Reviewer Comments and Proponent Responses

Project: Inuvik Soil Treatment Facility
Board: Gwich'in Land and Water Board
Organization: KBL Environmental Ltd.

No.	Topic	Reviewer Comment	Reviewer Recommendation	Proponent Response
GNWT-ENR - EAM (Environmental Assessment and Monitoring) - Environmental Regulatory Analyst				
1	Security Estimate	ENR has reviewed the financial security estimate update associated with KBL Environmental Ltd. (KBL or Proponent) Water Licence (WL) updated security request for the Inuvik Hydrocarbon Contaminated Soil Treatment Facility (Facility or Project), G22L1-005. The intent of this review by ENR is to present the calculation of security estimate for the closure and reclamation of the Facility. As such, ENR has provided a RECLAIM estimate that, in our opinion, best represents the liability of the site based on the information presented. To better refine the estimate by ENR, recommendations for information deficiencies have been provided herein. Upon response from KBL on the below information deficiencies, ENR would be happy to work with KBL to better refine ENR's estimate for the Board's consideration.	ENR recommends that the Board set the security for the current liability at $581,621, split into water related liability of $384,056 and land related liability of $197,565. ENR recommends that the Board and KBL review the attached memorandum from ARKTIS Solutions Inc. and the RECLAIM estimate for further details on ENR's recommendation and information requests.	The memorandum from ARKTIS Solutions Inc. and associated RECLAIM estimate provided by ENR increased disposal costs for the following line items that are either already included in the third party costs obtained by KBL or are based on the presence of materials that are not nor will be stored at the soil treatment facility. The memorandum assumes that the water treatment plant included in the O&M Plan will need to be decomissioned. This is a portable facility owned and operated by KBL. It is not stored on site and is instead brought to the facility for treatment campaigns. The decomissioning of the water treatment plant is not included in the RECLAIM estimate as it is not a permanent structure at the facility. The memorandum also included costs for the removal of a shed, fuel, and other wastes not a part of the soil treatment facility. The storage shed referenced is located at the Town of Inuvik landfill and is owned by the Town of Inuvik. The demolition of the shed would not be a part of the decomissioning of the facility and is therefore not included in the RECLAIM estimate for the decomissioning of the Facility. Below is a summary of the additional costs included in the memorandum that should not be included in the RECLAIM estimate: 1.Buildings and equipment - The AST removal costs were included in the third party quote. Additional waste from the water treatment plant, shed and other waste are not applicable as discussed above. 2. Chemicals and contaminated soil management - The memorandum included an increase of 72% (or 4500 m3) for remediation of additional soil beyond the maximum capcity of the facility and should not be included in the calculation. In addition the memorandum included costs for the third party soil assessment, however these costs are already included in the estimates obtained by KBL. KBL submits that according to the RECLAIM User Manual, "contingency is added to cover both t

				he uncertainty in the costing esti mate (i.e., variability in quantity of work, unit costs and required scope of activities) and the possi bility that some aspects of the cl osure and reclamation activities may be more difficult to perfor m." Based on this infomation, th e additional soil removal amount s for unknown or potential costs i ncured during decomissioning of the facility are covered within th e contingency category of the R ECLAIM model by design and sho uld not be added to the direct co sts line item. 3. Surface and groundwater ma nagement - The pump out costs for the water were included in th e third party costs provided by K BL as both a seprate line item co st and during pumping of the wa ter and mixing with chemicals fo r the soil treatment campaign. 4. Inflation - The estimates provi ded by KBL are current and ther efore inflation should not be incl uded in the RECLAIM costs. 5. Post-closure monitoring and m aintenance - The costs for two ye ars of post-closure and maintena nce were included in the KBL est imate as annual groundwater mo nitoring, sample analysis and rep orting in a quote provided by thi rd parties.
2	Buildings & Equipment	ENR has noted outstanding unce rtainties that could further refine the reclamation security estimat e for the costs associated with th e reclamation of buildings and e quipment.	ENR recommends KBL confirm t he size and structure type of the water treatment plant and stora ge shed for removal. ENR recommends KBL confirm t he number, size and type of fuel tanks present at site for removal. ENR recommends KBL confirm t he total anticipated volume and/ or tonnage of waste material req uiring disposal in the Inuvik land fill.	The water treatment plant includ ed in the O&M Plan is a portable f acility owned and operated by K BL. It is not stored on site and is instead brought to the facility for treatment campaigns. The deco missioning of the water treatmen t plant is not included in the calc ulations as it is not a permanent structure at the facility, nor woul d it be included int he decomissi oning of the facility. The storage shed is located at th e Town of Inuvik landfill and is o wned by the Town of Inuvik. The demolition of the shed would not be a part of the decomissioning of the facility and is therefore not included in the costs for the dec omissioning of the Facility. No fuel tanks are present at the site. Soil requiring removal is the max imum amount of soil accepted at the facility under the permit: 63 61 m3. Other wastes that would require removal during decommissioning of the soil treatment facility inclu de the facility fence, two 60m3 A STs for water storage at the site and the facility liner. The cost for the removal and/or recycling/ben eficial reuse of these items was i ncluded in the third party quote provided by KBL.
3	Chemicals	ENR has noted outstanding unce rtainties that could further refine the reclamation security estimat	ENR recommends KBL confirm t he maximum quantity of fuel sto red on site.	Fuel is not stored on site.

		e for the costs associated with th e reclamation of chemicals in the corresponding tab in RECLAIM.	ENR recommends KBL confirm t he quantity of potentially untrea table soil remaining following 1 y ear of treatment.	The third party calculation of soil treatment chemical volumes and time required for 6361 m3 of hy drocarbon impacted soils with an average PHC/F2 concentrations 6 000ppm (Clearance 1500) was 1 year. This is consistent with histo rcial contaminations levels and tr eatment times required for soil r eceived at the KBL Inuvik and Yel lowknife soil treatment facilities. Please see the third party quote f or more information.
4	ENR cover l etter	Please see the attached cover let ter.	N/A	N/A

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

January 30, 2023

AlecSandra Macdonald
Regulatory Specialist
Gwich'in Land and Water Board
P.O. BOX 2018
INUVIK, NT X0E 0T0

Dear AlecSandra Macdonald,

Environment and Natural Resources' recommendations on KBL Environmental Ltd.'s updated security estimate for the Inuvik Soil Treatment Facility (G22L1-005)

The Department of Environment and Natural Resources (ENR), Government of the Northwest Territories has reviewed the application at reference based on its mandated responsibilities under the *Waters Act.* ENR has provided comments and recommendations on the Online Review System for the consideration of the Gwich'in Land and Water Board at this time.

Please contact Bill Pain, Environmental Management Scientist with the Water Management and Monitoring Division at Bill_Pain@gov.nt.ca if you have any technical questions.

Please contact GNWT_EA@gov.nt.ca with any general questions or concerns.

Sincerely,

L McGregor

Laurie McGregor
Environmental Assessment Analyst
Environment and Natural Resources

MEMORANDUM

File:	**2023-GNWT ENR**
To:	**Government of the Northwest Territories, Environment and Natural Resources**
Attention:	**Bill Pain, Environmental Scientist, Water Management and Monitoring Division**
Subject:	**KBL Environmental Ltd. – Inuvik Hydrocarbon Contaminated Soil Treatment Facility RECLAIM Estimate for Type B Water Licence (G22L1-005)**
Author:	**Drew Stavinga, M.Sc., P.Geo.** **Jamie Van Gulck, Ph.D., P.Eng.**
Page Total:	**8 plus appendices**
Revision	**0**
Date:	**January 27, 2023**

1.0 INTRODUCTION

ARKTIS Solutions Inc. (ARKTIS) was contracted by the Government of the Northwest Territories, Environment and Natural Resources (GNWT) to complete a financial security estimate associated with KBL Environmental Ltd. (KBL or Proponent) Water Licence (WL) renewal application for the Inuvik Hydrocarbon Contaminated Soil Treatment Facility (Facility or Project), G22L1-005. The purpose of this Memorandum is to present the calculation of security estimate for the closure and reclamation of the Facility. The financial security estimate utilized the RECLAIM v7 model – Oil and Gas (O&G) version.

2.0 METHODOLOGY

The security estimate has been developed utilizing the RECLAIM v7 model and in general accordance with Indian and Northern Affairs Canada (2002) “Mine Site Reclamation Policy for the Northwest Territories”. Despite the policy being developed for mining reclamation, select principles of this policy with regards to reclamation security are directly applicable to soil treatment facility reclamation. The estimate is based on the premise that adequate security is to be provided to cover the cost of reclamation, including shutdown, closure and post-closure for all project components, and that a third party, independent contractor would complete the reclamation activities. Where applicable, unit costs were selected using the RECLAIM costing database.

The security amount was calculated from the sum of capital costs and indirect costs associated with the activities described in the following primary documentation:

- KBL Environmental Ltd., May 2022, Closure and Reclamation Plan (Version 1.1), Inuvik Hydrocarbon Contaminated Soil Treatment Facility, Gwich’in Land and Water Board, G17L1-002 Type “B” Licence.
- KBL Environmental Ltd., May 2022, Environmental Monitoring Plan (Version 1.1), Inuvik Hydrocarbon Contaminated Soil Treatment Facility, Gwich’in Land and Water Board, G17L1-002 Type “B” Licence.
- KBL Environmental Ltd., July 2021, Operations and Maintenance Plan (Version 2.2), Inuvik Hydrocarbon Contaminated Soil Treatment Facility, Gwich’in Land and Water Board, G17L1-002 Type “B” Licence.
- KBL Environmental Ltd., July 2021, Spill Contingency Plan (Version 1.1), Inuvik Hydrocarbon Contaminated Soil Treatment Facility, Gwich’in Land and Water Board, G17L1-002 Type “B” Licence.
- KBL Environmental Ltd., February 2021, Waste Management Plan (Version 2.2), Inuvik Hydrocarbon Contaminated Soil Treatment Facility, Gwich’in Land and Water Board, G17L1-002 Type “B” Licence.

