Enclosure 1: Provincial Advice Record – Crawford Nickel Project Impact Statement

Please submit the completed form by **January 24, 2025,** via the Registry.[1]

Ministry or Organization Contact Information

Submission Date	January 21, 2025
Ministry/Organization	Ministry of Environmental Consultation and Parks – Environmental Permissions Branch
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Please see questions and guidance in Tables 1, 2 and 3 attached.

Name of Ministry / Organization Responder

Title of Responder

Date

[1] All comments should be submitted via the ***Submit a Comment*** feature available on the Project's Canadian Impact Assessment Registry page (Reference 83857). Letters and forms can be uploaded using this feature. If you have any difficulties submitting this way, please contact IAAC at *Crawford@iaac-aeic.gc.ca* for assistance.

Table 2. Additional issues and concerns

Table 2 should be used to identify concerns and other views and input in relation to the Impact Statement, the Project's effects, the proposed mitigation measures, and other matters the authority considers relevant to the assessment. It can also be used to identify recommended clarifications or requests for additional information from the Proponent that may be helpful to interpret or better understand the information in the Impact Statement. These concerns or requests for clarification would not typically result in deficiencies, but may be provided to the Proponent for consideration or may function to assist IAAC in understanding the views and expert advice of the authority. They may also be taken into account by IAAC in the analysis of the Project's adverse federal effects and preparation of the Impact Assessment Report and proposed conditions.

Concern Number	Refence to IS	Description of Concern	Clarification or additional information requested	Advice
Please identify concern by organization and comment number. *e.g.: IAAC-01*	*Identify the specific section of the IS to which your comment applies.*	*Provide a brief description of the information that is unclear or an issue or a concern in the IS. These may not require the proponent provide additional information, but may inform IAAC's assessment of the Project and the preparation of the Impact Assessment Report and recommended mitigation and follow-up measures. Additionally, it may provide the proponent information to inform other regulatory requirements for the project.*	*Briefly describe the information that should be provided to correctly interpret the information in the IS.*	*If appropriate, provide information on how the proponent, IAAC, or another department or ministry may be able to address the issue or concern. Include where relevant any additional information as outlined in the Table 1 Advice column.* *In the event of cross-cutting issues or a shared mandate/expertise with another agency, department, or organization please specify the agency/department/organization and contact persons.*	
MECP/EPB/IPSW-01	*Appendix C.5, Table 3.2, PDF p.296* *Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316* *Appendix C.5, Table 7.4, PDF p.318 and Table 7.5, PDF p.320*	**Baseline surface water quality**: Canada Nickel established (*Appendix C.5, Table 3.2, PDF p.296*) a **baseline water quality** for West Buskegau River and North Driftwood River which are the main receivers for this project. The baseline includes heavy metals and non-metallic compounds such as un-ionized ammonia, nitrite, nitrate, sulphate, chloride and phosphorus. Canada Nickel noted that the 75th percentile concentrations for **total iron** and **total phosphorus** exceed the Ontario Provincial Water Quality Objectives (PWQO), making the receivers Policy 2 for total iron and total phosphorus. The baseline data revealed that the 75th percentile concentrations for **sulphate** are 900 microgram per litre (ug/L) in West Buskegau River and 1000 ug/L in North Driftwood River. The 75th percentile concentrations for **mercury** are 3.45 ug/L in North Driftwood River and 6.45 ug/L in West Buskegau River. The baseline data also showed no values for **chromium III** and **chromium VI**. Similarly, no values were provided from **un-ionized ammonia**.	*The type of chemical reagent anticipated for the milling process for this project is unknown. Therefore, I am unable to verify if the chemical reagent was taken into consideration in establishment of the baseline.* *It is unclear to me why no values were reported for chromium III, chromium VI and un-ionized ammonia in the baseline, although Canada Nickel stated (Appendix C.5, PDF p.295-296) that "when more than 50% of results were below the reportable detection limit (RDL), summary statistics were not calculated, except for the maximum parameter values". I did not find the maximum values for chromium III, chromium VI and un-ionized ammonia. I am further confused as Table 7.2 and Table 7.3 provide receiver 75th percentile concentration as 1.5 ug/L for chromium III, 0 ug/L for chromium VI and 0.48 ug/L for un-ionized ammonia (Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316). Also, Table 7.4 and Table 7.5 provide receiver mean concentration as 1.3 ug/L for chromium III, 0 ug/L for chromium VI and 0.60 ug/L for un-ionized ammonia (Appendix C.5, Table 7. 4, PDF p.318 and Table 7.5, PDF p.320). With*	***1**-Canada Nickel should provide detail information on the anticipated chemical reagent.* ***2**-Canada Nickel should take the reagent into consideration in the establishment of the baseline, if not done.* ***3**-Canada Nickel should reconcile baseline data in Appendix C.5, Table 3.2, PDF p.296 and information provided in Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316.*	

