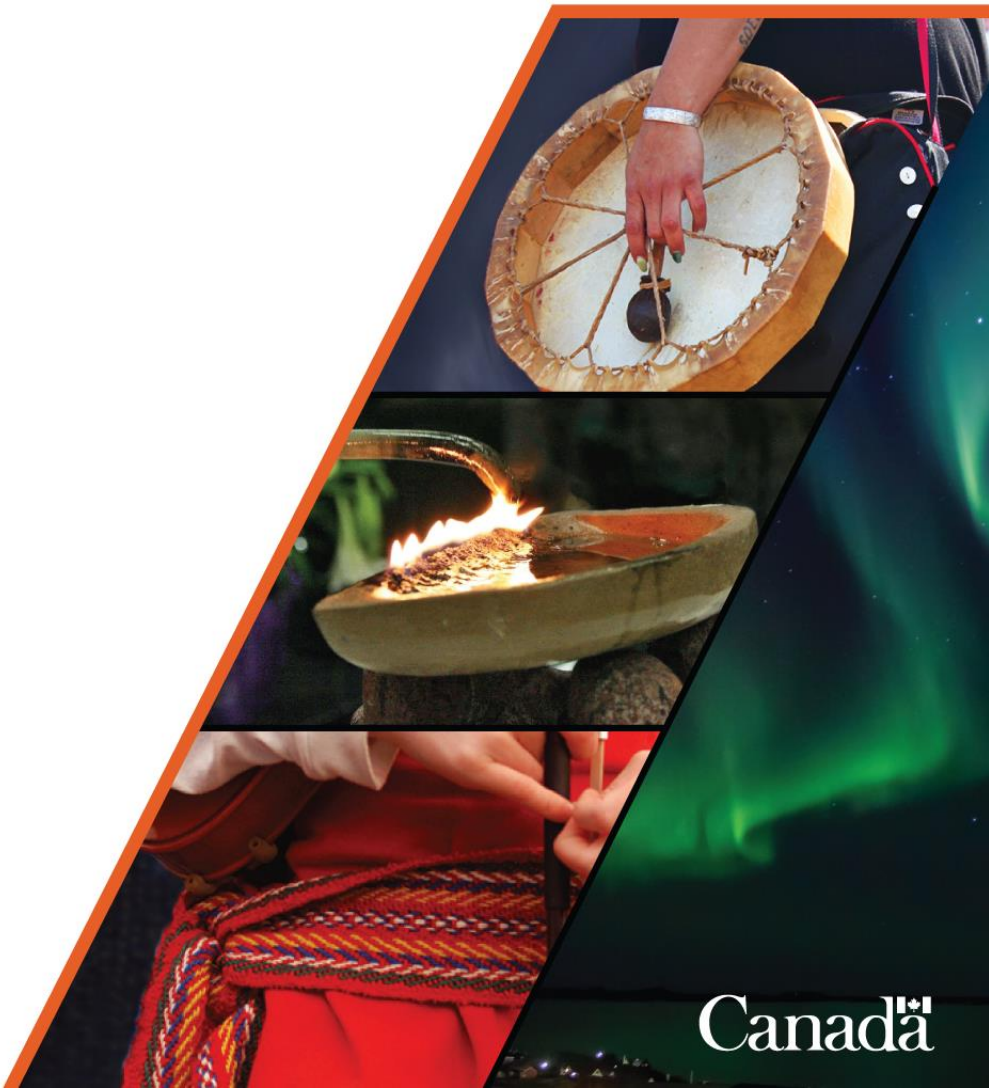
Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Final Written Submission

City of Iqaluit Application to Amend Type A Water Licence 3AM-IQA1626

January 11, 2021



EXECUTIVE SUMMARY

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has participated in every stage of the review for the municipal water licence application for the City of Iqaluit, which included a completeness review, a technical review, a technical meeting, and a pre-hearing conference.

The application was submitted by the City of Iqaluit. The application is for an amendment of Type A Water Licence No. 3AM-IQA1626. The licence permits Municipal Undertakings such as potable water withdrawals and storage, operation of truck fill stations, wastewater collection and treatment, and the operation of waste management sites, including the current West 40 Landfill, which is reaching its capacity. The application proposes a new solid waste management facility and a waste transfer station be constructed and operated north of the City of Iqaluit.

During the technical review, the areas of concern discussed include:

1. Reclamation of West 40 Landfill
2. Runoff from Baled Waste at Transfer Station
3. Landfill Leachate Treatment
4. Landfill Leachate Collection
5. Surface Water Management at Landfill
6. Fencing
7. Permafrost Considerations
8. Waste Transfer Station Geotechnical Report
9. Landfill Design Drawings
10. Operations

All of the issues have been resolved at the Technical Meeting and by submissions made by the City of Iqaluit following the Pre-Hearing Conference. Some of the concerns have been resolved pending commitments by the City of Iqaluit and the inclusion of conditions in an amended licence. In this submission, CIRNAC provides further recommendations relating to:

1. Runoff from Baled Waste at the Transfer Station;
2. Landfill Leachate collection; and
3. Permafrost Considerations.

RÉSUMÉ

Relations Couronne-Autochtones et Affaires du Nord Canada (RCAANC) a participé à toutes les étapes de l'examen de la demande de permis d'utilisation des eaux de la Ville d'Iqaluit, qui comprenait un examen de l'exhaustivité, un examen technique, une réunion technique et une conférence préparatoire.

La demande a été présentée par la Ville d'Iqaluit. Il s'agit d'une demande visant à modifier le permis d'utilisation des eaux de type A n^{o} 3AM-IQA1626. Le permis permet des projets municipaux comme les prélèvements et le stockage d'eau potable, l'exploitation de postes de remplissage de camions, la collecte et le traitement des eaux usées et l'exploitation de sites de gestion des déchets, y compris le site d'enfouissement West 40 actuel, qui atteint sa capacité maximale. La demanderesse propose la construction d'une nouvelle installation de gestion des déchets solides et d'une station de transfert des déchets au nord d'Iqaluit.