- KBL Environmental Ltd., December 2022, Updated Closure Cost Estimate – RECLAIM, KBL Inuvik Soil Treatment Facility – Type B Water Licence G22L1-005.
- KBL Environmental Ltd., May 2022, G17L1-002 Type B Water Licence Renewal Application Form to the Gwich'in Land and Water Board (GLWB).
- KBL Environmental Ltd., December 2022, KBL Inuvik Security Request – Confidential Quotes.
- Gwich'in Land and Water Board, November 2022, KBL Inuvik Soil Treatment Facility - Type B Water Licence G22L1-005 – Issuance Package.

Key cost estimate assumptions and limitations include:

- This cost estimate is associated with the Inuvik Hydrocarbon Contaminated Soil Treatment Facility as described by the Closure and Reclamation Plan[1], including the biotreatment facility and retention pond areas and associated equipment/infrastructure.
- A review of any securities currently held for the Project site was not completed. No review of securities held under previous authorizations was completed to reconcile common securities or to evaluate if the past security estimates remain valid or reflect the Closure and Reclamation Plan.
- This cost estimate is an end of project life security estimate for the Inuvik Facility; thus, no phasing of liabilities over time was considered at this time.

2.1 Capital Costs

At closure the following primary reclamation activities will occur:

- Soil testing and treatment;
- Water testing and treatment;
- Removal of clean soil for use at the Inuvik landfill;
- Completion of contaminated soil investigations and removal of potential contaminated soil;
- Removal of buildings, equipment and fuel and water tanks;
- Reclamation and remediation of disturbed land; and,
- Removal and disposal of hazardous and waste materials remaining on site and generated through reclamation activities.

Each of these activities have been accounted for in the security estimate as documented in the RECLAIM output sheets (see Appendix A). The RECLAIM output sheets include detailed notes associated with quantity and unit cost selection, as well as, key assumptions.

For each reclamation activity, a quantity was specified, and a unit cost was selected. Quantities are based on those reported in KBL's estimate or available Project documentation, where available, or assumed based on experience at other sites. Unit costs and associated high/low rates were selected based on the type of reclamation activity to be completed. The author's judgement and experience were used to select unit costs considered appropriate for each reclamation activity. The reclamation security amount associated with each reclamation activity was calculated as the product of the specified quantity and unit cost. Key assumptions in the estimation of capital costs are further described in Section 4.

2.2 Indirect Costs

The indirect costs applied in this estimate include the following:

- Completion of post-closure monitoring and maintenance; and,
- Indirect costs that are calculated as a percentage of the capital costs, as follows:
    - Engineering – 5%

[1] KBL Environmental Ltd., May 2022, Closure and Reclamation Plan (Version 1.1), Inuvik Hydrocarbon Contaminated Soil Treatment Facility, Gwich'in Land and Water Board, G17L1-002 Type "B" Licence.

- Project management - 5%
- Contingency – 20%

The indirect fee percentages applied are typical as described in the 2017 RECLAIM User Manual (Oil and Gas Version)[2]. It is the authors' opinion that a 15% contingency reasonably reflects the execution details available for the Project reclamation since a closure plan has been developed, with limited anticipated engineering remaining and most costs based upon verbal quotes. Key assumptions in the estimation of indirect costs are further described in Section 4 and the RECLAIM output sheets (see Appendix A). ARKTIS has applied an inflation factor to update the RECLAIM costs from 2014 to 2023 dollars.

3.0 ANALYSIS AND RESULTS

The costing information utilized in the security estimate presented in Section 2.0 were used as inputs to the RECLAIM v7 model. The RECLAIM v7 output sheets are provided in Appendix A. Table 1 summarizes the capital and indirect costs and total security estimate as calculated by the RECLAIM v7 model.

[2] GNWT, 2017. RECLAIM 7.0 – User Manual, Oil and Gas Version. March 2017.

Table 1. Summary of total reclamation security.

CAPITAL COSTS	TOTAL COSTS	LAND LIABILITY	WATER LIABILITY
WELLS AND FACILITIES	$0	$0	$0
BUILDINGS AND EQUIPMENT	$13,402	$13,402	$0
CHEMICALS AND CONTAMINATED SOIL MANAGEMENT	$270,705	$135,353	$135,353
SURFACE AND GROUNDWATER MANAGEMENT	$160,395	-	$160,395
INTERIM CARE AND MAINTENANCE	$0	-	$0
INFLATION (2014 TO 2023 $CAD – 22.05%) ON CAPITAL COSTS	$11,358	$6,093	$5,266
SUBTOTAL: Capital Costs	**$455,860**	**$154,847**	**$301,013**
PERCENT OF SUBTOTAL		**34%**	**66%**
INDIRECT COSTS	**TOTAL COSTS**	**LAND LIABILITY**	**WATER LIABILITY**
MOBILIZATION/DEMOBILIZATION	$0	$0	$0
POST-CLOSURE MONITORING AND MAINTENANCE	$10,170	$3,455	$6,715
ENGINEERING	$22,793	$7,742	$15,051
PROJECT MANAGEMENT	$22,793	$7,742	$15,051
HEALTH AND SAFETY PLANS/MONITORING & QA/QC	$0	$0	$0
BONDING/INSURANCE	$0	$0	$0
CONTINGENCY - APPLIED TO CAPITAL COST AND POST-CLOSURE MONITORING AND MAINTENANCE	$69,918	$23,750	$46,168
MARKET PRICE FACTOR ADJUSTMENT	$0	$0	$0
INFLATION (FROM 2014 TO 2023 $CAD – 22.05%) POST-CLOSURE MONITORING AND MAINTENANCE	$87	$30	$58
SUBTOTAL: Indirect Costs	**$125,761**	**$42,719**	**$83,042**
TOTAL COSTS	**$581,621**	**$197,565**	**$384,056**

4.0 RECLAMATION SECURITY ESTIMATE ASSUMPTIONS

Although not an exhaustive list, the key reclamation activities, and therefore reclamation costs, that are included in ARKTIS' estimate, and if applicable a general comparison to KBL's assumptions in their reclamation plan and/or estimate, are provided in the following bullets.

- *Removal of project buildings and equipment* – ARKTIS has included costing for dismantling of project structures and equipment (i.e., water treatment plant, sheds, water/fuel tanks) based on the quantity, footprint and type of structures present as identified in KBL's CRP and/or project drawings, as well as based on 3rd party quotes for certain reclamation activities where available (i.e., removal of above-ground water storage tanks [ASTs] and liner to the landfill). The Proponent's estimate includes costing for removal of ASTs only.
- *Removal of waste* - ARKTIS has assumed costing to transport by truck from the Project site to the adjacent Inuvik landfill all waste remaining on site and generated through reclamation activities that are not already costed with the removal activities, including miscellaneous debris and refuse, demolished or dismantled buildings, structures and equipment, fuel tanks and any other waste. ARKTIS has included costing for waste disposal at the Inuvik landfill based on current 2023 tipping rates from the city of Inuvik. Costing for waste removal to the landfill is included in KBL's estimate for select items only (e.g., liner, ASTs). It is uncertain if KBL's estimate includes landfill disposal fees.
- *Fuel removal and disposal* - ARKTIS has included costing for fuel removal and disposal based on the quantities provided in KBL's Spill Contingency Plan. ARKTIS has assumed 10% of the maximum fuel stored on site will require removal at closure. It is assumed storage of the fuel in small temporary or portable fuel tanks will limit handling and transport costs. ARKTIS has also included costing for an environmental coordinator to oversee fuel and contaminated soil removal. Costs for fuel removal are not included in the KBL's estimate.
- *Soil treatment and testing* – ARKTIS assumed the Facility will continue to operate and treat any existing contaminated soil present at the time of KBL's default on the licence for up to 1 year before initiation of closure and reclamation activities. Following 1 year of treatment, ARKTIS assumes any soil not meeting re-use criteria will be removed for disposal off-site. ARKTIS has assumed the Proponent's costing for soil treatment of the full capacity of the treatment cell. The basis of this estimate is not provided but appears consistent with the approved estimate for KBL's Yellowknife soil treatment facility. It is noted that the RECLAIM unit cost for soil remediation is higher. Costing for reagent supply, delivery and application oversight have also been included based on 3rd party quotes. ARKTIS has included costing for a single confirmatory soil investigation following treatment to verify soil meets re-use criteria. Costs for soil treatment, reagents and their application, and three separate soil investigations are included in KBL's estimate.
- *Contaminated soil removal and disposal* – The quantity of potentially contaminated soil remaining at the Project site following 1 year of treatment is uncertain. For this estimate and without further information, ARKTIS has assumed a costing allowance for excavation and disposal of a relatively minor volume of contaminated soil (100 m^3), occurring as either untreatable soil in the biotreatment cell and/or contaminated soil beneath the liner. The assumed contaminated soil volume is considered not unreasonable, given it represents less than 2% of the treatment volume and is less than the volume of contaminated soil that would occur if 5% of the area of the treatment cell below the liner was contaminated to 1 m in depth. It is assumed any contaminated soil requires transport to British Columbia for disposal. Costs for contaminated soil removal are not included in KBL's estimate.
- *Clean soil removal* – ARKTIS has included costing to remove clean soil from the biotreatment facility for re-use at the Inuvik landfill following treatment, assuming a soil volume equivalent to the maximum facility storage capacity, based on 3rd party quotes. Costs for soil removal to the landfill are included in KBL's estimate.
- *Contaminated soil investigation* – ARKTIS has included costing to complete sampling and testing of soils beneath the Facility liner for potential contamination. It is assumed the liner is in good condition such that contamination below the liner is minimal, with no free hydrocarbon product at site. Thus, only a minor volume of contaminated soil below the liner is assumed present that

requires some additional delineation sampling. It is uncertain if costs for confirmatory soil sampling following facility closure and liner removal are included in KBL's estimate.