			regards to these three parameters, I note that data provided in tables 7.2, 7.3, 7.4 and 7.5 contradict data initially provided in Table 3.2 (Appendix C.5, Table 3.2, PDF p.296).	
MECP/EPB/IPSW-02	*Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316, Table 7.4, PDF p.318 and Table 7.5, PDF p.320* *Chapter 15, PDF p. 23*	**<u>Changes to surface water quality:</u>** Canada Nickel evaluated the changes to surface water quality due to erosion, contact run-off, seepage, mine pit dewatering and process water during construction, operation and closure. They stated that a number of parameters of potential concern including nitrogen compounds, heavy metals and phosphorus will be present in the mine effluent. Those parameters are (*Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316, Table 7.4, PDF p.318 and Table 7.5, PDF p.320*) nitrite, nitrate, un-ionized ammonia, fluoride, total aluminum, dissolved aluminum, total arsenic, total boron, total cobalt, chloride, total chromium III, total chromium VI, total copper, total iron, total nickel, total selenium, total uranium, total vanadium, total zinc, dissolved zinc and total phosphorus. Canada Nickel determined the concentration of contaminants in the untreated mine effluent, which if discharged could change the quality of water in the receivers. Canada Nickel noted that untreated mine effluent (*Appendix C.5, Table B.2.1.1 PDF p. 349-350 and Table B.2.1.2 PDF p.351-352*) will contain **total phosphorus** at an average concentration ranging from 2 ug/L to 29 ug/L and a maximum concentration ranging from 7 ug/L to 39 ug/L. The predicted average concentration for **un-ionized ammonia** is between 1 ug/L and 6 ug/L while the maximum concentration is between 1 ug/L and 7 ug/L. The predicted average concentration for **chromium III** is around 9 ug/L while the maximum concentration is between 26 ug/L and 27 ug/L. Similarly, the predicted average concentration for **chromium VI** is between 0.52 ug/L and 6.30 ug/L and the maximum concentration is between 0.64 ug/L and 9.80 ug/L. While Canada Nickel listed **sulphate** as a parameter of non-potential concern, they predicted that untreated mine effluent (*Appendix C.5, Table B.2.1.1 PDF p. 349-350 and Table B.2.1.2 PDF p.351-352*) will contain a significant amount of	*I think that the assessment conducted by Canada Nickel has captured all major sources of water contamination resulting from mining activities. However, as the type of chemical reagent anticipated for the milling process for this project is unknown, I am unable to verify if it's potential contribution to change in surface water quality was taken into consideration.* *Moreover, I find that the list of parameters of potential concern provided in Appendix C.5 and the one provided in Chapter 15, PDF p. 23 are not consistent. Clarification should be provided by Canada Nickel.*	***1**-Canada Nickel should take the potential contribution of the reagent into consideration in the assessment of change to surface water quality, if not done.* ***2**-Canada Nickel should clarify and correct the discrepancies between the list provided in Appendix C.5 and the one provided in Chapter 15, PDF p. 23.*