Parmi les sujets de préoccupation discutés au cours de l'examen technique, mentionnons ce qui suit :

1. Remise en état du site d'enfouissement West 40
2. Ruissellement provenant des déchets en balles à la station de transfert
3. Traitement du lixiviat du site d'enfouissement
4. Collecte du lixiviat du site d'enfouissement
5. Gestion des eaux de surface au site d'enfouissement
6. Installation de clôtures
7. Facteurs liés au pergélisol
8. Rapport géotechnique sur la station de transfert des déchets
9. Dessins de conception du site d'enfouissement
10. Opérations

Tous les enjeux ont été résolus lors de la réunion technique et dans les documents présentés par la Ville d'Iqaluit à la suite de la conférence préparatoire. Quelques-unes des préoccupations ont été réglées en attendant des engagements de la Ville d'Iqaluit et l'ajout de conditions dans un permis modifié. Dans le présent document, RCAANC formule d'autres recommandations en ce qui concerne les points suivants :

1. Ruissellement provenant des déchets en balles à la station de transfert
2. Collecte du lixiviat du site d'enfouissement
3. Facteurs liés au pergélisol

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A. INTRODUCTION

The City of Iqaluit (the City) holds Type "A" Nunavut Water Board (NWB) Water Licence 3AM-IQA1626, which allows for water withdrawal, wastewater release, and solid waste disposal for municipal purposes. The licence permits the City to extract water from Lake Geraldine and Apex (Niaqunngut) River and covers the operation of the water treatment plant, the wastewater treatment plant, and the West 40 landfill. Iqaluit is located in southern Baffin Island on Frobisher Bay.

The West 40 landfill is nearing capacity and the City requires another landfill to meet its solid waste disposal needs. The amendment application under review is to construct and operate a new solid waste treatment facility (landfill) approximately 6km northwest of the city and a waste transfer station (WTS) within the City's industrial area.

On April 9, 2020, the City of Iqaluit applied to the NWB to amend the Type A licence within the current 10 year term. Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) submitted information requests on May 6, 2020 as part of the completeness check. Table 1 provides topics of Information Requests. The City of Iqaluit (City) responded on June 2, 2020.

Table 1: Summary of Information Requests (IR-) and Preliminary Recommendations (R-)

IR or R	Subject
IR-01	Source of Gravel and Clay Materials
IR-02	Erosion and Sediment Control Plan
IR-03	Inclusion of Landfill in City Management Plans Previously Submitted
IR-04	Geotechnical Study for the Access Road
IR-05	National Building Code of Canada (NBCC 201 5)
IR-06	Method Statement of Construction Report
IR-07	Closure and Decommissioning Plan
IR-08, IR-09	Design Drawing Details
IR-10	Operation and Maintenance Manual

Based on the responses to Information Requests provided by the City, the NWB determined that the application was ready to move to a Technical Review. CIRNAC submitted Technical Review Comments on July 17, 2020. Table 2 provides topics of Technical Review Comments, including the current status of resolution for each recommendation. CIRNAC presented its concerns and recommendations, and the City provided responses and commitments to resolve the concerns, at the Technical Meeting and Pre-Hearing Conference (TM-PHC) held on September 17 and 23, 2020, respectively. These are recorded in the TM-PHC List of Issues (NWB, September 23, 2020) and List of Commitments (NWB, September 23, 2020).

Table 2: Summary of Technical Review Comments Recommendations and Resolution Status

Recommendation	Topic	Resolution
1	Reclamation of West 40 Landfill	Resolved
2	Runoff from Baled Waste at Transfer Station	Resolved
3	Landfill Leachate Treatment	Resolved
4.1	Landfill Leachate Collection	Resolved
4.2		Resolved
4.3		Resolved
4.4		Resolved
5.1	Surface Water Management at Landfill	Resolved
5.2		Resolved
5.3		Resolved
6	Fencing	Resolved
7.1	Permafrost Considerations	Resolved (Commitment)
7.2		Resolved
7.3		Resolved
7.4		Resolved (Commitment)
8	Waste Transfer Station Geotechnical Report	Resolved
9	Landfill Design Drawings	Resolved
10.1	Operations	Resolved
10.2		Resolved
10.3		Resolved
10.4		Resolved

The City provided three submissions to respond to the List of Issues on October 2 and October 9, 2020. CIRNAC reviewed these submissions and provided comments to the NWB on November 26, 2020. The City and CIRNAC held a meeting to discuss pathways to solutions on unresolved issues on December 11, 2020, which aided in clarifying questions for both parties.

The City provided a Supplementary Information Package, including the 100% drawings, on December 15, 2020. A list of documents submitted and reviewed is provided in Table 3, Table 4, and Table 5 in Section B. Full comment details are provided in Section C. A summary of follow up recommendations is provided in Section D. Documents referenced in the text which were not supplied by the proponent as part of the application can be found under Works Cited in Section E.

B. DOCUMENTS REVIEWED

The following tables (Table 3, Table 4, and Table 5) provide a summary of the documents reviewed under the Application Package for Amendment of 3AM-IGL1520 received in April, 2020, the Commitments from the Pre-Hearing Conference received in October, 2020, and the Supplemental Response Package received in December, 2020.

Table 1: Documents Reviewed as part of the Original Application

Attachment	Document Title	Author, File No., Rev., Date
Main Document	Type "A" Water Licence Amendment Application Form	City of Iqaluit, 07-04-2020
Block 5	Topographic Map	City of Iqaluit, 13-03-2020
Block 7	Nunavut Planning Commission Determinations	Nunavut Planning Commission, 03-12-2018
Block 8	Notice of Release of Screening Decision Report	Nunavut Impact Review Board, 13-09-2019
Block 8	Nunavut Impact Review Board Screening Decision Reports	Nunavut Impact Review Board, 13-09-2019
Block 9	Iqaluit Closure and Decommissioning Plan	Dillon Consulting, 01-2020
Block 9	Landfill Engineering Drawings	Dillon Consulting, 24-01-2020
Block 9	Waste Transfer Station Engineering Drawings	Dillon Consulting, 10-2019
Block 9	Method Statement of Construction Report	Dillon Consulting, 01-2020
Block 9	Waste Transfer Station and Landfill Facility Monitoring Program	Dillon Consulting, 01-2020
Block 9	Waste Transfer Station and Landfill O&M Manual	Dillon Consulting, 01-2020
Block 17	Environmental Management Plan	Dillon Consulting, 01-2020
Block 17	Environmental Protection Plan - Operations, Closure and Post-Closure Phases	Dillon Consulting, 01-2020
Block 17	Environmental Protection Plan - Construction Phase	Dillon Consulting, 01-2020
Block 17	Erosion and Sediment Control Plan	Dillon Consulting, 01-2020
Block 20	Solid Waste Management Project Public Consultation Report	City of Iqaluit, 12-2018
Block 23	Preliminary Geotechnical Investigation Report	EXP Services Inc., Rev. 1, 28-01-2020
Block 23	Physical and Biological Assessment	EXP Services Inc., 10-2018
Block 23	Compliance Assessment and Status Report	City of Iqaluit, 09-04-2020
	Executive Summary	City of Iqaluit, 09-04-2020
	Supporting Submission For Application to Amend Type A Water Licence 3AM-IQA1626	City of Iqaluit, 04-2020
	Emergency Response Plan	Dillon Consulting, 24-01-2020
	ICIP - Climate Lens – Greenhouse Gas Mitigation Assessment	Dillon Consulting, 10-2019
	ICIP - Climate Lens – Resiliency Assessment Report	Dillon Consulting, 10-2019