- *Water treatment and testing* - ARKTIS has included costing to treat Facility water during ongoing soil treatment up to time of closure, assuming a total treatment volume equivalent to the maximum storage capacity of the retention pond and a single AST. Costing to pump out the retention pond and AST were also included based on 3rd party quotes. KBL's estimate includes costing to treat water from a single AST, but assumes retention pond water will be used in soil treatment and thus excludes water treatment and pumping costs. ARKTIS has also included costing for a water sampling/testing and reporting event during soil treatment and at Facility closure to identify water/snow requiring treatment, for 2 events total, based on 3rd party quotes. Costs for two water sampling/testing and reporting events are also included in KBL's estimate.
- *Liner removal and site regrading* - ARKTIS has included costing to remove and dispose of the Facility liner at the Inuvik landfill, as well as recontour and regrade the Facility berms and pads based on 3rd party quotes. KBL's estimate also includes similar costing.
- *Removal of pipes and pumps* - ARKTIS has included an assumed minor costing allowance to address removal of the water treatment system pumps and pipes. Costs for removal of pumps and pipes are not included in KBL's estimate.
- *Interim care and maintenance* – ARKTIS' and KBL's estimate do not include an interim care and maintenance period for the Project. ARKTIS assumes that upon KBL defaulting on the licence, the GNWT would hire a 3rd party to continue to run the Facility to treat any remaining soil for up to 1 year before closure. This timeframe is assumed sufficient to finalize any closure preparations and negate the need for an additional interim care and maintenance period.
- *Mobilization/demobilization* - ARKTIS' and KBL's estimate do not include separate mobilization/demobilization costs for the Project. ARKTIS assumes all labour, equipment and materials is available locally and thus no mobilization/demobilization cost is required, or their costs are already included with the reclamation activity costing.
- *Post-closure monitoring and maintenance* – ARKTIS has included costing for two groundwater monitoring and regulatory reporting events after Facility reclamation, assuming confirmation of no on-going impacts is achieved. ARKTIS has included costing to decommission the groundwater monitoring wells following completion of monitoring. Costing for post-closure groundwater well monitoring and decommissioning are not included in KBL's estimate.
- *Inflation* – KBL does not include an inflation adjustment in their estimate to update the RECLAIM costs from 2014 to 2023 dollars. ARKTIS has applied an inflation factor of 22.05% to update the RECLAIM costs from 2014 to 2023 dollars. With respect to project specific or more recent unit costs, ARKTIS selectively applied inflation to RECLAIM unit costs only.

5.0 RECOMMENDATIONS

The RECLAIM security calculates the portion of security that is applicable to land and water liabilities. It is recommended that the security be held under the appropriate instrument (e.g., land use permit, water licence, etc.). The total reclamation security and recommended land and water portions as presented by ARKTIS' and KBL's estimate is provided in Table 2~~Table 2~~.

A comparison of the RECLAIM security estimate from ARKTIS' and KBL's estimate is provided in Table 3, along with notes identifying the primary causes of cost differences between the estimates.

Table 2. Summary of reclamation security.

Estimate	Total Costs	Total Land Liability	Total Water Liability
ARKTIS	$581,621	$197,565	$384,056
KBL	$402,070	$164,710	$237,360
Difference	+$179,551	+$32,855	+$146,696

N/A = Not available.

Table 3. Comparison of total reclamation security between estimates.

Capital Costs	KBL Estimate	ARKTIS Estimate	Notes
	Total Costs		
Wells and facilities	$0	$0	
Buildings and equipment	$500	$13,402	Increase of $12,902 primarily due to inclusion of all AST removal fees in this category, as well as inclusion of additional costs for building and waste removal and disposal.
Chemicals and contaminated soil management	$157,000	$270,705	Increase of $113,705 primarily due to the inclusion of a separate removal cost for treated soil on top of the adopted soil treatment cost, as well as additional costs for soil investigation beneath the liner, and removal, transport and disposal of potential untreatable soil and contaminated soil present beneath the liner.
Surface and groundwater management	$151,785	$160,395	Increase of $8,610 primarily due to the inclusion of pump out costs of the ASTs and retention pond for water treatment and discharge.
Interim care and maintenance	$0	$0	
Inflation (0% vs. 22.05%)	$0	$11,358	Increase of $11,358 due to addition of inflation to RECLAIM unit costs.
SUBTOTAL: Capital Costs	**$309,285**	**$455,860**	
Indirect Costs	**Total Costs**		
Mobilization/demobilization	$0	$0	
Post-closure monitoring and maintenance	$0	$10,170	Increase of $10,170 due to the inclusion of groundwater well monitoring and decommissioning costs following facility reclamation.
Engineering (5%)	$15,464	$22,793	These indirect costs are calculated as a percentage of the capital cost. The capital costs differ between the estimates and therefore these indirect costs are different.
Project management (5%)	$15,464	$22,793	
Health and safety plans/monitoring and quality assurance/quality control (0%)	$0	$0	
Bonding/insurance (0%)	$0	$0	
Contingency (20% vs. 15%)	$61,857	$69,918	Increase of $8,061 due to updates to capital costs above, application to post-closure monitoring / maintenance and inflation costs, as well as differences in assumed contingency rate (20% vs. 15%).
Market price factor adjustment (0%)	$0	$0	
Inflation (0% vs. 22.05%)	$0	$87	Increase of $87 due to increase to addition of inflation to RECLAIM unit costs.
SUBTOTAL: Indirect Costs	**$92,785**	**$125,761**	
TOTAL COSTS	**$402,070**	**$581,621**	

Additional information and details to be obtained from KBL to further refine the reclamation security estimate and address outstanding uncertainties include without limitation:

Buildings & Equipment

1. Confirm the size and structure type of the water treatment plant and storage shed for removal.
2. Confirm the number, size and type of fuel tanks present at site for removal.
3. Confirm the total anticipated volume and/or tonnage of waste material requiring disposal in the Inuvik landfill.

Chemicals

1. Confirm maximum quantity of fuel stored on site.
2. Confirm estimated quantity of potentially untreatable soil remaining following 1 year of treatment.

6.0 DISCLAIMER AND CLOSURE

ARKTIS Solutions Inc. assumes no responsibility for inappropriate use of the contents of this report and disclaims all liability arising from negligence or otherwise in respect of such information and recommendations presented in this report. General terms and conditions are available in Appendix B.

ARKTIS SOLUTIONS INC.

Drew Stavinga, M.Sc., P.Geo.	Jamie Van Gulck, Ph.D., P.Eng.
Professional Geoscientist	Chief Technical Officer

APPENDIX A – RECLAIM OUTPUTS

SUMMARY OF COSTS

CAPITAL COSTS	COMPONENT NAME	COST	LAND LIABILITY	WATER LIABILITY	Source of Information	Comparison to Proponent's Security
WELLS AND FACILITIES		$0	$0	$0		
BUILDINGS AND EQUIPMENT		$13,402	$13,402	$0		
CHEMICALS AND CONTAMINATED SOIL MANAGEMEN		$270,705	$135,353	$135,353		
SURFACE AND GROUNDWATER MANAGEMENT		$160,395	-	$160,395		
INTERIM CARE AND MAINTENANCE		$0	-	$0		
INFLATION	22.05%	$11,358	$6,093	$5,266	Inflation applied to Dec 2022	Not included in Proponent's estimate.
	SUBTOTAL: Capital Costs	**$455,860**	**$154,847**	**$301,013**		
	PERCENT OF SUBTOTAL		**34%**	**66%**		

INDIRECT COSTS		COST	LAND LIABILITY	WATER LIABILITY		
MOBILIZATION/DEMOBILIZATION		$0	$0	$0		
POST-CLOSURE MONITORING AND MAINTENANCE		$10,170	$3,455	$6,715		Not included in Proponent's estimate.
ENGINEERING	5%	$22,793	$7,742	$15,051		
PROJECT MANAGEMENT	5%	$22,793	$7,742	$15,051		
HEALTH AND SAFETY PLANS/MONITORING & QA/QC		$0	$0	$0		
BONDING/INSURANCE		$0	$0	$0		
CONTINGENCY	15%	$69,918	$23,750	$46,168	Includes a 15% contingency, applied to capital costs, post-closure and inflation costs. A preliminary or budget level contingency (15%) is considered appropriate for current project stage.	Includes 20% contingency on capital costs. Excludes post-closure and inflation costs.
MARKET PRICE FACTOR ADJUSTMENT		$0	$0	$0		
INFLATION	22.05%	$87	$30	$58	Inflation applied to Dec 2022	Not included in Proponent's estimate.
	SUBTOTAL: Indirect Costs	**$125,761**	**$42,719**	**$83,042**		

