OF TABLES

Table 1 Related project documents, permits and licences. 1
Table 2 Acceptable Waste for Disposal in the Ulu Landfill 6
Table 3 Non-acceptable waste for Disposal in Ulu Landfill 7
Table 4 Petroleum Hydrocarbon Requirement 8

LIST OF FIGURES

Figure 1 Ulu Gold Project location map 3
Figure 2 Landfill Location 4
Figure 3 Depression Method of Landfill Construction 7

LIST OF APPENDICES

Appendix A: Landfill Design Memorandum

1.0 INTRODUCTION

The *Landfill Management Plan* (the Plan) is intended exclusively for use by Blue Star Gold Corp. (Blue Star) and its contractors to ensure that best practices for minimizing potential environmental impacts and potential environmental liabilities during the use and closure of a non-hazardous waste landfill (the Landfill) during progressive reclamation at its Ulu Gold Project (the Project), and that the conditions of the water and land use licences are met, and should be read in conjunction with the documents listed in Table 1.

Table 1 Related project documents, permits and licences.

Document	Authors
Interim Closure and Reclamation Plan (2020a)	Blue Star Gold Corp.
Engagement Plan (2020b)	Blue Star Gold Corp.
Spill Response Plan (2020c)	Blue Star Gold Corp.
Waste Management Plan (2020d)	Blue Star Gold Corp.
Wildlife Protection Plan (2020)	Environmental Dynamics Inc.
Interim Water Management Plan (2006)	Gartner Lee Ltd.
Mineral Claim	Government of Canada
Screening Decision Report	Nunavut Impact Review Board
Water License	Nunavut Water Board
Land Use License	Kitikmeot Inuit Association
Engagement Plan (2020b)	Blue Star Gold Corp.
Spill Response Plan (2020c)	Blue Star Gold Corp.

1.1 SCOPE

This Plan is addresses how the Landfill will be constructed, operated and closed, and outlines how the facility will be inspected and managed to ensure compliance with authorizations.

1.1 OBJECTIVES

The objectives of the Plan are to:

- Provide guidance for construction of the Landfill, waste placement, closure and monitoring (operational and post-closure);
- Describe the responsibilities and tasks involved with the Landfill construction, operation and closure; and
- Support safe and compliant waste facility operations and maintenance.

1.2 SITE DESCRIPTION

The Project is located on Inuit-owned land in the Kitikmeot Region, Nunavut, within the Hood River watershed. It is located 126 km north of the Lupin Mine (Figure 1).

The mineral claims holding the Ulu deposit were initially staked in 1988. Portal excavation at the Ulu site commenced in 1996 to confirm resource calculations and mining design for mill feed to the Lupin Mine. Equipment to construct the camp and develop the mine was mobilized to site via a winter road from the Lupin mine in 1996. Camp 3 was built at the esker sand quarry to facilitate construction of the airstrip, road and underground exploration site. It included tent accommodations, a garage and a fuel tank farm.

Camp 3 was reclaimed in 2018/2019. Underground development of the ramp ceased in August 1997 at the 155 m level. The existing facilities at the Ulu underground exploration site consist of a 20-person camp with sleeping and dining quarters, a 22 m by 37 m vehicle repair shop, fuel containment areas (tanks removed in 2018) for bulk diesel and day tank storage, core storage area, core shack, and fuel staging area. The previous operator demolished unused facilities and stockpiled them in preparation for disposal in the underground workings and in a landfill at the portal entrance. Blue Star intends to utilize a surface landfill that does not compromise the underground workings.

The Project is located within the Southern Arctic Ecozone and the Takijuq Lake Upland Ecoregion. Much of this region is composed of unvegetated rock outcrops. Vegetative cover is characterized by shrub tundra, consisting of dwarf birch, willow, northern Labrador tea, avens species and blueberry species. Organic Cryosols are the dominant soils in the lowlands and permafrost is deep and continuous (ECCC 2019).

Based on regional normals from Lupin A station between 1980 and 2010 (ECCC, 2020), average yearly rainfall in the region is 160 mm, mostly occurring during July and August, and average yearly snowfall is equivalent to 138 mm of water, most of which falls during autumn and spring. The average temperature in a year is -10.9 ° Celsius.

1.3 OVERVIEW

The Landfill is a new waste management facility intended to receive legacy waste arising from historic works on site, the construction and operation of which is part of progressive reclamation works being undertaken Ulu. The Landfill will have the capacity to receive approximately 20,000 m3 of non-hazardous solid waste, and occurs in an area situated between what was the Ulu Camp tank farm and the portal access road, approximately 6,500 m2 in area (see Figure 2). The orientation and topography of this area allows for construction using the depression method for constructability. It is also situated in proximity to all consolidated waste stockpiled by the previous site operator in 2018/2019. The Landfill is intended to operate until all of the existing waste on site has been suitably disposed of, for a period 1-2 years. Plan Management
The Plan is reviewed annually by Blue Star's General Manager and updated as needed following receipt of or amendments to licences and permits, to ensure alignment with relevant terms and conditions. When material changes occur, the updated document will be provided to parties in accordance with the *Engagement Plan* (Blue Star 2020b).

1.4 PLAN IMPLEMENTATION

This Plan is effective upon approval and is valid throughout all phases of the Project.

The General Manager or Remediation Project Manager is responsible for Plan implementation.

A copy of this Plan is maintained on site in the Office, while the camp is open.

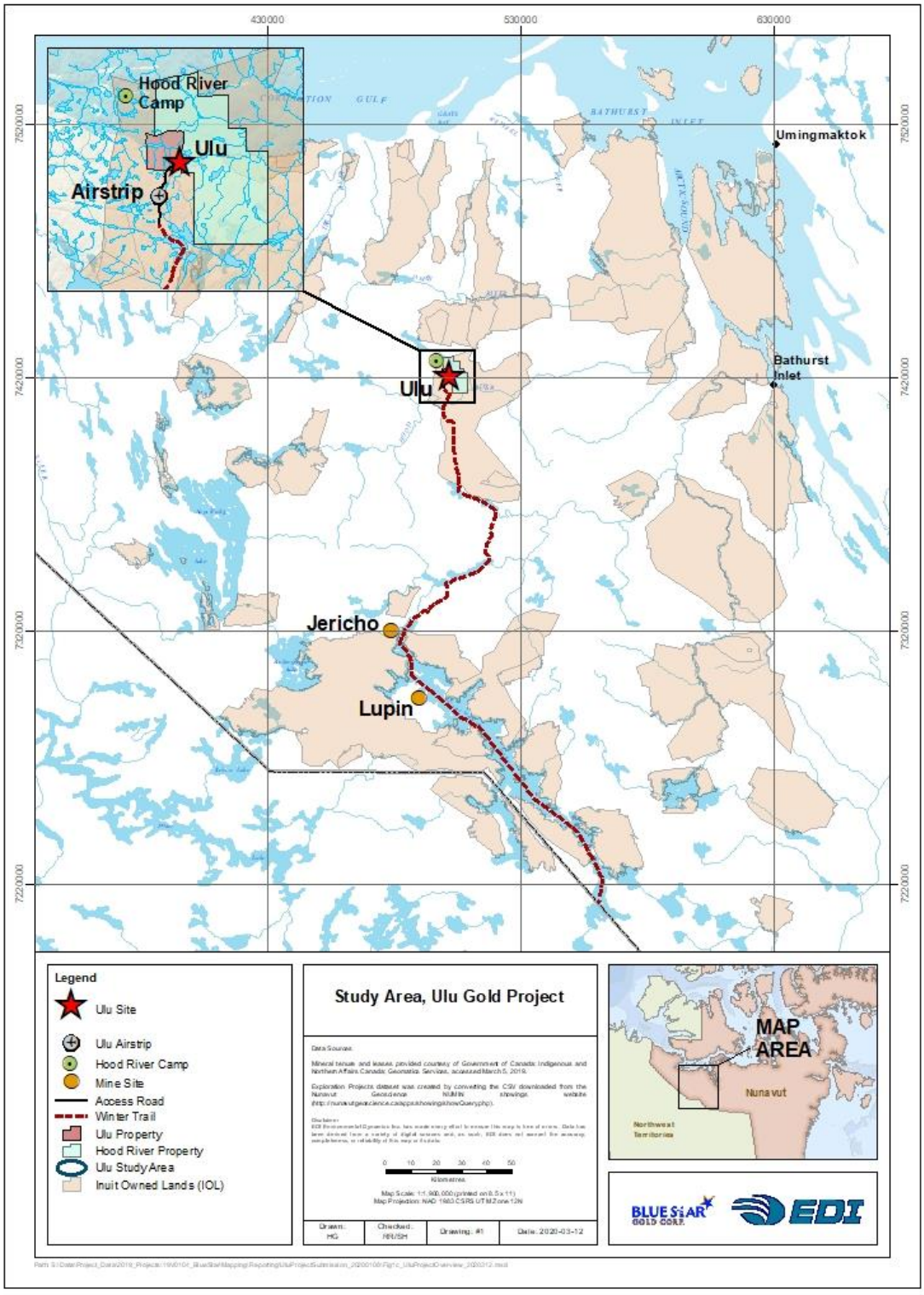

Figure 1 Ulu Gold Project location map

Figure 2 Landfill Location

2.0 ROLES AND RESPONSIBILITIES

Blue Star is responsible for activities associated with the Project, including implementation and management of this Plan. Blue Star's contact information is provided below.