Table 2: Documents Reviewed as part of the Pre-Hearing Conference Commitments

Attachment	Document Title	Author, File No., Rev., Date
Main Document	MEMO to the City of Iqaluit Re: July 2020 Regulator (ECCC/CIRNAC) Comments – Responses	Keith Barnes, P.Eng., Dillon Consulting, File No. 19-9543, October 2, 2020
Addendum A	Regulator Commitments Status, 2 October 2020	
Appendix B	Regulator Commitments Response Package, 2 October 2020	
Main Document	West 40 Closure Memo to Alan Rustom MClArb, BEng,MSc, Med, Colliers Project Leaders Re: Water License Amendment	Jim Clare, RET, AECOM Canada Ltd., File No. 60609125 (470), September 30, 2020
Main Document	MEMO to the City of Iqaluit Re: July 2020 Regulator (ECCC/CIRNAC) Comments – Responses October 9	Keith Barnes, P.Eng., Dillon Consulting, File No. 19-9543, October 9, 2020
Addendum A	Regulator Commitments Status, 9 October 2020.	
Addendum B	Regulator Commitments Response Package, 9 October 2020.	

Table 2: Documents Reviewed as part of the Supplemental Submission in December, 2020

Attachment	Document Title	Author, File No., Rev., Date
	Cover Letter	Keith Barnes, P.Eng. Project Manager, File No. 19-9543, December 15, 2020
001	Response to Regulators	Keith Barnes, P.Eng. Project Manager, File No. 19-9543, December 15, 2020
002	EPP Ops, Closure, Post Closure	Dillon Consulting, October 2020
003	EPP Construction Phase	Dillon Consulting, December 2020
004	Facility Monitoring Program	Dillon Consulting, December 2020
005	Operations and Maintenance Manual	Dillon Consulting, October 2020
6	Commitment 17 Supplemental Information	Dillon Consulting, December 2020
007	Drawing Package for Approval (100% Package)	Dillon Consulting, October 30, 2020
008	CIRNAC Comment 2iii and 10-1 SDK 01 912 2020	Dillon Consulting, December 2020
009	EPP Construction Phase	Dillon Consulting, December 2020
010	EPP Erosion and Sediment Plan	Dillon Consulting, October 2020
011	EPP Ops, Closure, Post Closure	Dillon Consulting, October 30, 2020
012	Geotechnical Report – Waste Transfer Station	EXP Services Inc., October 19, 2018
	Specifications Compiled Divisions 01 to 34 less Front End Document	Received December 22, 2020, from Keith Barnes, P.Eng. Project Manager

C. RESULTS OF REVIEW

1. Reclamation of West 40 Landfill

Issue 1

The water licence amendment application included the submission of a reclamation plan for the future landfill and waste transfer station. CIRNAC did not find further information on reclamation plans for the current West 40 landfill and noted that an update would be timely, as the most recent iteration of the plan provided in 2014 lacks some details typically present in a final closure plan. CIRNAC recommended that the City provide an update on plans for reclaiming the West 40 landfill including an estimated schedule for reclamation work and details on site drainage. CIRNAC also recommended that an amended licence include a condition for the applicant to provide the final closure design report, including details pertaining to site drainage, within one year of closure of the West 40 landfill and more than a year prior to undertaking reclamation work.

Status

(R-01) This concern is resolved.

The City responded that landfill is currently filling to a proposed final design elevation that has been established to provide the City with disposal capacity until the new facilities are fully operational. The City also stated that surveys have been recently conducted and confirm that the landfill will have capacity until 2022/2023, at which time the City expects that the final closure report and design for the West 40 landfill will be developed, and the facility closed and decommissioned. CIRNAC finds that this timeline is acceptable to resolve the indicated concern.

2. Runoff from Baled Waste at Transfer Station

Issue 2

The Waste Transfer Station and Landfill Operation and Maintenance (O&M) Manual outlines how waste will be baled and covered in plastic at the waste transfer station. Over the course of the review, CIRNAC had concerns pertaining to the integrity of the bales to prevent contact water and leachate production, the mixing of baled and unbaled wastes, and the potential for ponding of leachate due to low surface grades. Leachate and surface water in contact with the bales could potentially be contaminated.

CIRNAC recommended on July 17, 2020, that the applicant provide rationale for not controlling leachate and contact water from the bale storage area at the waste transfer station, and how they will ensure proper drainage. On November 26, 2020, CIRNAC further recommended the following:

i. **Resolved:** CIRNAC recommended that the City clarify whether the sump is shown in other drawings, and if so, direct CIRNAC to the relevant drawing(s).

ii. **Resolved:** CIRNAC recommends that the NWB include a condition in amended water licence to require that all water collected from the transfer station floor, produced by baling operations or by waste storage, be treated as leachate rather than being discharged to offsite drainage systems.

iii. **Resolved:** CIRNAC recommended that the City clarify whether there is a strategy for separating baled and unbaled waste, and if not, how the integrity of the bale wrap will be maintained.

iv. **Resolved:** CIRNAC recommended that the NWB include a condition in an amended water licence to require that the City review the O&M Manual on an annual basis, and make revisions to the O&M Manual based on any changes to operational practices that vary from the current iteration or version of the manual, derived from operational experience gained with the balefill.

Status

(R-02) This concern is resolved pending further action from the City and pending conditions in an amended water licence.

Recommendation of July 17, 2020

Resolved: The drainage plan for the transfer station site is described in Section 12.1 of the updated Operations and Maintenance (O&M) Manual (Dillon Consulting, Rev. 4, October, 2020, pg. 240), as outlined in the October 2 and October 9, 2020, response packages. This resolves the concern pertaining to drainage and the control of leachate and contact water from the bale storage area at the waste transfer station, identified on July 17, 2020.

Recommendations of November 26, 2020

(i) **Resolved:** Drawings WTS-C02 and C05, contained in the 100% package, clearly show the sump as described.

(ii) **Resolved Pending Licence Condition:** The City has agreed with CIRNAC that all water collected from the transfer station floor, produced by baling operations or by waste storage, should be treated as leachate rather than being discharged to offsite drainage systems. CIRNAC recommends that the NWB include this as a licence condition in an amended licence.