TOTAL COSTS	**$581,621**	**$197,565**	**$384,056**

Statistics Canada inflation rate for YK from January 2014 (Consumer Price Index 127.0) to 155.0 Dec 2022 for inflation of 22.05%. (https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000401)

Inflation	22.05%

1 **Building / Equip Name:** **Bldg / Equip #:** ***1***

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost	Inflation	Source of Information	Comparison to Proponent's Security
OBJECTIVE: DISPOSE MOBILE EQUIPMENT												
Decontaminate and ship off-site		each		#N/A	$0.00	$0		$0	$0			
Decontaminate, dispose on-site		each		#N/A	$0.00	$0		$0	$0			
Other		each		#N/A	$0.00	$0		$0	$0			
OBJECTIVE: BUILDING DECONTAMINATION & HAZ. MATERIAL REMOVAL												
Decontaminate, oil, fuel and glycol systems		mandays		#N/A	$0.00	$0		$0	$0			
Decontaminate, general		mandays		#N/A	$0.00	$0		$0	$0			
Mechanical		mandays		#N/A	$0.00	$0		$0	$0			
Electrical		mandays		#N/A	$0.00	$0		$0	$0			
Decontaminate maintenance shop		each		#N/A	$0.00	$0		$0	$0			
Decontaminate power plant		each		#N/A	$0.00	$0		$0	$0			
Decontaminate bulk fuel storage		each		#N/A	$0.00	$0		$0	$0			
Deontaminate offices/warehouse/accom		each		#N/A	$0.00	$0		$0	$0			
Removal of asbestos siding on buildings		each		#N/A	$0.00	$0		$0	$0			
Removal of friable asbestos on equipment		each		#N/A	$0.00	$0		$0	$0			
Other				#N/A	$0.00	$0		$0	$0			
OBJECTIVE: REMOVE BUILDINGS - ALL BUILDING AREAS SCALED TO ACCOUNT FOR HEIGHT												
Accomodation Complex		m2		#N/A	$0.00	$0		$0	$0			
Process Facilities		m2		#N/A	$0.00	$0		$0	$0			
Offices, Repair, Lab, Warehouse		m2		#N/A	$0.00	$0		$0	$0			
Storage Facilites	Storage shed. Steel teardown.	m2	12.25	BRS1L	$45.00	$551	100%	$551	$0	$122	Storage shed identified in CRP for removal. Assume approx. 3.5 m x 3.5 m based on site drawings. Assume steel, single story teardown.	Not included in Proponent's estimate.
Water and Wastewater Treatment Facilities	Package water treatment plant. Steel teardown	m2	84	BRS1L	$45.00	$3,780	100%	$3,780	$0	$833	Water treatment plant identified in CRP for removal. Assume approx. 12 m x 7 m based on site drawings. Assume steel, single story teardown.	Not included in Proponent's estimate.
U/G Heating Plant		m2		#N/A	$0.00	$0		$0	$0			
Emulsion Plant		m2		#N/A	$0.00	$0		$0	$0			
AN Storage Facility		m2		#N/A	$0.00	$0		$0	$0			
Warehouse, Shops and Other		m2		#N/A	$0.00	$0		$0	$0			
Storage Facility at Laydown/Airstrip		m2		#N/A	$0.00	$0		$0	$0			
Fuel tanks	Temporary or portable fuel storage tanks. Assume 4 tanks.	m2		#N/A	$0.00	$0		$0	$0	$0	Fuel tanks identified in CRP for removal. Assume approx. four (4) fuel tanks up to 3 m x 3 m based on site drawings. Assume fuel tanks are removed intact, thus no teardown required. Handling and disposal costs addressed with waste removal below and fuel removal in Chemicals tab.	Not included in Proponent's estimate.
Freshwater intake		m2		#N/A	$0.00	$0		$0	$0			
Reclaim pumps		m2		#N/A	$0.00	$0		$0	$0			
Outfall & Diffuser		m2		#N/A	$0.00	$0		$0	$0			
Airstrip lighting, navigation, electrician		mandays		#N/A	$0.00	$0		$0	$0			
Airstrip lighting, navigation, mechanical		mandays		#N/A	$0.00	$0		$0	$0			
Consolidate & dump boneyard debris		m3		#N/A	$0.00	$0		$0	$0			
Above ground water storage tanks (ASTs) - removal	2 x 63,000 L ASTs	allocation	1	#N/A	$7,500.00	$7,500	100%	$7,500	$0	N/A, current rates	CRP reports two 63,000 L water storage tanks for removal and disposal at Inuvik landfill. Based on 3rd party quotes for AST (and fence) removal and disposal. Assume cost includes transport but excludes disposal fee.	3rd party cost for AST removal included with costing for liner removal. Additional $500 removal cost for ASTs also included. Uncertain if this cost addressed tank removal or landfill disposal fee.
Waste transport	Transport of facility waste to Inuvik landfill.	hrs	1	HIABL	$155.00	$155	100%	$155	$0	$34	Assume 1 load of waste material for transport from KBL facility to adjacent Inuvik landfill. Assume includes demolished buildings, empty fuel tanks, pumps and pipes, site refuse and debris, and any other inert waste. Excludes ASTs and liner - cost included with their removal. Estimate 1 hr total for load, haul, unload. Assume transport by flat-bed truck.	Not included in Proponent's estimate.

1 **Building / Equip Name:** **Bldg / Equip #: 1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost	Inflation	Source of Information	Comparison to Proponent's Security
Landfill disposal fee	Inuvik landfill disposal fee	allow	1	#N/A	$1,415.25	$1,415	100%	$1,415	$0	N/A, current rates	Based on 2023 Inuvik landfill tipping fees for local waste. Assume an allowance for one full truck load of 40 tonnes for demolished buildings, empty fuel tanks, ASTs, liners, pumps and pipes, site refuse and debris, and any other inert waste.	Includes $500 removal cost for ASTs. Uncertain if this cost addresses tank removal or landfill disposal fee.
OBJECTIVE: BREAK BASEMENT SLABS												
Accomodation Complex		m2		#N/A	$0.00	$0		$0	$0			
Process Facilities		m2		#N/A	$0.00	$0		$0	$0			
Offices, Repair, Lab, Warehouse		m2		#N/A	$0.00	$0		$0	$0			
Storage Facilites		m2		#N/A	$0.00	$0		$0	$0			
Water and Wastewater Treatment Facilities		m2		#N/A	$0.00	$0		$0	$0			
U/G Heating Plant		m2		#N/A	$0.00	$0		$0	$0			
Emulsion Plant		m2		#N/A	$0.00	$0		$0	$0			
Warehouse, Shops and Other		m2		#N/A	$0.00	$0		$0	$0			
Other				#N/A	$0.00	$0		$0	$0			
OBJECTIVE: LANDFILL FOR DEMOLITION WASTE												
Place soil cover		m3		#N/A	$0.00	$0		$0	$0			
Vegetate		ha		#N/A	$0.00	$0		$0	$0			
Landfill disposal fee		tonne		#N/A	$0.00	$0		$0	$0			
OBJECTIVE: GRADE AND CONTOUR												
Accomodation Complex		ha		#N/A	$0.00	$0		$0	$0			
Process Facilities		ha		#N/A	$0.00	$0		$0	$0			
Offices, Repair, Lab, Warehouse		ha		#N/A	$0.00	$0		$0	$0			
Storage Facilites		ha		#N/A	$0.00	$0		$0	$0			
Water and Wastewater Treatment Facilities		ha		#N/A	$0.00	$0		$0	$0			
U/G Heating Plant		ha		#N/A	$0.00	$0		$0	$0			
Emulsion Plant		ha		#N/A	$0.00	$0		$0	$0			
Warehouse, Shops and Other		ha		#N/A	$0.00	$0		$0	$0			
Place rock cover		m3		#N/A	$0.00	$0		$0	$0			
Vegetate		ha		#N/A	$0.00	$0		$0	$0			
Other				#N/A	$0.00	$0		$0	$0			
OBJECTIVE: LINED SUMPS												
Puncture liner and place soil cover		m3		#N/A	$0.00	$0		$0	$0			
OBJECTIVE: RECLAIM ROADS												
Remove culverts		each		#N/A	$0.00	$0		$0	$0			
Remove bridges		each		#N/A	$0.00	$0		$0	$0			
Scarify and install water breaks		ha		#N/A	$0.00	$0		$0	$0			
Scarify airstriip		ha		#N/A	$0.00	$0		$0	$0			
Scarify laydown areas		ha		#N/A	$0.00	$0		$0	$0			
Vegetate		ha		#N/A	$0.00	$0		$0	$0			
Other				#N/A	$0.00	$0		$0	$0			
SPECIALIZED ITEMS												
Dispose of misc. debris and laydown area refuse				#N/A	$0.00	$0		$0	$0			
					Total	$13,402		$13,402	$0			
					% of Total			100	0			

Note: Unit costs are based on 3m high, single storey building. Scale larger building areas accordingly. E.g. 10m high building multiply area by 3.3 (10/3)

Inflation	
Land Cost	**Water Cost**
$989	$0

1 **Chemicals/Soil Area Name:**

Note: The procedures, equipment and packaging for clean up and removal of chemicals or contaminated soils are highly dependent on the nature of the chemicals and their existing state of containment. Government guidelines should be consulted on an individual chemical basis. Any estimate made here should be considered very rough unless specific evaluations have been conducted.