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Phone: 1 778 379 1433
Contact: Peter Kuhn, General Manager
Phone: 1 604 347 6999
Email: kjgold2010@gmail.com

2.1 STAFF, CONTRACTORS, SUPPLIERS AND VISITORS

All personnel conducting activities on site, including staff, contractors, suppliers and visitors, are required to be guided by this Plan as it pertains to their activities on site. Specifically, these responsibilities include:

- Taking all necessary steps to minimize negative effects to water, land and air;
- Cooperating fully with your supervisor and/or Blue Star management to implement an environmental protection program in your work area;
- Only carrying out duties and tasks that you are experienced at and trained to perform;
- Where there is uncertainty, asking questions and bring concerns to the attention of your supervisor when working with products or conducting tasks that may pose potential environmental risks;
- Reporting wildlife observations, spills and emergency situations in accordance with relevant management plans.

2.2 MANAGERS AND SUPERVISORS

Managers and supervisors have a responsibility to ensure that staff, contractors, consultants and visitors have been trained in Blue Star landfill operations in a manner relevant to their activities on site, environmental and any other relevant procedures. Additional supervisor and manager responsibilities include:

- Maintaining a no blame work environment in implementing mitigation measures and follow-up actions;
- Ensuring site-, task- and material-specific training is provided to all departments and staff;
- Ensuring there are appropriate and sufficient supplies on site to support implementing mitigation measures and follow-up actions;
- Providing assistance in responding to environmental hazards;
- Maintaining records regarding inspections, personnel training, equipment testing and maintenance; and
- Engaging with relevant parties in a timely and transparent manner, where appropriate.

2.3 REMEDIATION PROJECT MANAGER

In addition to the responsibilities listed above the Remediation Project Manager is responsible for:

- Reviewing and approving any material that is to be placed in the Landfill to ensure suitability for landfill disposal;
- Conducting and documenting regular inspections for operational compliance;
- Coordinating with other managers and supervisors to ensure safe and appropriate allocation of resources on site; and
- Maintaining the remediation schedule, and where schedule changes occur, advising the General Manager in a timely manner;
- Carrying our surface water quality monitoring, or assigning designate to do so;
- Assigning and overseeing specific roles and responsibilities regarding material handling
- Maintaining a log of waste deposited daily, mitigation measures applied, analyses conducted, preventative maintenance undertaken;
- Maintaining photo documentation of works.

2.4 SITE ENGINEER

In addition to the responsibilities listed above, the Site Engineer, whose role may overlap with or be filled by the Remediation Project Manager, is responsible for the following specific tasks:

- Confirming materials suitable for landfill construction;
- Conducting quality assurance/quality control (QA/QC) during construction and waste consolidation;
- Advising on corrective actions in the event of unauthorized dumping;
- Monitoring the performance of the Landfill cover.

3.0 OPERATION AND MAINTENANCE

3.1 SUITABLE WASTE DISPOSAL

Only non-hazardous waste is accepted at the Landfill. Table 2 provides a list of common items that can be managed in the Landfill.

Table 2 Acceptable Waste for Disposal in the Ulu Landfill

Material	Examples
Scrap Metal	Steel, decommissioned tanks, metal containers, rebar, tin
Rubble	Concrete, bricks
Wood products	Timbers, plywood, concrete forms, painted and stained lumber
Rubber products	Conveyor belts, non-reusable tires
Construction debris	Siding, tarps, insulation
Glass	Cleaned bottles and jars, plate glass, windows, mirrors
Piping	Steel and plastic piping (free of all hydrocarbons, lubricants and antifreeze), heat tracing
Fabric and liners	Synthetic liners (cut into strips), woven geotextiles
Electrical	Cables, cable support trays, panels, switchgear, transformers (free of all liquids)
Non-Recyclable or reusable Equipment (drained and free of all hydrocarbons and lubricants)	Electric motors, boilers, vans, heaters, pumps, screens, appliances, vehicle parts tools.

3.2 NON-ACCEPTABLE WASTE

Table 3 provides a list of typical waste that are prohibited from the Landfill.

Table 3 Non-acceptable waste for Disposal in Ulu Landfill

Material	Example
Corrosives	Batteries, unusable chemicals such as acids or lime
Hazardous Wastes	Used oils, hydraulic fluids, gasoline or any hydrocarbons, hydrocarbon contaminated matting or rags, asbestos and lead paint
Liquids	Kitchen wastes, portable latrines, paint
Contaminated soils	All soils collected as a result of a spill
Animal carcasses	Natural mortality or roadkill
Edible or spoiled edible products	All solid or liquid forms of food and/or kitchen waste (preparation or post clean up)
Combustible untreated lumber	Painted wood

3.3 PLACEMENT METHOD AND COMPACTION

Waste placement will be done by means of the depression method, which entails end-dumping, compaction and cover. Figure 3 taken from the NWT guidelines illustrates the process utilized with this method (FSC 2003).

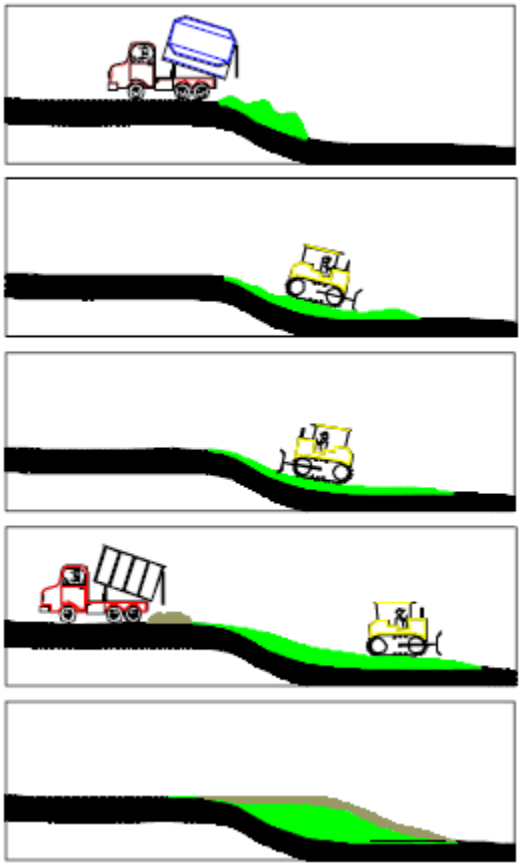

Figure 3 Depression Method of Landfill Construction

Waste will be placed in 1 m lifts and then compacted by "track packing" or mechanically using an excavator bucket. Alternatively, waste will be packed in sea containers and cleaned scraped fuel tanks. Once waste compaction is complete, areas where voids are still present will be covered with esker sand and repacked in order to fill the voids and prevent possible subsidence post-closure.

Lifts will be constructed in a manner that promotes positive water drainage away from the Landfill area to mitigate the need for water management and minimize recontouring should interim cover placement be required if operations extend beyond 1 year.

Waste will be place directly on the native ground surface, which is considered to be a suitable foundation given it is largely exposed bedrock.

As outlined in the following section soil containing traces of petroleum hydrocarbons (PHC) may be placed in the landfill to create workable waste placement surfaces where required.

3.4 USE OF MATERIAL CONTAINING PETROLEUM HYDROCARBON CONTAMINATION

The use of material containing traces of PHC is accepted provided the PHC content is below the minimum standard outlined in the Canada-Wide Standard for Petroleum Hydrocarbons in Soil (CCME 2008). Below the minimum requirements for surface and subsurface use of PHC contaminated soils. Surface soil guidelines apply from surface to 1.5 m depth and subsoil guidelines apply below 1.5 m depth.

Table 4 Petroleum Hydrocarbon Requirement

Parameter	Surface Soil (mg/kg)	Subsurface Soil (mg/kg)
Benzene	11	62
Toluene	75	150
Ethylbenzene	55	110
Xylenes	65	139
PHC Fraction 1 (F1)	210	700
PHC Fraction 2 (F2)	150	1,000
PHC Fraction 3 (F3)	300	2,500
PHC Fraction 4 (F4)	2,800	10,000
PAH Naphthalene	0.6	0.6
PAH Phenanthene	0.1	0.1

Source: CCME 2018, 2008

3.5 CONSTRUCTION MATERIAL

Construction material is required to cover the waste in the landfill and includes course grained esker sand and hard rock borrow material. Esker material considered suitable for construction for the Landfill is locally available both in a stockpile proximal to the landfill as well as a borrow location approximately 6 km from the Landfill location.