(iii) **Resolved Pending Action on behalf of the City:** The City provided a response in the document titled CIRNAC Comment 2.iii. and Comment 10.1 Supplementary Information (December 15, 2020, Attachment 8). The response indicates (pg. 3) that: *"… unbaled waste can be placed in a constructed void space within the active bale placement area, with 100 mm of aggregate cover being placed over the waste to prevent the potential for blowing litter. Depending on the size of the void, City construction equipment (e.g., excavator, tracked dozer) would be used to compact the waste. Should the waste abrade/breach the plastic wrap of the bales within the void space, it will be inconsequential as the bales will be below grade and covered by waste and aggregate cover…*" This response resolves the concern, and generates follow-up concerns. Follow up recommendations are outlined below.

(iv) **Resolved Pending Licence Condition:** The City has committed to reviewing the O&M Manual on an annual basis, and to make revisions to the O&M Manual based on any changes to operational practices that vary from the current iteration or version of the manual, derived from operational experience gained with the balefill. CIRNAC recommends that the NWB include this as a condition in an amended licence.

The City has committed to reviewing the O&M Manual on an annual basis in Recommendation 2(iv). CIRNAC recommends that the following considerations be included in the next iteration of the O&M Manual. A commitment to consider these recommendations would resolve this concern.

The description in the specifications notes that the baler is to have wire tied bales with plastic wrap. This increases the likelihood of breakdowns related to the wire tie and wrap equipment, which could put the baler out of service for extended periods until replacement parts can be acquired. This may be an operating option for a short-term down-time (1-day or 2-day) for residential and commercial waste; however, for an extended down-time for the bailer, CIRNAC does not find it to be a suitable solution. CIRNAC recommends that the next iteration of the O&M Manual include considerations regarding extended down-time for the baler machinery in the O&M Manual.

It is also unclear how this should be managed if the operating equipment is required to cross over uncovered bales to access the pocket. CIRNAC recommends that the next iteration of the O&M Manual provide direction to the operators in the O&M Manual for how to operate equipment when it is required to cross over uncovered bales to access the pocket. CIRNAC suggests that the City consider maintaining an area of the landfill cell unfilled and open for such events, and at a location that is accessible.

Furthermore, Iqaluit has to manage large volumes of debris resulting from building demolitions and structure fires. The O&M Manual as described may not be a suitable way to manage large debris volumes. CIRNAC recommends that the City consider including a separate disposal cell for construction, demolition, and fire related debris.

3. Landfill Leachate Treatment

Issue 3

Given the novelty of a landfill using plastic wrapped bales in an arctic environment, CIRNAC acknowledges the quantity and quality of leachate that will be generated is uncertain and it is therefore difficult to design an effective and efficient way of treating the leachate. Several options were discussed in the application documents submitted by the City and it was not clear which option the City was proposing. CIRNAC recommended that the City clarify their current position for treating landfill leachate and the factors that led their decision.

The City responded that they plan to hold leachate in new engineered lagoons for up to two years, samples will be taken to monitor its quality, and if leachate is found to exceed

discharge limits set by the NWB, then additional treatment will be designed and installed, such as aeration to the lagoons, metal precipitation and filtration. Over the first two years of landfill operation leachate quality may be such that direct discharge to the environment may be possible and practiced, or that leachate could be trucked to the waste water treatment plant (WWTP).

CIRNAC noted that a management/treatment process developed based on the first two years of operation may not be adequate for leachate generated in ten or twenty-years' time, and that monitoring of leachate quality and planning for an adequate management strategy would be more effective if implemented as an ongoing adaptive process rather than a process that is completed after a two-year period of observation. CIRNAC recommended that the City monitor and report on the leachate before the ponds become full, and implement any treatment methodologies within one year of a decision of a need for treatment.

Status

(R-03) This concern is resolved pending a licence condition.

Following the submission of the Pre-Hearing Conference commitments, CIRNAC recommended that the NWB include a condition in an amended water licence to require the City conduct ongoing monitoring of quality and leachate levels, that discharge events are recorded if and when they occur (volume, leachate quality), and that results be reported as part of the Annual Report, and that the City provide a status update on whether current leachate management is expected to be adequate for the future based on leachate quality trends to date as part of each Annual Report. The City committed to reporting leachate quality trends in Annual Reports. CIRNAC recommends that a condition be added to an amended licence that requires the City to monitor and report on the leachate before the ponds become full, and implement any treatment methodologies within one year of a decision of a need for treatment.

4. Landfill Leachate Collection

A robust leachate collection system is critical with regard to environmental protection and reducing future liability as it ensures continued leachate removal from the landfill into the post closure period, reducing head on the liner system and thus potential for uncontrolled discharges into the environment underneath the landfill. The design drawings submitted for the landfill in the 90% submission and the Method of Construction Statement Report were missing several elements which should be incorporated in final documents. CIRNAC recommended the applicant provide more detail on the leachate collection system, including: 4.1) leachate collection pipes; 4.2) leachate sump and manhole; 4.3) liner installation; and 4.4) cell 10 leachate collection.

Issue 4.1

CIRNAC noted during the Technical Meeting that the responses provided by the City seemed to indicate leachate will still flow to sumps from cells far away from those

sumps, and it was unclear how this would work once the landfill is closed. The City responded by providing updated Drawings LF-C14 and LF-C15 to offer more details on the leachate collection pipes. CIRNAC also reviewed Drawing LF-C11, submitted as response to CIRNAC 4.2 (leachate sump and manhole).

Drawing LF-C11 shows a 4m wide strip for Cell 1 only on the east and north side. The gravel layer under the waste and the waste mass itself are assumed to freeze up during winter months and will likely remain frozen once sufficient waste has been placed. Any leachate therefore has to flow along the surface or through the waste, particularly in the long-term.

Based on the responses and drawings provided, CIRNAC indicated the following concerns:

a. Leachate Overflow: The space between the berm and waste do not appear to be large enough to prevent overtopping of leachate during freshet or a larger precipitation event. It is not clear what happens to the leachate when this area is being filled in.
b. Leachate Ponding: Leachate is expected to be removed from two locations only in the long-term. For leachate to flow to these locations, during the summer months and initial operation of a cell, the gravel drainage layer may be available and could possibly freeze up. Leachate may accumulate if it cannot drain via the gravel layer. It is not clear how the City plans to remove accumulated leachate prior to landfill closure, nor is it clear how it intends to maintain the gravel layer so it remains unfrozen, as biodegradation of baled waste, and therefore heat generation, is likely to be limited.
c. Leachate Removal: It is possible that sumps will fill up with water (ice) and potentially litter, which could pose challenges to leachate removal. The pipe system has a risk of freezing up if not drained properly and it is most needed during spring; it would be very difficult to remove any blockage at that time of year.