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost	Inflation	Source of Information	Comparison to Proponent's Security
HAZARDOUS MATERIALS AUDIT												
Phase 1 audit		each		#N/A	$0.00	$0		$0	$0			
Phase 2 audit		each		#N/A	$0.00	$0		$0	$0			
CONSOLIDATE HAZARDOUS MATERIALS FOR REMOVAL												
Environmental technician/coordinator	Fuel and contaminated soil removal	personhrs	12	ENVCOL	$74.16	$890	50%	$445	$445	$196	Assume 1 day to oversee removal of residual fuel and contaminated soil by environmental coordinator. Assume unit cost for environmental coordinator.	Not included in Proponent's estimate.
Waste fuel	10% of total fuel storage	litre	45	ORL	$0.43	$19	50%	$10	$10	$4	Quantity based on 10% of total max fuel quantity at site. Assume approx. 450 L max fuel based on Spill Contingency Plan (Section 2.7). Assume low unit cost given fuel is to be stored in temporary or portable tanks, or equipment, limiting handling requirements. Assume cost includes disposal fee. Assume cost for transport off site is addressed with contaminated soil transport fees.	Not included in Proponent's estimate.
Waste oils		litre		#N/A	$0.00	$0		$0	$0			
Fuel - Type 1, eg diesel dregs		litre		#N/A	$0.00	$0		$0	$0			
Fuel - Type 1, eg gasoline dregs		litre		#N/A	$0.00	$0		$0	$0			
Waste batteries		kg		#N/A	$0.00	$0		$0	$0			
Assay & environmental lab reagents		kg		#N/A	$0.00	$0		$0	$0			
Machine shop, paints, solvents etc		litre		#N/A	$0.00	$0		$0	$0			
Metal contam. soil at conc. load-out		m3		#N/A	$0.00	$0		$0	$0			
Glycol		litre		#N/A	$0.00	$0		$0	$0			
Nuclear sources		each		#N/A	$0.00	$0		$0	$0			
HAZARDOUS MATERIALS												
Transportation to disposal facility		allocation		#N/A	$0.00	$0		$0	$0			
Disposal fees		allow		#N/A	$0.00	$0		$0	$0			
Other				#N/A	$0.00	$0		$0	$0			
CONTAMINATED SOILS												
Contaminated soils - hydrocarbon treatment	Cell: 75m * 36m - full capacity 6361 m3, soil treatment	allocation	1	#N/A	$140,000.00	$140,000	50%	$70,000	$70,000	N/A, current rates	CRP indicates soil treatment for 1 or more years. Assume Proponent's costing for soil treatment. Assume treatment cost does not consider removal to the landfill.	Includes lump sum of $140k for soil treatment and potential removal to landfill. Basis of cost uncertain.
Soil treatment chemicals	Assumed reagants, application and oversight	allocation	1	#N/A	$13,800.00	$13,800	50%	$6,900	$6,900	N/A, current rates	Assume separate cost from soil treatment for reagent material, their application and oversight based on 3rd party quotes. Assumed includes delivery costs to site.	Included in Proponent's estimate. Cost rounded up to 14k.
Contam. soil investigation - technical - soil treatment	Assume 1 per year, 1 year of soil treatment.	allocation	1	#N/A	$1,000.00	$1,000	50%	$500	$500	N/A, current rates	CRP indicates soil treatment for 1 or more years. Assume up to 1 year soil treatment, with 1 soil investigation per year to test against criteria for re-use. Uses Proponent's unit cost. Assume includes sampling and testing costs.	Included in Proponent's estimate.
Contam. soil investigation - technical - facility closure	Soil testing beneath facility liners at closure - lab analysis	each	28	#N/A	$190.00	$5,320	50%	$2,660	$2,660	N/A, current rates	CRP indicates soil testing beneath liner and at access ramps at facility closure, with minimum 20 samples collected. Assume liner is in good condition such that contamination below liner is minimal, with no free PHC product at site. In such a case, assume up to additional 8 samples only for potential liner defects, stains and step-out delineation of potential contamination as described in CRP. Assumed cost of $190/sample based on typical laboratory rates.	Not included in Proponent's estimate.
Contam. soil investigation - technical - facility closure	Soil sampling beneath facility liners at closure - labour	hrs	10	LAB-SL	$49.60	$496	50%	$248	$248	N/A, current rates	Assume 1 day labour for sampling beneath liner.	Not included in Proponent's estimate.
Contam. soil investigation - drilling & sampling		each		#N/A	$0.00	$0		$0	$0			
CONTAMINATED SOIL REMOVAL												
Clean soil removal	Excavate and haul clean soil to Inuvik landfill for re-use in daily cover.	allocation	1	#N/A	$55,000.00	$55,000	50%	$27,500	$27,500	N/A, current rates	CRP indicates clean soil following treatment will be removed for use in the daily cover at the Inuvik landfill. Assume separate cost from treatment for soil transport to landfill based on 3rd party quotes.	Uncertain if cost for clean soil removal to landfill is included with soil treatment cost.

1 **Chemicals/Soil Area Name:**

Note: The procedures, equipment and packaging for clean up and removal of chemicals or contaminated soils are highly dependent on the nature of the chemicals and their existing state of containment. Government guidelines should be consulted on an individual chemical basis. Any estimate made here should be considered very rough unless specific evaluations have been conducted.

Contaminated soils removal - excavate	Assume untreatable soils and contaminated soil below liner. Assume 100 m3.	m3	100	SB1L	$4.30	$430	50%	$215	$215	$95	CRP indicates any remaining contaminated soil to be shipped off site to approved facility for disposal. Assume minor volume for removal and disposal, inclusive of potential untreatable soil remaining in the cell following 1 year of treatment, and any potential contaminated soil present below the liner. Assumed 100 m3 represents less than 2% of assumed volume for treatment, and less than 5% of cell area (assuming 1 m depth), therefore is considered reasonable.	Not included in Proponent's estimate.
Contaminated soils removal - transport	Assumed disposal accepted in British Columbia 100 m3 soil =200 tonnes, 1 truck holds 40 tonnes 5 round trips required	each	290	HIABL	$155.00	$44,950	50%	$22,475	$22,475	$9,911	Assumed all waste transported to Fort Nelson, BC, which is near NT border and has hazardous waste disposal facilities. Estimated 2,176 km from Inuvik to Fort Nelson, BC. One round trip estimated as 58 hrs assuming average speed of 75 km/hr. Assume transport by flat-bed truck.	Not included in Proponent's estimate.
Contaminated soils removal - disposal fees	Assume $88/m3.	m3	100	#N/A	$88.00	$8,800	50%	$4,400	$4,400	N/A, current rates	Based on Fort Nelson landfill tipping fees of $44/tonne. Assume 2 tonnes/m3.	Not included in Proponent's estimate.
Metal contam. soil at conc. load-out		m3		#N/A	$0.00	$0		$0	$0			
Load, haul, dump or doze		m3		#N/A	$0.00	$0		$0	$0			
Reagents/stabilizing agent		m2		#N/A	$0.00	$0		$0	$0			
Contour reclaimed area		m3		#N/A	$0.00	$0		$0	$0			
Type 2, heavy fuel and oil		m3		#N/A	$0.00	$0		$0	$0			
CONTAMINATED SOIL VERY LOW PERMEABILITY COVER												
Supply geomembrame, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0			
Upper and lower bedding layers		m3		#N/A	$0.00	$0		$0	$0			
Install geomembrane, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0			
Erosion protection layer		m3		#N/A	$0.00	$0		$0	$0			
Vegetate		m2		#N/A	$0.00	$0		$0	$0			
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0		$0	$0			
Other				#N/A	$0.00	$0		$0	$0			
OTHER												
				#N/A	$0.00	$0		$0	$0			
					Total	$270,705		$135,353	$135,353			
					% of Total			50	50			