Hard rock borrow may include existing waste rock, as was historically used on site for construction by previous operators, or new quarry rock; an investigation into suitable hard rock borrow material for construction use is currently in progress. Geochemical testing must be done on all potential hard rock borrow planned for use prior to construction to ensure it is not potentially acid generating (PAG). No PAG material may be used in the construction of the Landfill.

As outlined in the design memorandum in Appendix A, the interim and intermediate covers will be constructed from the available esker sand. Investigations into the durability of the esker sand will confirm if it is suitable for the final cover.

All material to be confirmed by the Site Engineer prior to use for construction.

1.2 WATER MANAGEMENT

In the case of a non-hazardous waste landfill, it is not necessary to eliminate all moisture migration into and out of the landfill. However, it is good practice to minimize the water ingress and monitor water seeping/flowing out of the facility to ensure stability and confirm potential environmental effects are suitably mitigated.

As per the design (Appendix A), the areas surrounding the facility will be graded to promote drainage around and away from the Landfill.

Where water is found seeping out of the Landfill, water samples mush be taken accordance with the water licence to monitor water quality.

3.6 UNAUTHORIZED DUMPING

Unauthorized dumping can result in contamination and leachate generation, as well as pose a safety risk for unauthorized personnel entering a restricted area. Should any unauthorized dumping occur at the facility, the activity should be reported to the Remediation Manager or Site Engineering. Corrective actions, including removal and handling of the materials in accordance with the *Waste Management Plan* (Blue Star 2020d) should be implemented as soon as possible.

3.7 SIGNAGE

Entrance to the facility should be clearly marked with multi-lingual signage identifying types of acceptable waste. For example:

Non-Hazardous Landfill
Non-Hazardous Inert Material ONLY

No Hydrocarbon Contaminated Materials

No Food or Animal Waste

No Chemical or Liquid Waste

4.0 CLOSURE

The closure objectives outlined in the *Interim Closure and Reclamation Plan* (Blue Star 2020a) are to return the site to a condition of similar environmental productivity and land use that existed prior to the development of mine facilities. It is also intended eliminate/minimize requirements for long-term monitoring and maintenance. The specific objectives of Landfill closure are to:

- Isolate Landfill material from the environment, and
- Provide long term performance specifically focused on the prevention of erosion resulting in exposed waste.

The closure of the Landfill will incorporate an interim closure during winter shut down period, and the final facility closure once all identified waste is placed within the facility, as described in Appendix A. The mine can initiate the final Landfill closure at any point prior to the final mine site closure. The interim closure will require a higher level of monitoring and maintenance.

Refer to Appendix A for specifications regarding the intermediate and final cover design.

5.0 INSPECTIONS AND MONITORING

5.1 SURFACE WATER MONITORING

Surface water quality monitoring in seeps below the landfill will occur in accordance with the water licence and is intended to determine if there are changes in the seepage quality following the development of the Landfill. Surface water runoff patterns are to be monitored to determine if the drainage control structures are functioning as designed during the sites annual geotechnical inspection. Maintenance is to be conducted as necessary.

5.2 COVER PERFORMANCE MONITORING

Proper QA/QC during construction and waste consolidation will minimize cover subsidence over time and thus reduce the need for long term monitoring.

Periodic visual inspections will be undertaken, including, but not limited, identifying the following:

- Depressions or voids on the surface;
- Erosion gullies;
- Water flowing from the facility

Visual inspection will be carried out as follows:

- Within 24 hours following a rain event, when the site is occupied;
- Annually as part of the geotechnical inspection required under the water licence.

After the placement of the final cover, inspection of the Landfill during the annual geotechnical inspections should be sufficient to monitor the site's long-term performance. The performance of the cover must be compared to the cover design as outlined in Appendix A.

6.0 TRAINING

All attendees to site involved in Landfill operations will participate in a site orientation which outlines environmental and Landfill operations procedures. Specific roles and responsibilities regarding material handling will be assigned by the Site Engineer or Remediation Manager.

7.0 REPORTING AND DOCUMENTATION

7.1 REPORTING

Reporting will occur in accordance with the water licence and land use permit regulatory requirements and the Engagement Plan (Blue Star 2020b).

7.2 DOCUMENTATION

The Remediation Project Manager will maintain a logbook of:

- The quantity and type of waste deposited each day (in cubic meters);
- The measures taken to avoid or mitigate any adverse impacts from the deposition of waste;
- Records of any test results, waste analysis or other determinations;
- Maintaining equipment preventative maintenance logs and required follow-up actions on site.

Photographs to document activities are taken throughout the field season. The logbook is transported to the site at the start of each field season and stored off-site during the off season for safe keeping. An electronic copy is made at the end of each field season and retained by Blue Star.

8.0 REFERENCES

Blue Star Gold Corp. 2020a. Interim Closure and Reclamation Plan, Ulu Gold Project, Kitikmeot Region, Nunavut.

Blue Star Gold Corp. 2020b. Engagement Plan, Ulu Gold Project, Kitikmeot Region, Nunavut.

Blue Star Gold Corp. 2020c. Spill Response Plan, Ulu Gold Project, Kitikmeot Region, Nunavut.

Blue Star Gold Corp. 2020d. Waste Management Plan, Ulu Gold Project, Kitikmeot Region, Nunavut.

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Ferguson Simek Clark Engineers & Architects (FSC). 2003. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT. Prepared for: The Department Municipal and Community Affairs Government of the Northwest Territories. Prepared by: Ferguson Simek Clark Engineers & Architects. FSC Project No: 2001-1330. April 21, 2003

Gartner Lee Limited. 2006. Interim Water Management Plan. Prepared for Wolfden Resources Inc., Ulu Gold Project. March 2006.

Appendix A: Landfill Design Memorandum

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Memo

To:	Peter Kuhn	**Client:**	Blue Star Gold Corp.
From:	Darryl Godley	**Project No:**	1CB041.000
Cc:	Arlene Stearman, Michel Noel	**Date:**	March 12, 2020
Subject:	Ulu Gold Project Non-Hazardous Waste Landfill		

1 Introduction

The Ulu Gold project (the Project) is located on Inuit-owned land in the Kitikmeot Region, Nunavut, within the Hood River watershed. It is located 126 km north of the Lupin mine.

The mineral claims holding the Ulu deposit were initially staked in 1988. Portal excavation at the Ulu site commenced in 1996 to confirm resource calculations and mining design for mill feed to the Lupin Mine. Equipment to construct the camp and develop the mine was mobilized to site via a winter road from the Lupin mine in 1996. Camp 3 was built at the esker sand quarry to facilitate construction of the airstrip, road and underground exploration site. It included tent accommodations, a garage and a fuel tank farm. Camp 3 was reclaimed in 2018/2019. Underground development of the ramp ceased in August 1997 at the 155m level. The existing facilities at the Ulu underground exploration site consist of a 20-person camp with sleeping and dining quarters, a 22 m by 37 m vehicle repair shop, fuel containment areas (tanks removed in 2018) for bulk diesel and day tank storage, core storage area, core shack, and fuel staging area. The previous operator demolished unused facilities and stockpile piled them in preparation for disposal in the underground workings and in a landfill at the portal entrance. Blue Star intends to utilize a surface landfill that does not compromise the underground workings.

In support for renewal and amendment of the site water licence application submitted by Blue Star Gold Corporation (Blue Star), SRK Consulting (Canada) Inc. (SRK) was given the mandate to design a non-hazardous waste landfill facility (landfill). The landfill is intended to contain non-hazardous wastes generated during ongoing remediation activities.

This memo provides details of the landfill design and should be read in conjunction with the attached engineering drawings (Appendix A).