		sulphate with an average concentration ranging from 75,083 ug/L to 107,273 ug/L and a maximum concentration ranging from 126,400 ug/L to 220,100 ug/L.		
MECP/EPB/IPSW-03	*Appendix C.5, Table C-9, PDF p.365, Table C-10 PDF p.366, Table C-11 p.367, Table C-12 p. 368* *Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316, Table 7.4, PDF p.318 and Table 7.5, PDF p.320*	**<u>Onsite Water Management:</u>** It appears from the EA report that, Canada Nickel water management will focus on (i) *non-contact water*, (ii) *pit groundwater* and *precipitation*, (iii) *contact water and (iv) domestic sewage*. Canada Nickel proposed to divert ***non-contact water*** from roadways and laydown area to adjacent watercourses to help maintain existing flow while minimizing the amount of water that needs to be managed. They plan to pump ***pit groundwater*** *and* ***precipitation*** received in the pit, to the Tailings Management Facility (TMF). They stated that ***contact water*** from the Rock Impoundment Facility (RIF), Process Area and Stockpiles will be captured and conveyed into ponds #1, #2 and #3. ***Contact water*** from the TMF will be conveyed to *TMF-NW Pond and TMF-NE Pond* from where, part of the decant will be recycled for the processing/mill operations. Canada Nickel made the commitment to treat water in the ponds using modular treatment plants. The goal of this treatment is to remove contaminants of concern, if required to meet discharge criteria. They stated that the design of the proposed modular treatment plants will be based on the results of the **geochemical testing/predictive model** and effluent criteria determined through assimilative capacity study. Canada Nickel anticipates that, the treatment plants will have unit processes such as coagulation, flocculation and precipitation to remove heavy metals from the mine effluent. Canada Nickel predicted that treated mine effluent at end of pipe (*Appendix C.5, Table C-9, PDF p.365, Table C-10 PDF p.366, Table C-11 p.367, Table C-12 p. 368*) will still have an average concentration of **sulphate** varying from 66,906 ug/L and 95,385 ug/L and a maximum concentration varying from 102,300 ug/L to 220,100 ug/L. The prediction reveals that even after full mixing, the concentration of sulphate in the receivers will be 4 to 15 times higher than the baseline concentration (800 ug/L to 1000 ug/L).	***Part A:*** *It is my opinion that the review of the results of the geochemical testing/predictive model, to confirm their validity, falls under the mandate of the technical experts of the Ministry of Mines (i.e., a qualified professional geoscientist: P.Geo.,). As best practice, and to ensure representative results, field geochemical testing is generally recommended. Indeed, small scale short time lab test poses the fundamental question of: how the results can be translated to the field condition? The accuracy of geochemical testing is critical because it serves to evaluate the potential for acid rock drainage (ARD) and the potential for metal leaching (ML). It has therefore a direct impact on the chemistry of the mine effluent and seepage.* *I cannot comment on Canada Nickel anticipated treatment plants using coagulation, flocculation and precipitation to remove heavy metals from the mine effluent; as the detailed engineering information of these plants is out of the scope of an EA report. Coagulation/flocculation is a process that is used in wastewater treatment as primary treatment to reduce the load of heavy metals. However, the efficiency of this process depends on the type of chemical used, concentration of the contaminant, contact time, etc. I feel that the anticipated treatment might not be sufficient to remove some contaminants such as chromium III and chromium IV for which the predictions have shown that, under the regulatory scenario, the concentration at the point of full mixing of*	***Part A:*** ***1****-Canada Nickel should clarify how PWQO will be met for chromium III and chromium IV, under regulatory scenario, knowing that the concentration at the point of full mixing of the treated mine effluent in the receivers is 2.8 times the PWQO value?* ***Part B:*** ***1****-Canada Nickel should first clarify whether the treated effluent considered in their assessment of the mixing zone is the effluent from the settling ponds or the effluent from the modular water treatment plants. If it is the effluent from the modular water treatment plants, then I am concerned about the ability of the proposed measures to meet the requirements at the full mixing point.* ***2****-If it is the effluent from the settling ponds, then Canada Nickel should provide effluent data for the modular water treatment plants and then re-run their assessment to determine the concentrations at the full mixing point.*