The leachate collection system presented appeared to be complex; with complexity comes an increase in potential points of failure. Whatever system is in place will need to be robust and resilient to function reliably, particularly during freshet when environmental risk is highest. CIRNAC recommended the following on November 26, 2020:

i. **Resolved:** CIRNAC recommended that the City consider leachate collection system designs that focus on robustness and resiliency, so it can work during freshet when environmental risk is highest.
ii. **Resolved Pending Action on behalf of the City:** CIRNAC recommends that the O&M Manual provide guidance on how leachate may flow and which areas should not be obstructed.

Status

(R-04.1) This concern is partially resolved.

The 100% Drawings Package and updated O&M Manual were submitted. These documents clarify how leachate may flow and which areas should not be obstructed. This response resolves the concern, and generates a follow-up concern.

As it is yet unknown how the leachate collection system will behave in terms of freeze up over the operational period, it is important that the entire circumference of the cell(s) be checked to confirm leachate is flowing to the sump and not pooling anywhere, specifically in late spring and after heavy precipitation events. These checks are important in the prevention and identification of unintentional overtopping of the outer berm by leachate. If pooling is observed, especially along the outer berms where there would be a risk of overflow, obstructions should be removed to promote good flow to the sump. Frequent inspections of the insides of the berms to keep the area between berm and waste bales free of obstacles (litter, soil) to promote flow in this area would also be good practice.

The City has committed to reviewing the O&M Manual on an annual basis in Recommendation 2(iv). CIRNAC recommends that the next iteration of the O&M Manual include details regarding leachate system inspections (Section 4.2.5 or 12.2 or both of the O&M Manual). CIRNAC recommends that a condition be included in an amended water licence to require that the City inspect the leachate collection system.

Issue 4.2

CIRNAC expressed that the key concern is a low point in which leachate can accumulate remaining after sump or manhole removal and specifically requested that the City clarify how the sump will be removed. Drawings LF-C11 and LF-C16 show a note that the sump will need to be removed. It was not clear how the sump would be removed to ensure leachate flow to the sump in Cell 4, nor was it clear what led to the choice of placing a manhole in Cell 1. Based on the responses provided by the City of Iqaluit, little flow is expected within the leachate collection drainage layer and most of the flow would be at surface once waste has been placed. CIRNAC recommended that the City clarify the rationale for placing a manhole in Cell 1, and how the sump will be removed to ensure leachate flow to the sump in Cell 4.

Status

(R-04.2) This concern is resolved.

The City of Iqaluit provided the 100% submission in December, 2021, which includes drawings with sufficient detail to show how pipes and access to the manhole are supported. Details have been added to drawings to show how the sump will be filled in. The proposed method is to fill the sump with granular material, then filling the sump with leachate which will freeze and remain frozen in perpetuity to provide a base for leachate flowing to the Cell 4 sump along the low spot in Cell 1, 2 and 4.

Issue 4.3
The City proposed typical types of geotextile for landfill and road construction applications (Type A: 6 oz, Type B: 12 oz, and Type C: 28 oz). Based on the drawing set dated May 2019, and on selected drawings provided in the October submission, the type of geotextile to be used was not definitive in all details. The type of geotextile chosen should be of an appropriate thickness/weight to offer adequate protection of the geomembrane. CIRNAC was concerned that Type A geotextile may not be robust enough to provide adequate protection.

Status
(R-04.3) This concern is resolved.

CIRNAC recommended that the City ensure that the type of geotextile used be of an appropriate thickness/weight to offer adequate protection of the geomembrane. The City has committed to using a robust geotextile, above Type A thickness. This resolves the concern.

Issue 4.4
The City provided updated drawings LF-C17 and LF-C19 as part of the October 9, 2020 submission, which showed leachate collection in Cell 10. Based on Drawing LF-C16, which was provided in response to CIRNAC recommendation 4.2 (leachate sump and manhole), the low point in cell 10 to the north of the sump is still in place. Two elevations have been annotated on Drawing LF-C16 and it was unclear what they show.

Status
(R-04.4) This concern is resolved.

CIRNAC recommended that the City clarify the significance of the elevations which are annotated in Drawing LF-C16, and clarify whether the low point in cell 10 to the north of the sump is still in place. Drawing LF-C16 in the 100% package shows a revised base grading for Cell 10, which resolves the concern.

5. Surface Water Management at Landfill

Surface water management at landfills is important to prevent run-on to landfill cells and operating areas by conveying clean off-site runoff around the site and to manage site run-off such that it does not cause damage at the point of release. It is also important to avoid erosion of built up berms to prevent structural damage to landfill cells or roads. Several elements were missing or unclear from the 90% submission design drawings for the landfill, submitted as part of the original application package, including: 5.1) surface water ponding; 5.2) stormwater berm in cell 1; and 5.3) erosion control features.

Issue 5.1
CIRNAC recommended that the City provide details on surface water ditching on north side of Cell 1 to convey drainage. The City responded by providing Drawing C-04, which

does not show north side of cell. Other drawings appeared to indicate routing of flow, but there was no clear indication that a ditch or swale would be constructed. CIRNAC recommended that the City provided the entire drawing set as a single document for review purposes.

Status

(R-05.1) This concern is resolved pending clarification from the City.

The City has provided the drawings as requested, resolving the concern. CIRNAC recommends that the City clarify the following questions pertaining to the specified drawings, outlined in Table 6.