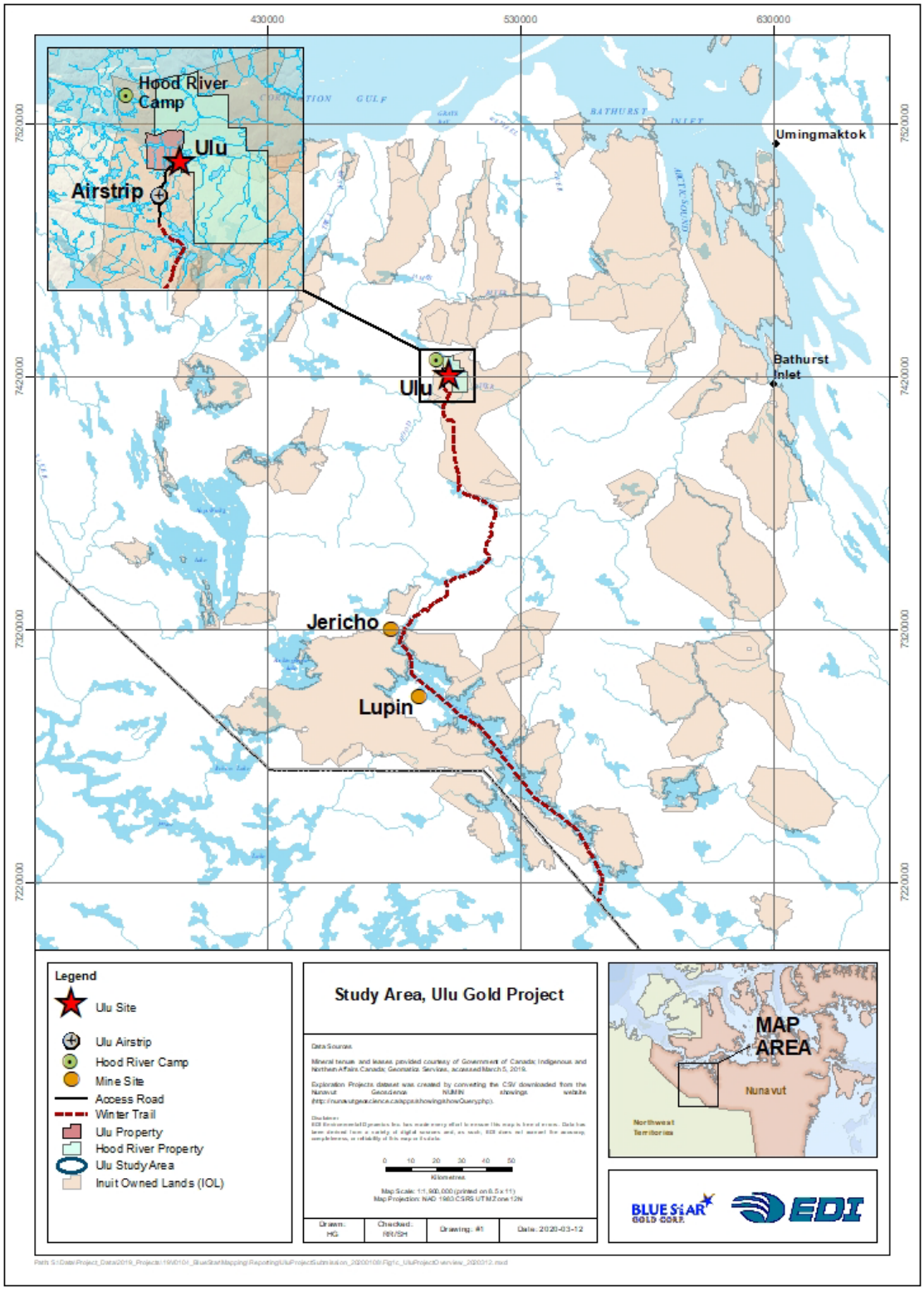

Figure 1 Ulu mine project location

2 Existing Conditions

2.1 Non-Hazardous Waste

The previous operators compiled an inventory list of the waste requiring management on the project in September 2018, see Appendix C. During initial remediation activities the waste was consolidated into three primary areas identified in Figure 3. SRK conducted further investigations in 2019, the topographic drone survey was used to verify the waste volumes provided, these volumes can also be found in Appendix C. Due to the uncertainty in the waste volumes a 30% contingency was added to the minimum storage capacity of the landfill. Total consolidated waste, including contingency, is approximately 10500 m³.

2.2 Climate

The proposed landfill, for the former Ulu Mine exploration camp, is located within the Southern Arctic Ecozone and the Takijuq Lake Upland Ecoregion. Much of this region is composed of unvegetated rock outcrops. Vegetative cover is characterized by shrub tundra, consisting of dwarf birch, willow, northern Labrador tea, avens species and blueberry species. Organic Cryosols are the dominant soils in the lowlands and permafrost is deep and continuous (ECCC 2019).

Regional annual normals from Lupin A station between 1980 and 2010 (ECCC, 2020a) indicate a mean annual rainfall of 160 mm, mostly occurring during July and August. The mean annual snowfall is equivalent to 138 mm of water, most of which falls during autumn and spring. The mean annual air temperature is -10.9 degrees Celsius. Monthly precipitation and temperature normals are presented in Figure 2, and Table 1.

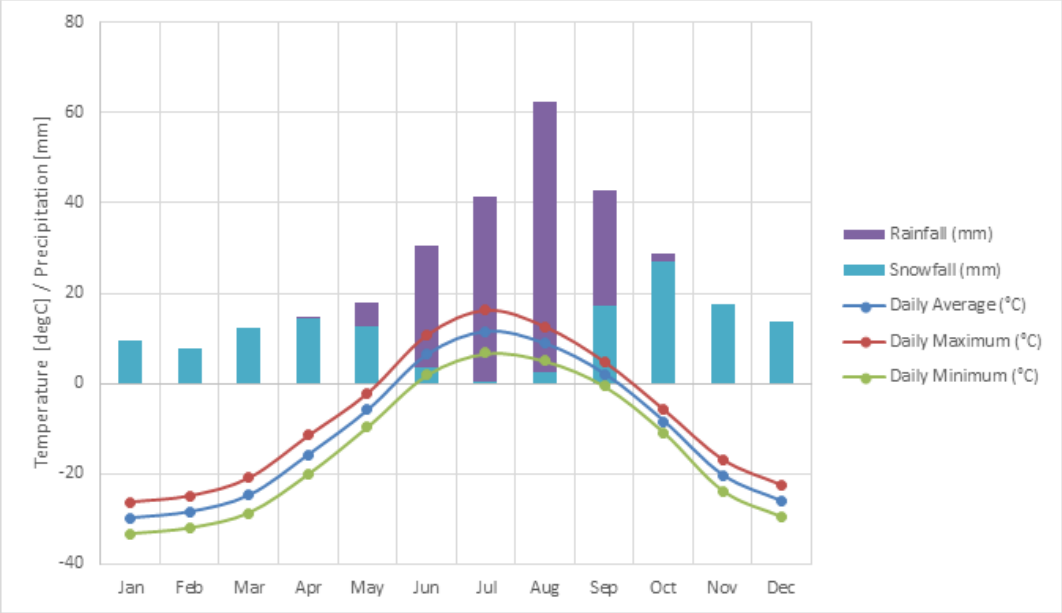

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Figure 2 Temperature and Precipitation Normals

Table 1 Precipitation and Temperature normals based on Lupin A records

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	0	0	0	0.4	5.3	26.8	41.1	59.8	25.5	1.6	0	0	160.5
Snowfall (mm)	9.4	7.8	12.2	14.3	12.5	3.6	0.4	2.6	17.1	27.1	17.4	13.7	138
Precipitation (mm)	9.4	7.8	12.2	14.6	17.8	30.4	41.5	62.5	42.6	28.7	17.4	13.7	298.5
Daily Average Temperature (°C)	-29.9	-28.5	-24.8	-15.8	-5.9	6.4	11.5	8.8	2.1	-8.4	-20.4	-26.2	-10.9
Daily Maximum Temperature (°C)	-26.3	-24.9	-20.9	-11.5	-2.1	10.8	16.3	12.6	4.8	-5.8	-16.9	-22.6	-7.2
Daily Minimum Temperature (°C)	-33.4	-32.1	-28.7	-20.1	-9.6	1.9	6.7	5	-0.6	-10.9	-23.9	-29.7	-14.6

Source: Compiled into text from ECCC 2020a
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3 Location Alternatives

During the July 2019 site investigation, SRK reviewed potential locations for the landfill. The preferred locations were chosen due to their proximity to waste and cover material, use of the surrounding topography for optimal storage space and minimised facility footprint. Figure 3 shows the proposed landfill locations, the proximity to access roads, water courses, and remediation works.