Inflation	
Land Cost	**Water Cost**
$5,103	$5,103

1 **Capital Expenditures and Short Term Water Treatment identified in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	Inflation	Source of Information	Comparison to Proponent's Security
OBJECTIVE: STABILIZE SEDIMENT PONDS/WATER MANAGEMENT PONDS									
Place soil cover		m3		#N/A	$0.00	$0			
Doze & spread excavated material	Contour berms and pad areas (biotreatment cell, water retention pond, building pads)	allocation	1	#N/A	$65,000.00	$65,000	N/A, current rates	Based on 3rd party quotes for site re-grading.	Included in Proponent's estimate.
Vegetate spread material		ha		#N/A	$0.00	$0			
Rip rap in channel base		each		#N/A	$0.00	$0			
Remove liner	Remove liner and dispose in Inuvik landfill.	allocation	1	other	$50,000.00	$50,000	N/A, current rates	Based on 3rd party quotes for liner removal and disposal at landfill. Assume cost includes transport but excludes disposal fee (addressed in Bldgs tab).	Includes lump 3rd party cost to remove/dispose liner and ASTs and fence.
OBJECTIVE: REDIRECT RUNOFF/CONSTRUCT DIVERSION DITCHES									
Excavate ditches -soil		m3		#N/A	$0.00	$0			
Excavate ditches -rock		m3		#N/A	$0.00	$0			
Stabilize side slopes		m3		#N/A	$0.00	$0			
Rip rap in channel base		m3		#N/A	$0.00	$0			
OBJECTIVE: BREACH DITCHES									
Excavate breaches		m3		#N/A	$0.00	$0			
Backfill/recontour		m3		#N/A	$0.00	$0			
Install flow dissipation		m3		#N/A	$0.00	$0			
Vegetate remainder of ditch		m2		#N/A	$0.00	$0			
OBJECTIVE: FRESH WATER SUPPLY									
Breach embankment		m		#N/A	$0.00	$0			
Remove pump		LS		#N/A	$0.00	$0			
Remove pipeline		m		#N/A	$0.00	$0			
OBJECTIVE: WATER CONTROL IN RECLAMATION QUARRY									
Install pumping system		LS		#N/A	$0.00	$0			
Remove pumping system	allocation	allocation	1	#N/A	$500.00	$500	N/A, current rates	Assume minor allocation for pump removal for water treatment system. Cost excludes transport and disposal fee (addressed in Bldgs tab).	Not included in Proponent's estimate.
OBJECTIVE: REMOVE WATER PIPELINES									
Remove pipes	Between facilities and discharge pipe.	m	200	PSRL	$1.00	$200	$44	Assume minor allocation for pipeline removal for water treatment and discharge system. Assume unit cost excludes transport and disposal fee (addressed in Bldgs tab).	Not included in Proponent's estimate.
Concrete plug deep pipes		m3		#N/A	$0.00	$0			
Other				#N/A	$0.00	$0			
OBJECTIVE: GROUNDWATER COLLECTION SYSTEM									
Excavate/install sumps		m3		#N/A	$0.00	$0			
Install pumping wells		m3		#N/A	$0.00	$0			
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0			
OBJECTIVE: CONSTRUCT CONTAMINATED WATER STORAGE POND									
Excavate pond		m3		#N/A	$0.00	$0			
Doze & spread excavated material		m3		#N/A	$0.00	$0			
Vegetate spread material		ha		#N/A	$0.00	$0			
Bedding layer		m3		#N/A	$0.00	$0			
Supply geomembrane		m2		#N/A	$0.00	$0			
Install geomembrane		m2		#N/A	$0.00	$0			

1 **Capital Expenditures and Short Term Water Treatment identified in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	Inflation	Source of Information	Comparison to Proponent's Security
Erosion protection layer		m3		#N/A	$0.00	$0			
OBJECTIVE: CONSTRUCT PASSIVE TREATMENT SYSTEM (e.g. Constructed Wetland)									
Construct access roads		km		#N/A	$0.00	$0			
install HDPE piping system from collection pond		m		#N/A	$0.00	$0			
Inter-cell flow structures		allow		#N/A	$0.00	$0			
Install liners		m2		#N/A	$0.00	$0			
Install growth media		m3		#N/A	$0.00	$0			
Wetland vegetation		ha		#N/A	$0.00	$0			
OBJECTIVE: CONSTRUCT WATER TREATMENT PLANT									
Build treatment plant		LS		#N/A	$0.00	$0			
Build sludge containment facility		LS		#N/A	$0.00	$0			
OBJECTIVE: WATER TREATMENT									
Water treatment - smapling and reporting	From Water Treatment Spreadsheet	alloc		#N/A	$0.00	$44,695			
					Total	$160,395			

Inflation Water Cost
$44

1 **Post Closure Water Treatment - Identified as long term/post-closure in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	Inflation	Source of Information	Comparison to Proponent's Security
OBJECTIVE: ADDITION OF REAGENTS TO WTP									
H2O2		kg		#N/A	$0.00	$0			
lime		kg		#N/A	$0.00	$0			
ferric sulphate		kg		#N/A	$0.00	$0			
ferrous sulphate		kg		#N/A	$0.00	$0			
flocculents		kg		#N/A	$0.00	$0			
Other - pumping	Pump out pond and ASTs for treatment and discharge.	allocation	1	#N/A	$15,000.00	$15,000	N/A, current rates	Based on 3rd party quote for pumping out pond and any water in ASTs.	Not included in Proponent's estimate.
Other - WTP operation	Contingency treatment - 63,000 L in ASTs 205 m3 in retention pond	m3	268	OTPh	$2.00	$536	$118	CRP indicates stored snow and water will be tested and treated if required. Assume Proponent's contingency allowance for max storage volume of single AST to require treatment. Assume retention pond will be treated as identified in CRP. Assume total storage capacity of pond will be treated over duration of soil treatment period and at closure. Assume no water requires disposal offsite (i.e., all treated water meets discharge criteria or can be used in soil treatment).	Includes volume of single AST for treatment. Assumes retention pond water is used in soil treatment, thus no water treatment cost.
OBJECTIVE: LABOUR AND SUPPLIES									
Annual fuel		litres		#N/A	$0.00	$0			
Annual power		kW-h		#N/A	$0.00	$0			
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0			
Equipment maintenance and parts		allow		#N/A	$0.00	$0			
Misc. supplies, hoses, tools		allow		#N/A	$0.00	$0			
Communications		allow		#N/A	$0.00	$0			
Other				#N/A	$0.00	$0			
OBJECTIVE: WTP WATER SAMPLING AND ANALYSES									
Sampling equipment		allow		#N/A	$0.00	$0			
Analyses	Water testing	allow	2	#N/A	$2,579.40	$5,159	N/A, current rates	Uses Proponent's assumption for 1 year of water treatment, with 2 sampling events per year for 7 sampling locations. Costs based on 3rd party quotes for laboratory testing.	Included in Proponent's estimate.
Shipping to laboratory		allow		#N/A	$0.00	$0			
Reporting (annual Reporting, O&M, Spill Contingency, etc)	Water sampling and reporting	allow	2	other	$12,000.00	$24,000	N/A, current rates	Uses Proponent's assumption for 1 year of water treatment, with 2 sampling/reporting events per year. Costs based on 3rd party quotes for sampling/reporting.	Included in Proponent's estimate.
Other - Misc sampling and shipping		allow		#N/A	$0.00	$0			
OBJECTIVE:SITE ACCESS									
Road maintenance (incl. snow removal)		allow		#N/A	$0.00	$0			
Winter road tariff		allow		#N/A	$0.00	$0			
Truck rental		allow		#N/A	$0.00	$0			
Air support		allow		#N/A	$0.00	$0			
					Annual water treatment costs	$44,695			
Number of years of water treatment		years	1						
					Total water treatment costs	$44,695			

Inflation
Water Cost
$118

1 **Interim Care and Maintenance**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
INTERIM CARE & MAINTENANCE						
on-site caretaker		manmonths		#N/A	0	$0
extra personnel		manmonths		#N/A	0	$0
-electrician		manmonths		#N/A	0	$0
-mechanic		manmonths		#N/A	0	$0
annual fuel		litre		#N/A	0	$0
misc. supplies		allow		#N/A	0	$0
pick-up truck		each		#N/A	0	$0
small dozer		allow		#N/A	0	$0
small excavator		allow		#N/A	0	$0
snow machine		allow		#N/A	0	$0
communications		allow		#N/A	0	$0
SNP/AEMP water sampling & reporting		each		#N/A	0	$0
geotechnical assessment		each		#N/A	0	$0
interim water treatment		each		#N/A		$44,695
other		each		#N/A	0	$0
			Annual	Interim C&M Cost		$44,695
Number of years of ICM		years		Total Cost		$0

1 Mobilization/Demobilization:

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MOBILIZE HEAVY EQUIPMENT						
Excavators		each		#N/A	0	$0
Dump trucks		each		#N/A	0	$0
Dozers		each		#N/A	0	$0
Demolition shears		each		#N/A	0	$0
Crane		each		#N/A	0	$0
Loader		each		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		each		#N/A	0	$0
MOBILIZE MISC. EQUIPMENT						
Pump shipping		each		#N/A	0	$0
Pipe shipping		m		#N/A	0	$0
Minor tools and equipment		allow		#N/A	0	$0
Truck tires		allow		#N/A	0	$0
Other				#N/A	0	$0
MOBILIZE CAMP						
Reclamation activities		allow		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		allow		#N/A	0	$0
MOBILIZE WORKERS						
Reclamation activities - transport		each		#N/A	0	$0
Reclamation activities - travel time		manhours		#N/A	0	$0
Long term reclamation activities (eg pump flooding) - transport		each		#N/A	0	$0
Long term reclamation activities (eg pump flooding) - travel time		each		#N/A	0	$0
Monitoring Airfare		each		#N/A	0	$0
WORKER ACCOMODATIONS						
Reclamation activities		manmonths		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		manmonths		#N/A	0	$0
MOBILIZE FUEL						
Fuel freight - reclamation activities		litre		#N/A	0	$0
Fuel freight - long reclamation activities		litre		#N/A	0	$0
Fuel freight accomodations		litre		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Winter road tarriff		km		#N/A	0	$0
DEMOBILIZE OTHER INFRASTRUCTURE AND SITE EQUIPMENT						
Excavators		km		#N/A	0	$0
Dump trucks		km		#N/A	0	$0
Dozers		km		#N/A	0	$0
Demolition shears		km		#N/A	0	$0
Crane		km		#N/A	0	$0
Loader		km		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		km		#N/A	0	$0
Other		km		#N/A	0	$0
DEMOBILIZE CAMP						
Remaining camp facilities		allow		#N/A	0	$0
DEMOBILIZE WORKERS						
crew travel time		mandays		#N/A	0	$0
crew transportation		each		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Winter road tarriff		km		#N/A	0	$0
				Mobilization/Demobilization Cost		**$0**