Table 6: Follow Up Questions Pertaining to 100% Submission Drawings

Drawing	Concern/Recommendation
LF-C03	Where are Section Lines 1, 2, 3, and 4 shown on the plan drawing?
LF-C05	West Perimeter Road – Please show cross-section in a fill location.
LF-C06	Leachate Lagoon Road - Please clearly identify and state on the drawing that road cuts of 1 to 3 m in depth for a length of about 210m are required, and that some sections of the cut may be into bedrock underlying overburden soils based on EXP Geotech Report. Drawings should note that cuts into the original ground might encounter bedrock and that the Contractor may require drill and blast to achieve design elevations. What is meant by a 5 string horizontal thermistor? Should this be interpreted as 5 horizontal ground temperature cables in both Lagoons 1 and 2?
LF-C22	One cannot have steep 4V:1H (Vertical:Horizontal) cuts in permafrost soils. A 4V:1H slope may be possible in bedrock if the rock is intact and contains no planes of weakness and excess ground ice. The road cross-sections presented for Rock and Permafrost need to be different sections. Permafrost is a thermal state of the ground it's not a soil type, and permafrost conditions can exist in rock or soil. There are cuts in rock and there are cuts in overburden materials, these cut slopes will behave differently. The drawings need to be clear about whether the cuts are expected to be in rock or soil and whether permafrost conditions are expected. Cut slope angles will be different in bedrock vs mineral soil. The road cross-sections should show minimum fill thicknesses for the Surface Course material and the Base Course material. The road cross-sections presented are insufficient to describe the conditions the Contractor is expected to encounter. The drawings need to show cut slope angles.
Excavation Backfill and Compaction Notes	Clause 1 states refer to WOOD report for recommendations or excavation, proof rolling and backfill materials and 'minimum specifications'. Please clarify what 'minimum specifications' mean?

Issue 5.2

CIRNAC recommended that the City provide information on the stormwater berm in Cell 1. Specifically, if the berm is temporary, information on the design intent for removal of the berm, and if the berm is permanent, how filling of bales should occur at the berm location.

Status
(R-05.2) This concern is resolved.

The City responded by adding a note to the relevant drawings indicating the berm is temporary and to be removed by the Owner prior to waste being placed in that location. This resolves the indicated concern.

Issue 5.3
CIRNAC recommended that the City provide rationale for why erosion control features were not deemed necessary in the sediment traps along the west side of west access road, nor along the south side of south access road. The City responded that the flow would be captured by the northern most sediment trap on the east side, resolving this portion of the concern.

Based on CIRNAC's review of drawing LF-C03, it was unclear why erosion control features were not deemed necessary in the fibre rolls and silt fence on both sides of Leachate lagoon road, how surface water north of the west perimeter is managed, and how erosion and sediment control is implemented in the area immediately to the north of where the west access road ends.

Status
(R-05.2) This concern is resolved.

CIRNAC recommended that the City provide rationale for why erosion control features were not deemed necessary on both sides of the leachate lagoon access road, and clarify how the runoff north of the end of the west access road is captured and conveyed. The drawings and answer provided in the 100% package sufficiently illustrate the rationale used. Drawing LF-C03 provides detail on erosion and sediment control, and drawing LF-C08 provides details on the Cell 1 ditch and flow direction at the end of north access road.

6. Fencing

Issue 6
The landfill design drawings provided as part of the original submission did not provide an indication of which areas of the landfill will be fenced. CIRNAC recommended that the City provide clarification on where fencing and gates are to be installed and procedures for gate closures, or if no fencing is planned, details on how wildlife and general public will be restricted from access and any response procedures if the public or wildlife access the site. Unfenced leachate ponds pose a risk to wildlife becoming trapped.

The City responded by providing an updated Operation and Maintenance Manual. Section 2.1.2 describes site security; details include fence locations and end of the day

gate closure at the landfill and the Transfer Station. This information resolves part of the indicated concern.

The City also provided Drawings LF-C03 and LF-C04, which show a gate and fencing at the entrance of the landfill site. Drawing LF-C11 shows fence and gate around Cell 1. The drawings do not include a fence reference or legend to show the fence locations around the entire site. No drawing provided demonstrated fencing around the leachate ponds. CIRNAC recommended that the City implement a strategy to prevent wildlife from entering the leachate ponds.

Status
(R-06) This concern is resolved.

Fences are shown around both landfill and leachate ponds on drawing LF-C14, provided by the City in the 100% package.

7. Permafrost Considerations

It was unclear from the original submission how permafrost is being addressed in the design, construction, and operation of the facility.

Issue 7.1
CIRNAC recommended on July 17, 2020, that the City clarify the construction methodologies that will be used to minimize impact on permafrost, and the design approach, recognizing the geotechnical and permafrost conditions that exist at the landfill site. The City responded that best practices can be found in the CSA PLUS 4011:19 Technical Guide. The City did not provide design reports, construction drawings, or construction specifications indicating how the design and construction will minimize impact on permafrost due to construction activities.

CIRNAC recommended on November 26, 2020, that the City provide design reports, construction drawings, or construction specifications that demonstrate how the design and construction will minimize impacts on permafrost.

Status
(R-07.1) This comment is resolved pending a commitment from the City.

The City has committed to providing design reports, construction drawings, or construction specifications that demonstrate how the design and construction will minimize impacts on permafrost, by January, 2021. This commitment resolves the concern.

CIRNAC recommends that once the design reports, construction drawings, or construction specifications are submitted, an opportunity be provided for interveners to review and comment on the plan.

Issue 7.2

CIRNAC recommended on July 17, 2020, that the City describe permafrost conditions at the proposed leachate pond location and explain how permafrost conditions have been addressed in the design, construction and operation of the ponds. The City responded that "The construction of leachate ponds have been designed to avoid cuts into the active layer and placed over a thick gravel pad on a bedrock base, minimizing potential for impact to permafrost" (Response Package, October 9, 2020, pg 291).

Drawing LF-C06 showed a cross section through the leachate ponds and then a section of the existing grades along a different location, which suggests that the leachate ponds will be excavated into the original ground. Drawing LF-C13 provided a cross section which shows the lagoons constructed above grade. The cross section does not show an elevation profile for the existing ground surface and for the top of bedrock, nor is it clear whether the overburden will it be excavated or left in-place, or whether the leachate lagoons road will be constructed by excavating into the original ground as indicated in Drawing LF-C06.

CIRNAC recommended on November 26, 2020, that the City clarify whether the leachate ponds have been designed on fill only pads with no cuts into the original ground within the footprint of the lagoons. The City responded by providing the 100% Drawings document in the submission package, and pointed to Drawing LF-C16 which identifies the cuts associated with the construction of the lagoons.

Status

(R-07.2) This comment is resolved pending actions on behalf of the City.

Drawing LF-C16 does not provide a cross section of the leachate ponds. Drawing LF-C14 shows a cut into the overburden for leachate Lagoon 1 of about 1.5m, and little to no cuts in overburden for leachate Lagoon 2. This clarifies the design as recommended by CIRNAC on November 26, 2020.

The question of describing permafrost conditions at the proposed leachate pond location and explaining how permafrost conditions have been addressed in the design, construction and operation of the ponds, remains unclear. Following review of the documentation provided in the supplemental information package submitted on December 15, 2020, CIRNAC notes that some relevant permafrost information is missing from essential documents. CIRNAC recommends that the City of Iqaluit make the following inclusions in the documents, as described below.