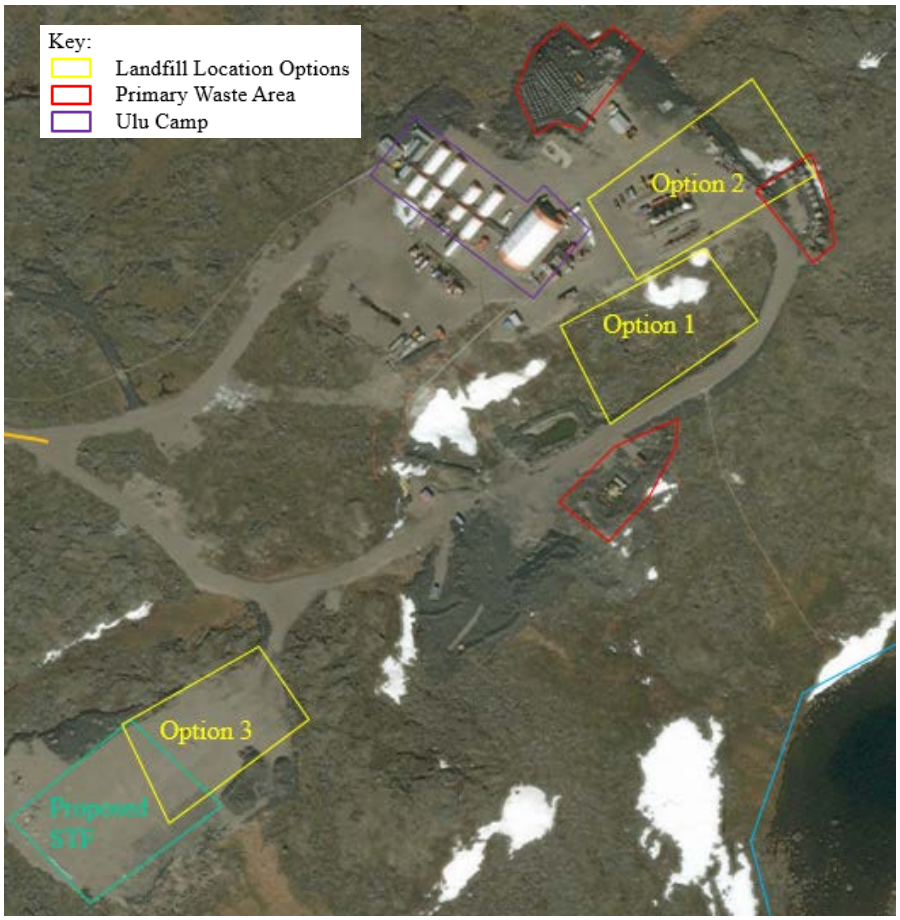

Figure 3 Landfill Location Overview

The following design locations were considered for the landfill:

#1 Adjacent to the Ulu Camp tank farm. An area situated between what was the Ulu Camp tank farm and portal access road. The orientation and topography of this area allows for construction using the depression method for constructability. It is also situated in proximity to all consolidated waste stockpiles. *This location was selected due the proximity to consolidated waste, independent of other reclamation activities and minimized side slopes exposed to potential erosion.*

#2 Ulu camp tank farm void. This location is situated on the former exploration camp tank farm footprint, where contaminated material will be removed prior to the construction of the landfill. The selected location contains petroleum hydrocarbon (PHC) contaminated material intended for the soil treatment facility. An approximately 2.5 m deep void to bedrock will remain once excavated. The intention is to utilize this void to minimized additional ground surface disturbance as well as minimise the required landfill embankment slopes to assist with erosion control. *This option was not selected due to the dependence of the STF PHC contaminated material excavations which pose a risk of delaying the reclamation activities as well as possible interaction with potentially acid generating rock within the vicinity.*

#3 Waste rock pad. A level pad was constructed for the Run-of-Mine stockpile, this location is situated in the South West of the Ulu camp. The area was leveled using waste rock form underground workings and covered with esker sand. *This option was not selected because of the high volumes of cover material required increasing the facility cost as well as this location being the preferred option for the Soil Treatment Facility being constructed in conjunction with landfill.*

The selected locations are situated outside of the primary land-use zone for airstrips as outline by Transport Canada. Primary Hazard Zones generally enclose airspace in which aircraft are at or below altitudes of 1500 feet above ground level (Government of Canada 2013/14). Dry waste landfills are classified to have a “potentially low” level of risk, however, they must not be situated within the primary land-use acceptability zone. See Figure 2 of Appendix A for the site plan showing the zone and landfill locations.

A topographic drone survey was conducted during the 2019 site investigation to capture the detailed topographic surface which implicitly includes the elevation of slope transitions and the general site profile. A 3D model of the Ulu Camp area was utilized for the design of the landfill.

4 Design and Construction

4.1 General

The landfill will contain generally dry, non-leachate generating materials originating from the demolition of site infrastructure, progressive reclamation and closure activities. The non-hazardous waste material includes:

- Non-hazardous building demolition waste,
- Non-hazardous equipment and tyres,
- Untreated wood waste,
- Decontaminated, non-hazardous steel from demolition of tanks, trailers and sea cans, and
- Decontaminated fabrics: Geomembrane liners, weather-haven camp fabric.

Details of the waste volume breakdown can be found in Appendix C.

4.2 Design criteria

The design criteria for the Non-Hazardous Waste Landfill is based on the Guidelines for the Planning, Design, Operations, and Maintenance of Modified Solid Waste Sites in the Northwest Territories (Ferguson et. al. 2003). The design criteria for the landfill is as follows:

- Maximum sidewall slopes of 4H:1V;
- Petroleum hydrocarbon concentrations of material placed within the landfill shall not exceed the Canada-Wide Standard for Petroleum Hydrocarbons in Soil (CCME 2008) for subsoil;
- Geochemical properties of construction material shall be non-metal leaching/acid rock drainage (ML/ARD);
- Minimize surface run-off through the landfill area during operations and post-closure;
- The general drainage gradient of the landfill outer surfaces post-closure shall not be less than 1%;
- Beyond 1:200-year return period flood elevation;
- 30 m beyond high water mark (a distance from water sources to ensures the protection of drinking water); and
- Outside the airstrip primary land-use acceptability zone (Transport Canada)

As the materials are non-hazardous, the design is not dependent on permafrost aggradation into the landfill.

4.3 Construction Specification

Minimal ground preparation will be required due to the sloping nature of the landfill location. Petroleum hydrocarbon contaminated (PHC) material acceptable for burial can be used to create working platforms at the base of the landfill (refer to Landfill Management Plan for specifications on accepted PHC content).

The landfill facility has a maximum capacity of 20,000 m^3 of non-hazardous waste material. The non-hazardous waste will be consolidated by stacking and compacting 1 m thick layers. The maximum vertical length of the facility varies from 5m to 10m across the footprints of the landfill locations.

There will be cut or filled with non-hazardous waste prior to placement within the landfill where shipping containers or tanks are placed. Where applicable, hazardous waste material must be removed from storage tanks or containers prior to placement within the landfill.

Each lift will be compacted with the mobile heavy equipment available on site, namely excavator or bulldozer. The technique to achieve an effective compaction during the initial waste placement will be determined by the construction supervision team and the on-site engineer. Voids within the waste material will be filled with available dry soil material in order to reduce settlement and final cover subsidence. Material with allowable petroleum hydrocarbon concentrations may be used to fill voids within the landfill (refer to Landfill Management Plan for specifications on accepted PHC content).

Snow and ice in excess of 100 mm must be removed from areas where waste is being placed. It is not required to prevent or capture all the seepage that may originate from the waste given the non-hazardous nature of the waste material.

Refer to section 3 for details regarding interim and final closure cover specifications.

4.4 Schedule

It is anticipated the non-hazardous waste will be collected and placed in the proposed landfill for one summer work season. The design and schedule are based on the following equipment:

- 1 x excavator (CAT 311)
- 1 x front end loader (CAT 966D)
- 1 x dump truck (CAT 769C)
- 1 x bulldozer (CAT D8N)
- 1 x grader (CAT 14G)

It is understood that the above includes all the mobile equipment available on site.

4.5 Construction QA/QC

The construction quality assurance and quality control (QA/QC) will consist of the following:

- **Waste Consolidation:** During waste placement, the contractor will consolidate the wastes; voids will be filled using available dry soil (esker) to avoid excessive voids that could lead to post-closure subsidence.

- **Elevation Control:** During construction, the construction team will maintain elevation control of the landfill construction to ensure sufficient void space remains for placement of the final containment cover over the consolidated wastes.

- **Lift Compaction:** The onsite construction supervisor will compact the landfill cover in maximum of 1 m lifts. Compaction will be performed with the available equipment, either by “track packing” using tracked equipment or by tamping with the excavator bucket for small surfaces. The compaction technique will be determined by the construction supervision and the site engineer.

4.6 As-built Report

An as-built survey will be performed after construction of the landfill to confirm and document its size and location. An as-built report of the landfill construction will be prepared and will contain:

- Description of the construction activities;
- Results of the QA/QC program;
- Changes to the design;
- Photos;
- As-built drawings from the site survey; and
- Waste relocation map (area not necessarily accurate survey).