1 Post-Closure Monitoring & Maintenance:

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	Inflation	Source of Information	Comparison to Proponent's Security
OBJECTIVE: MONITORING & INSPECTIONS									
Annual geotechnical inspection		each		#N/A	$0.00	$0			
Survey inspection		each		#N/A	$0.00	$0			
Groundwater monitoring	Water sampling, reporting and labour cost allowance by 3rd party.	visits	2	#N/A	$4,000.00	$8,000	N/A, current rates	CRP indicates post-closure monitoring to occur for 1 year involving collection of 2 sets of groundwater samples. Assume crew of 2 (1 enviro tech, 1 supervisor) Assume 1 day x 2 people = 20 hr Assume local crew from Inuvik (no travel time). Assume 40 hrs in office for 2x annual sampling (20 hrs per sampling event). Total crew time = 40 hr/visit. Assume average labour cost $100/hr Totals labour cost = $4,000/visit	Not included in Proponent's estimate.
Site water monitoring (SNP)	Water testing	samples	8	#N/A	$184.24	$1,474	N/A, current rates	CRP indicates post-closure monitoring to occur for 1 year involving collection of 2 sets of groundwater samples. Water Licence SNP program identifies 4 groundwater wells, thus 8 samples total. Costs based on 3rd party quotes for laboratory testing.	Not included in Proponent's estimate.
- During pit flooding		each		#N/A	$0.00	$0			
- Post pit flooding		each		#N/A	$0.00	$0			
Air Quality Monitoring Program (AQMP)		each		#N/A	$0.00	$0			
Wildlife Effects Monitoring Program (WEMP)		each		#N/A	$0.00	$0			
Vegetation Monitoring		each		#N/A	$0.00	$0			
Regulatory	Included with monitoring.	each		#N/A	$0.00	$0		Regulatory reporting costs included with monitoring costs above.	Not included in Proponent's estimate.
OBJECTIVE: SITE MAINTENANCE									
Repair erosion - infill gullies		allow		#N/A	$0.00	$0			
Repair erosion - upgrade diversion ditches		allow		#N/A	$0.00	$0			
Remove problem vegetation		allow		#N/A	$0.00	$0			
Repair animal damage		allow		#N/A	$0.00	$0			
Repair/upgrade access controls		allow		#N/A	$0.00	$0			
Other				#N/A	$0.00	$0			
Groundwater monitoring wells - cut/cap	Cut and cap 4 groundwater wells	personhrs	8	LAB-SL	$49.60	$397	$87	CRP and SNP identifies 4 groundwater monitoring wells to be removed following post-closure monitoring. Assume 2 skilled labourers at: 0.5 hr to cut, backfill with local material and cap with clay bentonite. 0.5 hr to move to next hole Thus, 1 hr/well. Assume local crew.	Not included in Proponent's estimate.
Groundwater monitoring wells - clay bentonite	Clay bentonite for capping.	kg	136	#N/A	$2.20	$299	N/A, current rates	Assume 4" diameter well. Assume clay bentonite cap for 2 m = approx. 0.02 m3/well or 34 kg/well. Estimate approx. $2.2/kg based on retail rates. Assume bentonite available locally, no mob cost.	Not included in Proponent's estimate.
SPILLWAY MAINTENANCE									
Repair erosion		m3		#N/A	$0.00	$0			
Clear spillway		each		#N/A	$0.00	$0			
Other				#N/A	$0.00	$0			
POST-CLOSURE WATER TREATMENT									
Annual water treatment cost, from "Water Treatment"						$0			
Subtotal, Annual post-closure costs						$10,170			
Discount rate for calculation of net present value of post-closure cost, %				0.00%					
Number of years of post-closure activity				1	years				
Present Value of payment stream						$10,170			

Inflation
$87

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

Filter by unit

ITEM	Detail	COST CODE	UNITS	LOW $	HIGH $	SPECIFIED $	COMMENTS
Accomodation							
		ACCM	manday	100.00	175.00		
Buildings - Decontaminate							
	Asbestos	BDA	m2	25.60	51.20		Low: removal of asbestos siding & flooring; High: removal of insulated pipes, friable asbestos
Buildings - Remove							
	areas are per floor of 3 m average height						
	Wood	BRW	m2	27.50	41.00		
	Concrete	BRC	m2	40.00	65.00		
	Steel - teardown	BRS1	m2	45.00	65.00		
	Steel - for salvage	BRS2	m2	67.00	100.00		
Concrete work							
	Small pour	CSF	m3	426.50	639.75		Low: YK; High=1.5xLow
	Large pour	CLF	m3	353.50	530.25	2,130.00	Specified: concrete crown pillar
Contaminated Soils							
	Remediate on site	CSR	m3	47.00	146.00		
	Env. investigation Phase I/II	CSEI	each	25000.00			Low: small, "clean" site
Dozing							
	doze rock piles	DR	m3	1.05	2.40		Low cost: doze crest off dump
	doze overburden/soil piles	DS	m3	0.95	3.80		High cost: push up to 300 m
Excavate Rock; Low Spec's and QA/QC							
	drill/blast/load/short haul	RB1	m3	11.40	17.05		Low:quarry operations for bulk fill
	drill/blast/load/long haul	RB2	m3	12.05	17.80		
	RB1 + spread and compact	RB3	m3	12.05	17.80		
	RB2 + spread and compact	RB4	m3	12.70	30.75		
	Specified activity	RBS	m3				
Excavate Rock; High Spec's and QA/QC							(e.g. ditch/spillway excavation)
	drill/blast/load/short haul	RC1	m3				Low:foundation excavation;High:spillway excavation
	drill/blast/load/long haul	RC2	m3	12.70	18.40		
	RC1 + spread and compact	RC3	m3	12.70	18.40		e,g, cover construction
	RC2 + spread and compact	RC4	m3	13.50	19.20		e,g, cover construction
	Specified activity	RCS	m3			175.00	Specified-drift excavation
Excavate Rip Rap							
	drill/blast/load/short haul/place	RR1	m3	13.50	17.75		High: quarry & place rip rap in channel
	drill/blast/load/long haul/place	RR2	m3	13.50	20.65		
	source is waste dump/short haul	RR3	m3	5.20	7.00		
	source is waste dump/long haul	RR4	m3	5.70	7.60		
	specified rip rap source	RR5	m3				
Excavate Soil; Low Spec's and QA/QC							
	clear & grub	SBC	m2	3.40	5.00		
	excavate/load/short haul	SB1	m3	4.30	5.90		
	excavate/load/long haul	SB2	m3	4.30	7.30		
	SB1 + spread and compact	SB3	m3	4.50	6.50		Low: non-engineered; High:engineered
	SB2 + spread and compact	SB4	m3	5.50	11.00		Low: non-engineered; High:engineered
	Specified activity	SBS	m3	3.20	6.00		Low: rehandle waste rock dump by dozing; High:rehandle waste rock by hauling
	Tailings	SBT	m3	1.35	3.70	15.50	Low:doze frost heaves; High:contour surface - wet or frozen; Specified:haul/place wet infill
Excavate Soil, High Spec's and QA/QC							
	excavate/load/short haul	SC1	m3	6.80	9.30		
	excavate/load/long haul	SC2	m3	7.10	11.75		
	SC1 + spread and compact	SC3	m3	8.50	14.20		Low: non-engineered; High:engineered
	SC2 + spread and compact	SC4	m3	8.90	23.20		Low: non-engineered; High:engineered (e.g. complex covers, low volume dam construction)
	Specified activity	SCS	m3			18.80	Backfill adit with waste rock
Fence							
		FNC	m	13.55	203.00		
Fuel and Electricity							
	Fuel operating cost automative	FOA	litre	1.05			
	automative	FONA	litre	0.99	1.31		
	Fuel mobilization	FM	litre	0.22	0.42		High: winter road usage
	Electricity	FE	kW-h	0.17	0.19	0.49	Low and High:Yellowknife; Specified:diesel generator
Geo-Synthetics							
	geotextile	GST	m2	3.44			Supply and install
	geogrid	GSG	m2	5.75			
	liner, HDPE	GSHDPE	m2	7.95			Supply and install; large quantity
	liner, ES3	GSES3	m2	20.20			FOB Yellowknife
	geosynthetic installation	GSI	m2	3.16	14.00		Low:geotextile; High:ES3 or HDPE
	bentonite soil ammendment	GSBA	tonne	308.30	348.50		FOB Edmonton, add shipping & mixing
Grouting (/m3 of rock grouted)							
		grout	m3	236.55	286.75		High: cement, FOB Yellowknife
Labour & Equipment Rates							
	Manager	Sman	$/hr	$125.00			
	Superintendant		$/hr	$103.54			
	Registered engineer	Eng	$/hr	$220.00			
	Environmental coordinator	Envco	$/hr	$74.16			
	Electrician	Elec	$/hr	$74.00			
	Journeyman - various	Jour	$/hr	$71.79			
	Labour - skilled	Lab-s	$/hr	$49.60			
	Labour - unskilled	Lab-us	$/hr	$43.98	$50.00		
	Equipment operator	oper	$/hr	$65.00	$80.00		
	Heavy duty mechanic	mech	$/hr	$72.85			