002 - EPP Ops, Closure, Post Closure

The report notes that the site is located in a permafrost environment and permafrost contains medium ice content. 'Medium ice content permafrost' has been referenced in at least 2 EPP (Environmental Protection Plan) reports. Medium ice suggests that excess ground ice should be expected in the permafrost soils and bedrock. Excess ground ice is typically thaw-sensitive permafrost but might be thaw-stable depending on site-specific conditions. This is not identified or described in any of the reports. CIRNAC recommends that this information be clearly indicated in the EPP.

Permafrost needs have not been identified and described under environmental considerations in Section 3.0. The environmental permafrost protection measures that will be considered and may be implemented should be identified in accordance with the EPP. Permafrost should be added/included as an environmental consideration. This should include the environmental protection measures that the project expects to implement to protect permafrost and mitigate permafrost degradation during the Operations, Closure and Post-Closure Phases of the facility, or what response(s) will be undertaken in the event there is an environmental impact.

003 - EPP Construction Phase
This document is nearly identical to 02 - EPP Ops, Closure, Post Closure. CIRNAC did not find information regarding subsurface soil/bedrock or permafrost and ground ice conditions beneath the lagoons. Excavation or re-grading at the lagoons would require the contractor to remove ground ice. If bedrock is encountered then it may need to be excavated. CIRNAC recommends that the City identify the potential environmental impact and mitigation measures that the project will follow, and that the Contractor will be responsible for developing and implementing, to prevent the degradation of permafrost below the leachate lagoons.

004 - Facility Monitoring Program
Section 3.0 - Monitoring Plan paragraph 3 (pg. 9) notes that “No thermistors have been installed at the WTS; therefore, soil temperature monitoring will be conducted at the landfill only.” It is not clear why there will be no ground temperature monitoring at the Waste Transfer Station. CIRNAC recommends that the rationale for not including thermistors be clearly indicated.

The City plans to install thermosyphons as part of the foundation design for the WTS. Thermosyphon foundations require ground temperature monitoring, and the development of a monitoring and maintenance plan, and analysis of the monitoring data, to verify that they function as intended. This is not described in the Facility Monitoring Program. CIRNAC recommends that the City of Iqaluit implement an annual review of soil deformation by a geotechnical engineer, with more frequent reviews if undesirable trends appear.

005 - Operations and Maintenance Manual
The operation and maintenance manual does not include ground temperature monitoring at the WTS. As described above thermosyphon foundations require ground temperature monitoring. CIRNAC recommends that this information be included in the O&M manual.

Block 9 - Method Statement of Construction Report
The Method Statement of Construction does not have a section on the Lagoons, which is part of the landfill facility. The intention of the Method Statement of Construction Report is to describe a construction methodology for the proposed development, which should also include the Leachate Lagoons. CIRNAC recommends that this information be added to the report.

Issue 7.3

CIRNAC recommended on July 17, 2020, that the City describe the rationale for thermistor locations and how they will monitor ground temperature changes within and below the facilities. The City responded that the original thermistor locations were designed to provide a baseline assessment of the site without drilling conduit holes in locations where bales and drainage paths may be influenced. The City intends to place thermistors at the cells, the lagoons, and the Waste Transfer Station, to assess the permafrost conditions once the final arrangement is confirmed. The City does not intend to monitor temperatures below the access road. The City refers to updated drawings LF-C09 and LF-C13. The information provided resolved the indicated concern, and presented new concerns regarding the collection and use of long-term monitoring data.

CIRNAC recommended on November 26, 2020, that that the NWB include a condition in an amended water licence to require that the City provide its plan for long-term ground temperature monitoring for the facility, once the thermistor locations in the final design are decided. This plan should include the design locations of the thermistor string installations, the purpose of collecting round temperature data, and how the data will be used for operating the facility.

Status

(R-07.3) This comment is resolved pending a licence condition.

The City of Iqaluit has committed to providing its plan for long-term ground temperature monitoring for the facility, once the thermistor locations in the final design are decided. CIRNAC recommends that a condition be added to an amended licence to require that the City provide its plan for long-term ground temperature monitoring for the facility in an emended licence, and that the plan include the design locations of the thermistor string installations, the purpose of collecting round temperature data, and how the data will be used for operating the facility.

Issue 7.4

The City's mitigation plan for an event in which heat is generated from decomposing municipal bale waste was not provided as part of the original application, nor as part of the PHC commitments. As a result, it was not clear how the City intends to ensure that the wrapped waste bales will remain intact. Damaged bales have a risk of being exposed to oxygen over the long term before the bales are buried. Ultraviolet light, climatic conditions and wildlife, for example, pose risks to the integrity of the linear low-density polyethylene (LLDPE) wrapping material.

CIRNAC recommended on July 17, 2020, that the City explain why it was not deemed necessary to consider heat generation from decomposing municipal waste in the thermal modeling of the landfill. The City responded that little is known regarding heat generation from decomposing municipal bale waste (high density) in a northern climate, and that the conditions require the presence of oxygen, which will be limited due to the wrapping of the waste bales with LLDPE.

CIRNAC recommended on November 26, 2020, that the City provide a mitigation plan for an event in which heat is generated from decomposing municipal bale waste, as part of the long-term ground temperature monitoring plan recommended in comment 7, Recommendation 7.3.

Status
(R-07.4) This comment is resolved pending a commitment from the City.

The City has committed to providing a mitigation plan for an event in which heat is generated from decomposing municipal bale waste, as part of the long-term ground temperature monitoring plan by January, 2021. This commitment resolves the concern.

CIRNAC recommends that once the heat generation mitigation plan is submitted, an opportunity be provided for interveners to review and comment on the plan.

8. Waste Transfer Station Geotechnical Report

Issue 8
CIRNAC was unable to locate the report titled “City of Iqaluit Geotechnical Investigation Proposed Waste Transfer Station Lots 3586 228/17/18/20 and 3480 220 1 Iqaluit, Nunavut, October 2018” referred to in the Method Statement of Construction Report, and recommended that the City identify where this report can be found.

Resolution Status
(R-08) This comment is resolved.

The City has provided the Waste Transfer Station geotechnical report. The geotechnical report was received and used as background information for the CIRNAC review. This resolves the concern.

9. Landfill Design Drawings

Issue 9
The design drawings for the landfill, as presented in the 90% submission, did not include information pertaining to cuts in rock and overburden, or to ditches. CIRNAC recommended that the City clarify the construction methodology for cuts and ditches at the landfill. The City responded in the Response Package from October 9, 2020 (pg. 291) that “Cuts will be minimized and insulation utilized where possible to prevent heat transfer to permafrost. Future design may be adjusted based on knowledge gained during temperature monitoring from thermistors placed within the active cell.”