5 Operations and Maintenance

The Landfill Management Plan will accompany the design memo. The plan will provide the types of waste accepted, methods of placement, operating method, engineering controls, closure details and monitoring procedures to be followed during the operation of the facility. It will also include guidance on the placement of materials which are required to be buried at depth.

6 Closure

6.1 General

As with all reclamation activities, the objective is to return the site to a condition of similar environmental productivity and land use that existed prior to the development of mine facilities. It is also intended to eliminate or minimize the requirements for long-term monitoring and maintenance. The specific objectives of the landfill closure plan for the Project are to provide:

- Isolating landfill material from the environment, and
- long term performance specifically focused on the prevention of erosion that may expose the buried waste.

The closure of the landfill will incorporate an interim closure during mine site operation, winter shut down periods, and the final closure once all the identified waste is placed in the landfill facility. The mine will be able to initiate the final closure at any point prior to the final mine site closure. The interim closure will require a higher level of monitoring and maintenance.

6.2 Interim Closure

Interim closure ensures isolation of the waste material prior to final closure.

6.2.1 Design Criteria

The closure design criteria for the non-hazardous landfill is as follows:

- All surface depressions to be to be filled with dry soil cover material;
- Petroleum hydrocarbon concentrations in the surface cover shall not exceed the Canada-Wide Standard for Petroleum Hydrocarbons in Soil (CCME 2008) for surface soil;
- Minimum of 200 mm interim dry soil cover above waste material (temporary wildlife barrier);
- All surfaces graded to prevent ponding of water; and
- Slope angles may not exceed 4H:1V.

6.2.2 Design and Specifications

The objective of the dry soil cover is to isolate the waste from wildlife contact during site inactivity periods (i.e. winter season or prolonged site shut-down). A minimum of 200 mm thick dry soil cover material will be placed over the consolidated non-hazardous waste. The maximum slopes shall not exceed a grade of 4H:1V. Placement to be done in such a way as to minimise water accumulation on the facility.

The dry soil cover material will consist of gravel and sand material sourced locally; esker sand. It is anticipated that the dry soil cover will be constructed by pushing the material over the landfill with a bulldozer and/or placement by an excavator. The surface must be shaped/graded to prevent ponding water. Compaction will be achieved by vibrating roller or multiple passes by the track-mounted bulldozer and/or the excavator.

6.3 Final Closure

6.3.1 Design Criteria

The final closure design criteria for the non-hazardous landfill is as follows:

- All surface depressions to be to be filled with dry soil cover material;
- Petroleum hydrocarbon concentrations in the surface cover shall not exceed the Canada-Wide Standard for Petroleum Hydrocarbons in Soil (CCME 2008) for surface soil;
- Minimum 300 mm intermediate cover (which includes any interim cover placed) and a 300 mm final cover;
- All surfaces graded to prevent ponding of water; and
- Slope angles may not exceed 4H:1V.

6.3.2 Design and Specifications

At final closure, the landfill will be covered in two lifts: a minimum 300 mm intermediate dry soil cover; and then the final cover of 300 mm rock fill or dry soil cover for a total cover thickness of 600mm.

The intermediate cover will include any interim cover previously placed. For; example, if 200mm interim cover is present, only the remaining 100mm of dry soil cover is needed to complete the 300 mm intermediate cover.

Investigations are currently underway to locate suitable rock fill construction material required for the landfill final cover. An investigation will also assess the durability of the available dry soil cover during the construction period. If considered acceptable as final cover material by the site engineer, the client will have the option of using either dry soil or rockfill as final cover material.

All depressions and voids must be filled and closed prior to placement of the final cover. The final side slope surfaces of the landfill will be graded to a maximum slope of 1V:4H and the edges graded to blend into the adjacent surface slope features. Vegetation is naturally sparse in this area and it is expected that natural recolonization will occur over time in areas capable of supporting vegetation. The final landscaping of the facility will be configured to prevent ponding of water, shed surface water away from the landfill facility and merge as much as possible with the surrounding topography.

The 600 mm thick cover composed of two 300 mm layers complies with the Nunavut landfill guidelines (FSC 2003).

7 Monitoring

Minimal monitoring will likely be required for the landfill due to the non-hazardous nature of the waste. The construction and operation of the landfill will include a QA/QC program to ensure compliance with the design and to control waste consolidation for minimizing possible cover subsidence over time. Intermittent maintenance may be required during the interim period of the closure work. Annual visual inspections will be required to determine the need for repair work.

Visual inspections should include, but not limited, to the following:

- Depressions or voids on the surface;
- Frost boils or bulges from frost heave;
- Erosion gullies;
- Damages from human and animal activities;
- Evidence of contamination;
- Abnormal water seeps.

After the placement of the final cover (final closure), inspection of the landfill during the annual mine closure geotechnical inspections should be sufficient to monitor the site's long-term performance.

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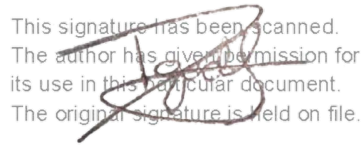

Darryl Godley, EIT (BC)
Consultant

Michel Noel, PEng (BC, NWT/NU)
Principal Consultant

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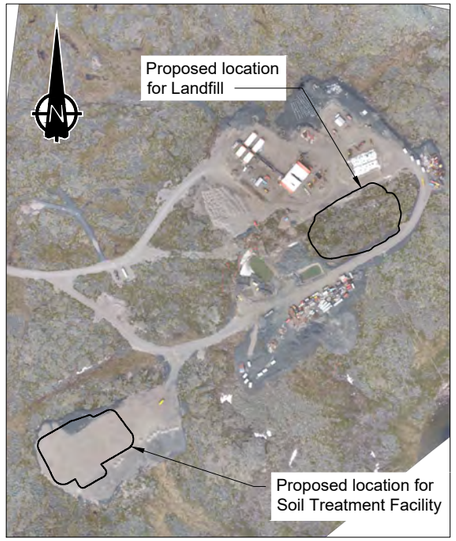
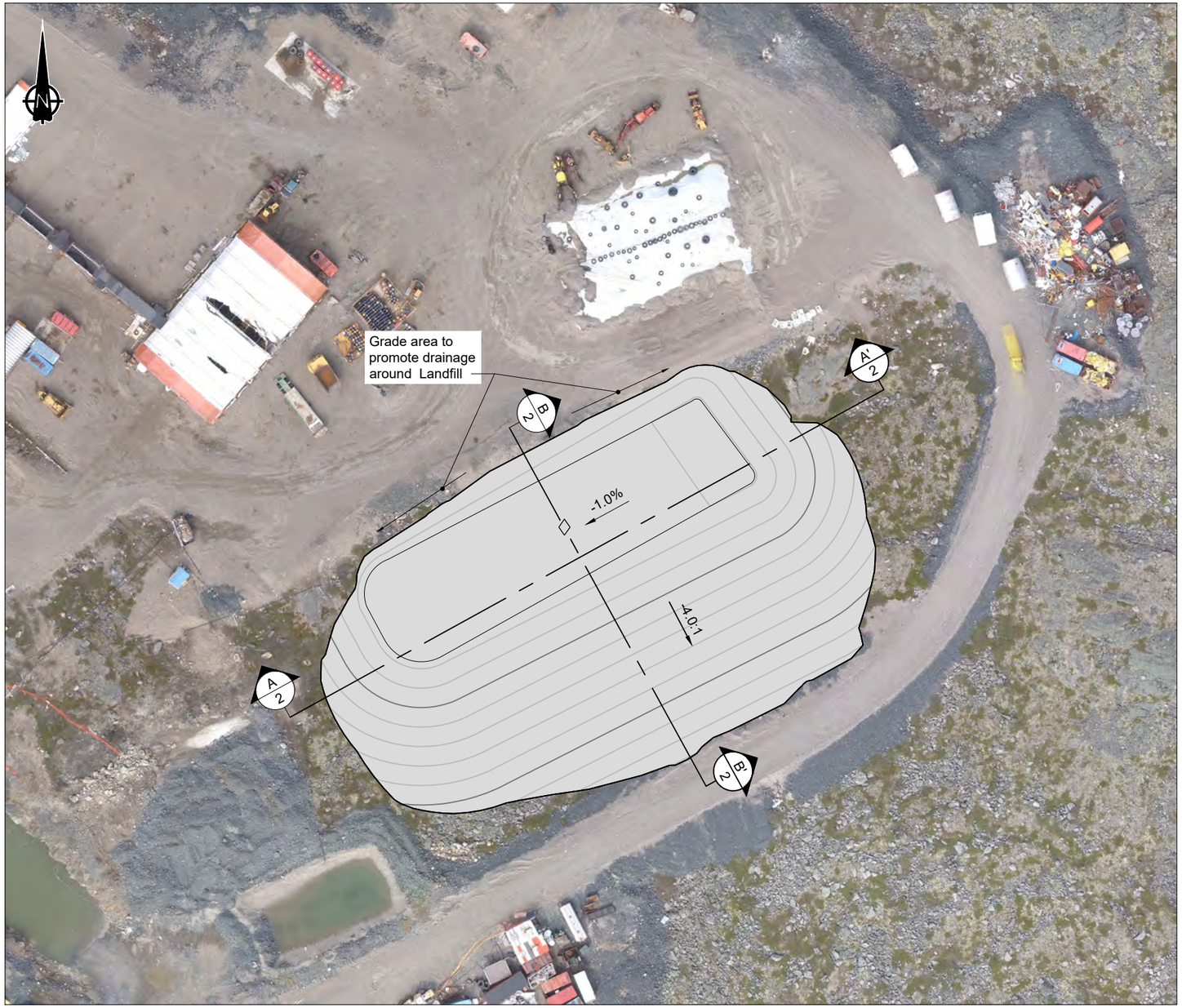
Appendix A: Design Drawings