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
Water treatment plant operator	oper-wt	$/hr	$59.86			
Security / first aid	safety	$/hr	$66.97			
Administative staff	admin	$/hr	$57.89			
Equipment rates include operator and fuel unless specified						
Loader - 4 cu.yd (3.06m3)	load-s	$/hr	$175.00			
Loader - 7 cu.yd (5.35m3)	load-l	$/hr	$315.00			
Excavator - 26.76-30.84 tonnes	exc-s	$/hr	$190.00			
Excavator - 68.95+tonnes	exc-l	$/hr	$420.00			
Grader	grad	$/hr	$190.00			
Dump truck off hwy 30-50 tonnes	truck-s	$/hr	$225.00			
Dump truck off hwy 55-75 tonnes	truck-l	$/hr	$300.00			
dozer, small	dozers	$/hr	$205.00	$260.00		
dozer, large	dozerl	$/hr	$490.00	$565.00		
smooth drum compactor	comp	$/hr	$155.00			
scooptram, 6 yd3 bucket	scoop	$/hr	$170.00			
flat bed truck with hiab	hiab	$/hr	$155.00			
fuel truck	ftruck	$/hr	$150.00			
water truck	wtruck	$/hr	$150.00			
Mobilize Heavy Equipment						
Road access	MHER	kmtonne	3.40	10.25		
Air access	MHEA	kmtonne	12			cargo rate>500lb
Mobilize Camp						
Road access	MCR	each	50000			refurbish existing camp
Mobilize Workers						
flight	MW	each	4500.00	9100.00		Low:e.g. 8 passenger; High: Dash 7
Oil Removal						
oil removal	OR	litre	0.43	1.20		Low:waste oil heater; High: ship offsite
PCB Removal						
Remove from site	PCBR	litre	40.20	46.90		Low: shipping, handling & disposal from Yellowknife
Pipes, small (<6in dia.)						
remove/dispose on site	PSR	m	1.00	24.00		Low: remove/dispose on site; High: remove/re-use
supply	PSS	m	6.10	11.10		Low:supply; High:supply and ship
install	PSI	m	25.00			
Pipes, large (>6in dia.)						
remove/dispose on site	PLR	m	22.00	72.00		Low: remove/dispose on site; High: remove/re-use
supply	PLS	m	129.00	143.00		Low:supply; High:supply and ship
install	PLI	m	50.00			
Power Lines						
remove/dispose on site	POWR	each	25.50			
Process Chemicals						
Remove from site	PCR	kg	0.45	2.50		
Pumps						
Pump capital cost	PCR	each	195000.00			
Pump shipping	PS	each	2500.00			
Pump maintenance	PM	each	20000.00			
Pump sand BackFill						
	BF	m3	85.00	300.00		
Scarify - road/mine site						
	SCFY	ha	4300	6030	2150	
Shaft, Raise & Portal Closures						
Shaft & Raises	SR	m2	645	2132		Low:pre-cast concrete slabs, little site prep. Area=shaft+>1m all around
Portals	POR	m3	18.8	250	1200.00	Low:unit cost code SCS;High:excavate & backfill collapsed portal;Spec: installed pressure plug
Site Inspection Report						
	RPT	each	10000.00	20000.00		
SpillWay - Clear						
	CSW	each	3000.00	7000.00		
Survey/Instrumentation						
	SI	each	1800	3600		2 person crew
Treatment Plant - Construct						
Small (< 1000 m3/d)	BTPS	lump sum	1218600	2437300		
Large (> 1000 m3/d)	BTPL	lump sum	2437300	42650200		
Treatment Plant - Operate						
	OTP	m3	0.35	2		
Vegetation						
Hydroseed, Flat	VHF	ha	4000.00			
Hydroseed, Sloped	VHS	ha	6000.00			
veg. Blanket/erosion mat	VB	ha				
Tree planting	VT	ha				
Wetland species	VW	ha	50000.00		47.72	Specified= /m3, Wetland Growth Media Substrate mixed and installed (sand-local, biochar and fertilizer, woodchips-local)
Water Sampling/Analysis/Reporting						
	WS	each	3700.00	10000.00		
Water Treatment Chemicals						
ferric sulphate	ferric	kg	1.19			
ferrous sulphate	ferrous	kg	1.32			
lime	lime	kg	0.51			
hydrogen peroxide, 35%	hperox	kg	1.50			
Sodium Metabisulfate	Nametab	kg	1.18			
Caustic soda, 50%	caustic	kg	0.74			
Sulfuric acid, 93%	sulfuric	kg	0.31			
flocculant	flocc	kg	6.00			

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
copper sulphate	copper	kg				
shipping	shipping	kg	0.20			
Winter Road						
Construction	WRC	km	2000.00	11500.00		
Usage	WRU	kmtonne	0.29			
Well Abandonment						
All wells - Drilled / Cased		m			$12,500	-
Sweet Well - Completed / Active / Inactive		m			$56,600	0 - 1000 m
		m			$71,200	1000 - 2000 m
		m			$88,000	2000 - 3000 m
		m			$104,900	>3000 m
Sour Well (H2S > 1%) - Completed / Active / Inactive		m			$74,700	0 - 1000 m
		m			$94,400	1000 - 2000 m
		m			$116,500	2000 - 3000 m
		m			$138,600	>3000 m
Source Water Well		m			$5,000	0 - 150 m
		m			$10,000	151 - 300 m
		m			$30,000	>300 m
Vent Flow / Gas Migration					$87,200	-
Additional Completion Zones					Add 30% per zone	-
Facility Abandonment						
Oil / bitumen processing or injection / disposal facility		m3/day			$50,000	0 - 50 m3/d
		m3/day			$100,000	>50 m3 < 500 m3/d
		m3/day			$200,000	>50 m3 < 3000 m3/d
		m3/day			$400,000	>3000 m3/d
Gas processing facility		m3/day			$192,900	0 - 999 e3m3/d
		m3/day			$372,200	1000 - 2999 e3m3/d
		m3/day			$500,700	3000 - 4999 e3m3/d
		m3/day			$638,700	>5000 e3m3/d
Gas dehydration facility		m3/day			$53,000	0 - 299 e3m3/d
		m3/day			$132,500	300 - 1499 e3m3/d
		m3/day			$238,700	>1500 e3m3/d
Compressor stations		KW			$46,600	0 - 599 KW
		KW			$113,600	600 - 2999 KW
		KW			$210,500	>3000 KW
Battery sites		m3/day			$46,600	0 - 49 m3/d
		m3/day			$136,400	50 - 499 m3/d
		m3/day			$244,300	500 - 1500 m3/d
		m3/day			$353,100	>1500 m3/d
Battery sites w/ separation, compression, injection and/or disposal equipment		m3/day			$71,900	0 - 49 m3/d
		m3/day			$158,800	50 - 499 m3/d
		m3/day			$296,900	500 - 1500 m3/d
		m3/day			$406,200	>1500 m3/d
Satellite batteries		m3/day			$49,600	0 - 99 m3/d
		m3/day			$74,400	>100 m3/d
Other stations					$39,900	
H2S premium (>1%)					Add 10%	
Legacy premium (Pre 1990)					Add 20%	

APPENDIX B – GENERAL TERMS AND CONDITIONS

USE OF REPORT

This report has been prepared for the specific site, design objective, development and purpose described to ARKTIS Solutions Inc. (ARKTIS) by the Client. The factual data, interpretations and recommendations pertain to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation of site conditions, purpose, and development plans, or if the project is not initialed within three months of the date of the report may alter the validity of the report. ARKTIS cannot be responsible for use of this report, or portions thereof, unless ARKTIS is requested to review, and if necessary, revise the report.

This report and the assessments and recommendations contained in it are intended for the sole benefit of ARKTIS' Client. No other party may use or rely on this report or any portion thereof without ARKTIS' expressed written consent. If the report was prepared to be included for a specific permit application process, then upon reasonable request of the client, ARKTIS may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to ARKTIS.

The report, all plans, data, drawings and other documents as well as all electronic media prepared by ARKTIS are considered its professional work product and shall remain the copyright property of ARKTIS, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonable and necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any party without the express written consent of ARKTIS. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of ARKTIS' report or other work products. ARKTIS does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than ARKTIS' Client or Authorized User unless otherwise authorized in writing by ARKTIS.

LIMITATIONS OF REPORT

The report is of a summary nature and is not intended to stand alone without the reference to the instructions given to ARKTIS by the Client, communications between ARKTIS and the Client, and to any other reports prepared by ARKTIS for the Client relative to the specific site described in the report. In order to properly understand suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. ARKTIS cannot be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, and safety and equipment capabilities.

Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil and rock or geologic types or units may be transitional rather than abrupt. Accordingly, ARKTIS does not warrant or guarantee the exactness of the descriptions.

LIMITATIONS OF LIABILITY

The client, and any other parties using this report with the express written consent of the clients and ARKTIS, acknowledge that conditions affecting the financial liability of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

During the performance of the work and the preparation of this report, ARKTIS may have relied on the information provided by persons other than the client. While ARKTIS endeavors to verify the accuracy of such information when instructed to do so by the client, ARKTIS accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

The client, and any other party using this report with the express written consent of the client and ARKTIS, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that ARKTIS is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

STANDARD OF CARE

Services performed by ARKTIS for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and financial and physical constraints applicable to the services. Engineering judgment has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

ALTERNATE REPORT FORMAT

Where ARKTIS submits both electronic file and hard copy versions of reports, drawings and other project related documents and deliverables (collectively termed instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding.

The hard copy versions submitted by ARKTIS shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by ARKTIS shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of instruments of professional services shall not, under any circumstances, no matter who owns or uses them, be altered by any party except ARKTIS. The Client warrants that instruments of professional services will be used only and exactly as submitted by ARKTIS.