It was not clear from the October 9, 2020 response what the approach will be for protecting the permafrost during excavation (cutting and digging). CIRNAC recommended that the City commit to providing provide for review, at least 60 days prior

to work being undertaken, the proposed cut methodology for mitigating permafrost degradation.

Status
(R-09) This comment is resolved pending a commitment from the City.

The City has committed to providing the proposed cut methodology for mitigating permafrost degradation at least 60 days prior to work being undertaken. This resolves the concern.

10. Operations

There are certain elements of operations which had insufficient detail in the O&M Manual, which was submitted as part of the original application.

Issue 10.1
CIRNAC recommended that the City describe if non-baled waste in the landfill will be compacted, and how solid waste will be handled at the landfill in event of a mechanical breakdown of the baling or shredding equipment. The City responded by providing an updated O&M Manual which clarifies the proposed operations. This update resolved the concern, and raised a new concern.

As outlined in comment 2, the O&M Manual (Dillon Consulting, Rev. 4, October, 2020, pg. 240) suggests that unbaled waste may be placed in a pocket constructed within the balefill, which appears to occur over baled waste, resulting in baled and unbaled wastes being mixed in the same cells with equipment operating directly on baled waste. If this is the case, it is not clear how the integrity of the bale wrap will be maintained. CIRNAC has provided its recommendation under comment 2 for a review of the O&M Manual on an annual basis.

Status
(R-10.1) This comment is resolved pending a licence condition.

The City has committed to reviewing the O&M Manual on an annual basis, and to make revisions to the O&M Manual based on any changes to operational practices that vary from the current iteration or version of the manual, derived from operational experience gained with the balefill. CIRNAC recommends that the NWB include this as a condition in an amended licence.

Issue 10.2
CIRNAC recommended on July 17, 2020 that the City clarify what household hazardous wastes (HHW) will be accepted and if the hazardous waste storage area includes secondary containment. The City responded by providing a list of HHW which will be accepted under Section 4.1.5 of the updated O&M Manual. The list appears to not be

specific to Iqaluit, as it includes lawn care products and does not include fluorescent light ballasts. CIRNAC then recommended on November 26, 2020, that the City develop procedures for packaging, storage, and shipment of HHW, and include the procedures in the O&M Manual as part of its annual review.

Status
(R-10.2) This comment is resolved pending a commitment from the City.

The City of Iqaluit has committed to including procedures for packaging, storage, and shipment of HHW in the annual review of the O&M Manual. This resolves the concern.

Issue 10.3
CIRNAC recommended that the City provide additional details on leachate pumping including: objective criteria for when pumping is required (e.g. maximum allowable leachate head); method to be used to measure the leachate head and the level in the sump; and requirements for monitoring of pond levels and hoses for leaks during pumping operations. It was also requested that the City clarify if the float system has been eliminated. CIRNAC recommended that an amended water licence include leachate head monitoring frequency.

Status
(R-10.3) This comment is resolved pending a licence condition.

The City of Iqaluit has provided an updated O&M Manual. Section 4.2.5 and 12.2 of the O&M Manual require daily checking of leachate level and pump operation. Leachate height checks will be done through staff gauge, or if necessary with a tape measure.

CIRNAC recommends that an amended water licence include leachate head monitoring frequency.

Issue 10.4
CIRNAC recommended that an amended water licence include a condition requiring additional cover, if nuisances occur.

Status
(R-10.4) This comment is resolved pending a licence condition.

The City has committed to adding additional cover at the landfill, if nuisances occur. CIRNAC recommends a condition for additional cover be added to an amended licence.

D. SUMMARY OF FOLLOW-UP RECOMMENDATIONS

CIRNAC recommends that the next iteration of the O&M Manual include considerations regarding extended down-time for the baler machinery in the O&M Manual.

CIRNAC recommends that the next iteration of the O&M Manual provide direction to the operators in the O&M Manual for how to operate equipment when it is required to cross over uncovered bales to access the pocket.

CIRNAC recommends that the City consider maintaining an area of the landfill cell unfilled and open for such events, and at a location that is accessible.

CIRNAC recommends that the City consider including a separate disposal cell for construction, demolition, and fire related debris.

CIRNAC recommends that the next iteration of the O&M Manual include details regarding leachate system inspections (Section 4.2.5 or 12.2 or both of the O&M Manual).

CIRNAC recommends that the City clarify the follow-up questions from Table 6 under comment 5.1 regarding drawings in the 100% Submission.

The City has committed to providing design reports, construction drawings, or construction specifications that demonstrate how the design and construction will minimize impacts on permafrost, by January, 2021.

CIRNAC recommends that the City of Iqaluit include missing relevant permafrost information in the following referenced documents, as per comment 7.2:

- 002 - EPP Ops, Closure, Post Closure
- 003 - EPP Construction Phase
- 004 - Facility Monitoring Program
- 005 - Operations and Maintenance Manual
- Block 9 - Method Statement of Construction Report

CIRNAC recommends that the City of Iqaluit implement an annual review of soil deformation by a geotechnical engineer, with more frequent reviews if undesirable trends appear.

The City has committed to providing a mitigation plan for an event in which heat is generated from decomposing municipal bale waste, as part of the long-term ground temperature monitoring plan by January, 2021.

CIRNAC recommends that once the design reports, construction drawings, construction specifications, and the heat generation mitigation plan are submitted, an opportunity be provided for interveners to review and comment on the submissions.

E. REFERENCES

Crown-Indigenous Relations and Northern Affairs Canada. Letter to the Nunavut Water Board Re: Crown-Indigenous Relations and Northern Affairs Canada Completeness Review of City of Iqaluit Application for Amendment of Type “A” Water Licence No. 3AMIQA-1626. May 6, 2020.

Crown-Indigenous Relations and Northern Affairs Canada. Letter to the Nunavut Water Board Re: Crown-Indigenous Relations and Northern Affairs Canada’s technical review of the City of Iqaluit’s amendment application for water licence #3AM-IQA1626 for new solid waste disposal facilities. July 17, 2020.

Crown-Indigenous Relations and Northern Affairs Canada. Letter to the Nunavut Water Board Re: Crown-Indigenous Relations and Northern Affairs Canada’s Review of the City of Iqaluit’s Pre-Hearing Conference Commitments regarding the Amendment Application for Water Licence #3AM-IQA1626 for New Solid Waste Disposal Facilities. November 16, 2020.