Key Plan

0m 50 100 150 200 250 300



Landfill - Plan

0m 10 20 30 40

Landfill Volumes	
Material	**Volume m^3**
General Waste	20,100
Interim Cover	2485
Final Cover	3130

(See Note 5)

LEGEND

Design Infrastructure

NOTES

1. Contours shown at 1.0m intervals.
2. All dimensions are in meters unless otherwise noted.
3. Limits of existing roadway surfaces are approximate.
4. Final Cover volume estimate based on 350mm cover to accommodate possible oversize material.
5. All construction material to be approved by the Design Engineer.
6. All construction to be completed in accordance with the technical specifications in the design memorandum (Ulu Gold Project Non-Hazardos Waste Landfill Design. March 2020. Project No. 1CB041.000).

REFERENCE

1. Coordinate System is WGS84 UTM Zone 12N.
2. Original ground surface is created from historic data conturs in drawing ULUTOPO.DWG.
3. Background Image from drone survey completed 07/17/2019.

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SRK JOB NO.: 1CB041.000
FILE NAME: 1CB041.000 Contaminated Landfill.dwg

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Blue Star Gold Corp.

Ulu Gold Project

Landfill
Plan

DATE: March 2020 | APPROVED: | FIGURE: 1

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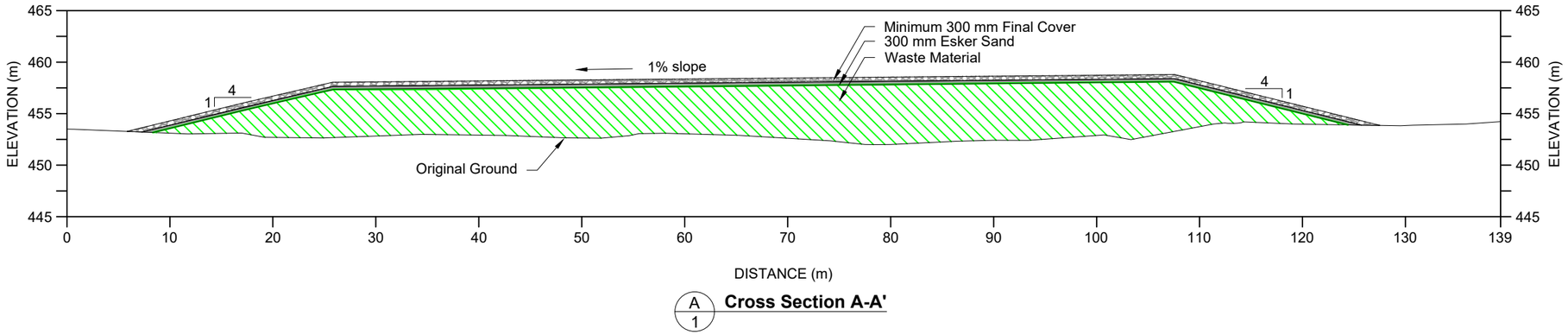
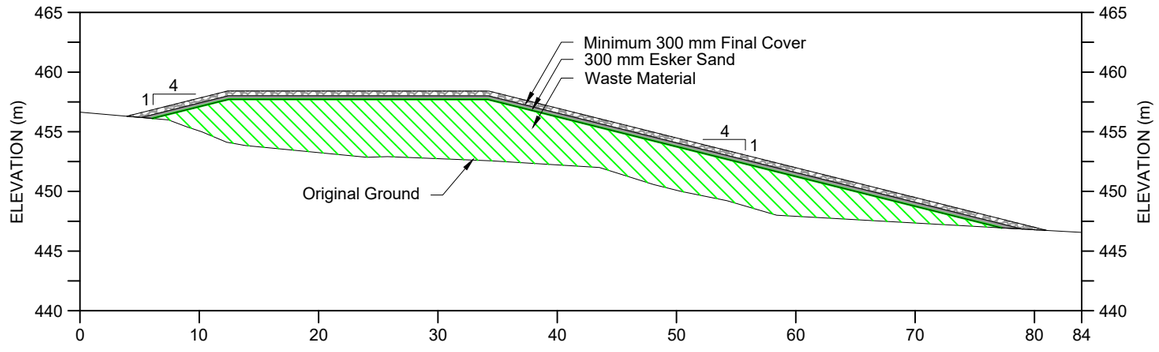


A/1 **Cross Section A-A'**



B/1 **Cross Section B-B'**

LEGEND

- Waste Material
- Esker Sand
- Final Cover

NOTES

1. All dimensions are in meters unless otherwise noted.
2. All construction to be completed in accordance with the technical specifications in the design memorandum (Ulu Gold Project Non-Hazardous Waste Landfill Design. March 2020. Project No. 1CB041.000).

REFERENCE

1. Coordinate System is WGS84 UTM Zone 12N.
2. Original ground surface is created from historic data conturs in drawing ULUTOPO.DWG.

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0m 5 10 15 20

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SRK JOB NO.: 1CB041.000
FILE NAME: 1CB041.000 Contaminated Landfill.dwg

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Ulu Gold Project

Landfill
Sections

DATE:	APPROVED:	FIGURE:
March 2020		2

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Appendix B: Landfill Design Figures

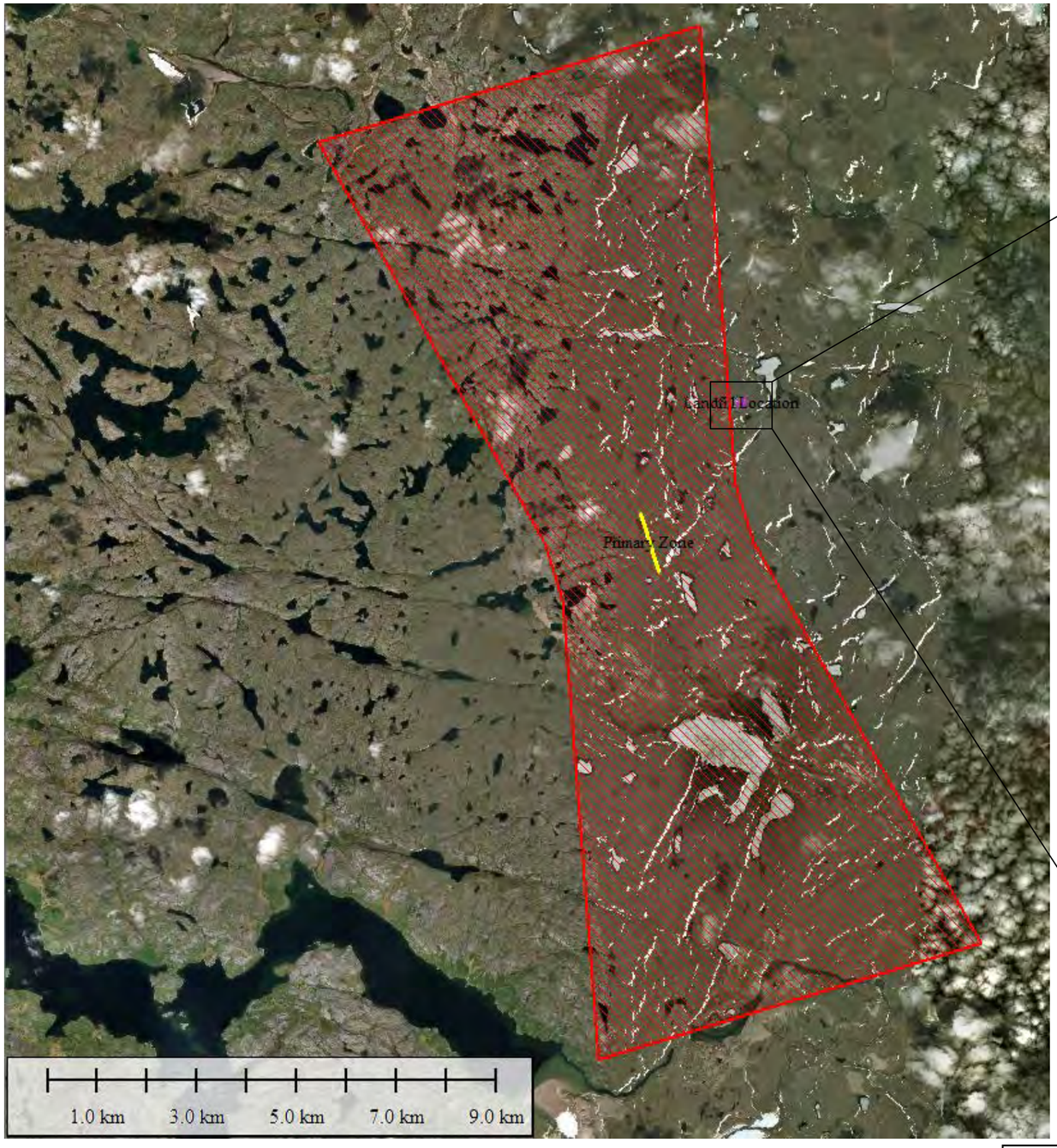

Image source: Global Mapper World Imagery 2009

srk consulting	BLUE STAR GOLD CORP.	Landfill Design	
Job No: 1CB041.00 Filename: LandfillDesign_Figures.pptx	Ulu Gold Project	**Airstrip Proximity Check**	
		Date: March 2020	Approved: DG	Figure: **1**

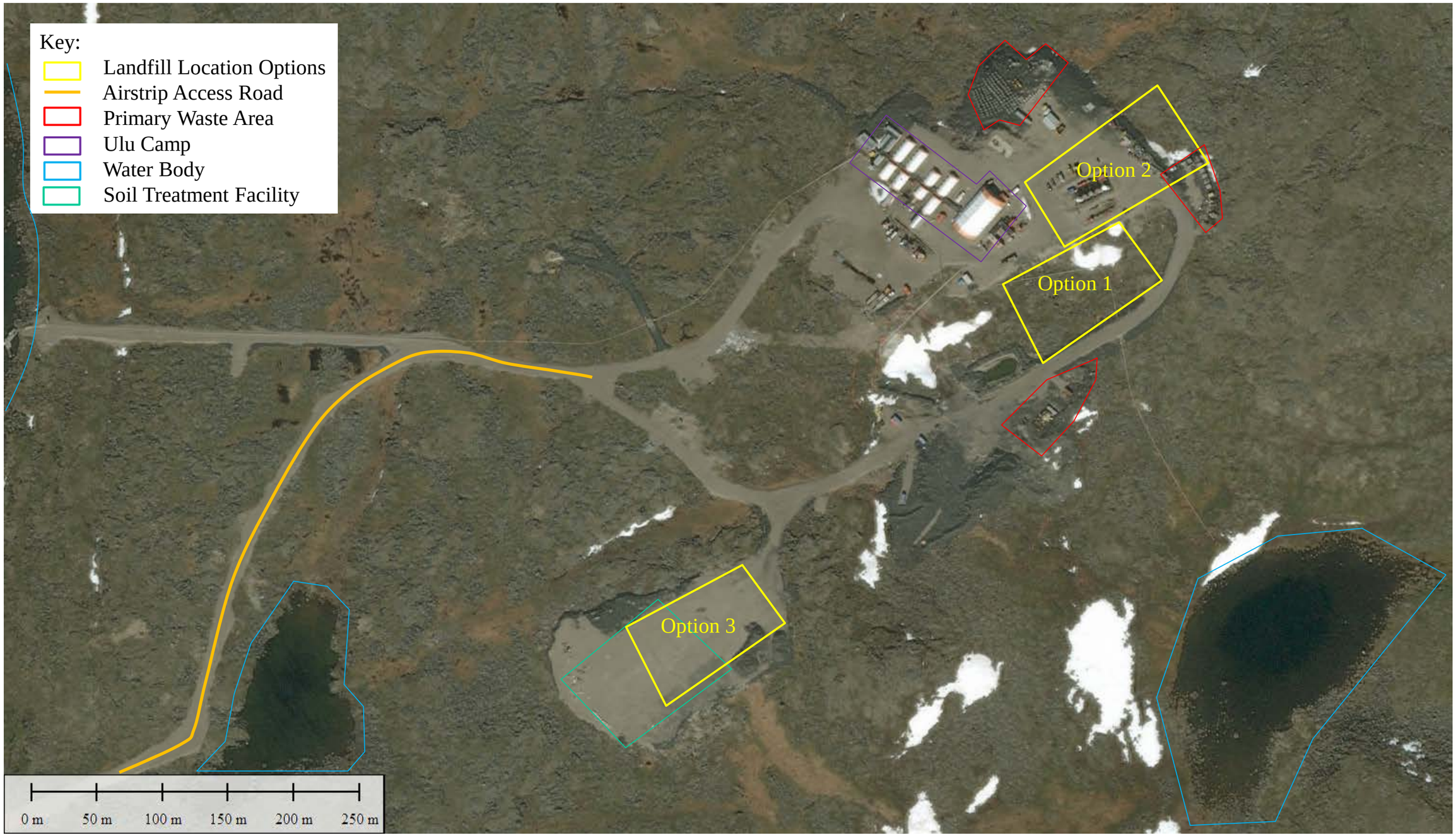

Image source: Global Mapper World Imagery 2009

srk consulting	BLUE STAR GOLD CORP.	Landfill Design
		Landfill Location Overview
Job No: 1CB041.00 Filename: LandfillDesign_Figures.pptx	Ulu Gold Project	Date: March 2020 / Approved: DG / Figure: **2**

Appendix C: Ulu Inventory 2018 September Estimate

Waste Overview

Type of Waste		Composition	Original Treatment Method	September 2018 Revised Volume Estimates (m3)	Notes and Blue Star Treatment Method	July 2019 SRK Volume Estimates (Lidar)
Non-Hazardous	Solid Waste	Non-combustible, non-hazardous building demolition waste.	Remove controlled/hazardous materials as per Solid & Hazardous Waste Management Plan. Cut into manageable pieces and haul to mine portal.	2040	This is volume in sea cans and trailers, does not include volume of materials in camp areas yet to be dismantled. Landfill disposal.	2183
	Bulky Items/Scrap Metal	Salvageable and non-salvageable non-hazardous equipment and tanks. Building support steel.	Option for salvage or recycling if feasible. If not, cut into manageable pieces and haul to mine portal or landfill.	3057	This is volume of sea cans, trailers and shop weatherhaven, does not include camp areas yet to be dismantled. Landfill disposal.	3907
	Solid Waste (Burn)	Paper, paperboard packing, untreated wood waste and natural fiber textiles.	Burned in a controlled manner in a permitted burn pit	0	All available burnable waste was burned. Does not include buildings and equipment not yet dismantled.	0
Hazardous	Hazardous	Batteries, light bulbs.	Prepare for shipment offsite, as detailed in Solid & Hazardous Waste Management Plan.	1	All hazardous material was hauled off site. Estimate of the volume that remains in areas in use, to be removed from site.	1
	Waste Oil	Waste oil from Project and drained from equipment	Prepare for shipment offsite, as detailed in Solid & Hazardous Waste Management Plan.	114	This is a revised estimate of the remaining waste oil barrel volumes (assumed full) at site and does not include waste oil/fuel that is expected to be drained from future decommissioned equipment.	144
Varied	Waste Ore	Ore remaining on Ore Pad	Transport to mine portal	1738	Ore remaining on site.	Unconfirmed
	Hydrocarbon Contaminated Soil	Hydrocarbon Contaminated Soil	Excavate and haul to mine portal	3042	Material found to be suitable for subsoil disposal. **Landfill disposal; non-hazardous**.	2000
					Transport to Soil Treatment Facility.	4000
			Total Hazardous Waste	115	Total Hazardous Waste	145
			Total Non-Hazardous	6835	Total Non-Hazardous	8090
			Total Waste	6950	Total Waste	8235
					Total Non-Hazardous Waste + 30% Contingency	10517

Appendix D: Site Images

srk consulting	BLUE STAR GOLD CORP.	Landfill Design
Job No: 1CB041.00 Filename: LandfillDesign_Figures.pptx	Ulu Gold Project	**Site Images 1/2**
		Date: Date / Approved: DG / Figure: **1**

srk consulting	BLUE STAR GOLD CORP.	Landfill Design
		Site Images 2/2
Job No: 1CB041.00 Filename: LandfillDesign_Figures.pptx	Ulu Gold Project	Date: Date / Approved: DG / Figure: **2**