		Although Canada Nickel listed **mercury** as a parameter of non-potential concern, they predicted that, treated mine effluent at end of pipe (*Appendix C.5, Table C-9, PDF p.365, Table C-10 PDF p.366, Table C-11 p.367, Table C-12 p. 368*) will have a **mercury** concentration higher than baseline line. Moreover, after full mixing there will be an increase mercury concentration in the receivers. Canada Nickel predicted that, at the point of full mixing of the treated mine effluent in the receivers (*Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316, Table 7.4, PDF p.318 and Table 7.5, PDF p.320*), the concentration for the following contaminants exceed the 75th percentile of the receiver and the PWQO for several parameters of potential concern such as **total arsenic**, **total boron**, **total cobalt**, **chromium III**, **chromium VI**, **total nickel**, **total vanadium**, **total zinc**, and **total phosphorus**. The concentration of total iron (policy 2) also exceeds the PWQO.	*the treated mine effluent in the receivers is 2.8 times the PWQO value (Appendix C.5, Table 7.2, PDF p.314, Table 7.3, PDF p.316). To my knowledge, there are several technologies for removal of heavy metals from wastewater. It is my opinion that treatment of high concentration of chromium and stringent treatment requirements may require a combination of several technologies including (i) coagulation/flocculation, (ii) adsorption, (iii) electrochemical reduction of chromium VI into chromium III followed by precipitation of chromium III and (iv) membrane filtration processes such as ultrafiltration, nanofiltration and reverse osmosis.* ***Part B:*** *Based on the results predicted by Canada Nickel, I am not convinced that parameters of potential concern such as total arsenic, total boron, total cobalt, total nickel, total vanadium, total zinc, and total phosphorus will meet the requirements at the full mixing point.* *Canada Nickel should first clarify whether the treated effluent considered in their assessment of the mixing zone is the effluent from the settling ponds or the effluent from the modular water treatment plants. If it is the effluent from the modular water treatment plants, then I will be concerned about the ability of the proposed measures to meet the requirements at the full mixing point. If it is the effluent from the settling ponds, then Canada Nickel should provide effluent data for the modular water treatment plants and then re-run their assessment to determine the concentrations at the full mixing point.*	
MECP/EPB/IPSW-04	*Chapter 15*	**Permitting:**	*I agree with Canada Nickel that an industrial sewage works ECA will be*	*To allow detailed technical review at the* ***permitting stage (****if the EA report is approved****), Canada Nickel will have to provide supporting*

		Canada Nickel identified the Ontario Water Resources Act (**OWRA**) as one of the key provincial legislations that their water management plan for this project will have to comply with (*Chapter 15*). Indeed, Section 53 of the OWRA requires an Environmental Compliance Approval (ECA) to establish, use and operate Sewage Works. Also, Section 34 of the OWRA requires to obtain a Permit to Take Water (PTTW) as per O. Reg. 387/04 when water takings are more than 50,000 L/d. Canada Nickel admitted that an ECA for industrial sewage works will be required to implement their water management plan.	***required to implement their proposed water management plan. It is my opinion that the sewage works ECA application should cover all sources of sewage including stormwater, seepage, process wastewater, domestic sewage, etc.***	*documentation for the sewage works ECA application including, but not limited to:* ***(i)*** *Design brief prepared by a professional engineer (P.Eng.), including the description of the proposed ponds and modular treatment plants, estimation of sewage flow for each of the collection ponds and modular treatment plants, size calculations for the storage volume of the collection ponds and modular treatment plants, description of the conveyance systems and their capacities, etc.* ***(ii)*** *Site plan showing the location of all infrastructures including the location of all sewage works to handle* ***stormwater, seepage, process wastewater, domestic sewage, etc****.* ***(iii)*** *Drawing of the proposed sewage works and process flow diagram of the modular treatment plans, signed and stamped by a P.Eng.* ***(iv)*** *Proof that the proposed collection ponds, convenance systems, modular treatment plants and sanitary sewage package plant meet the minimum design requirements established in the MECP's guidance documents such as "2003 Stormwater Management Planning and Design Manual", "2008 Design Guidelines for Sewage Works", "1982 Manual of Policy, Procedures and Guidelines for Onsite Sewage Systems" or any published engineering design manual/book.* ***(v)*** *Detailed engineering calculation to demonstrate how the proposed collection ponds and modular treatment plants will remove suspended solids, nitrogen, phosphorus, and heavy metals from the mine effluent so that their concentrations meet the level imposed by water quality experts (scientists) of MECP's regional technical support section (RTSS).* ***(vi)*** *List of composition and concentrations of contaminants in the raw sewage, composition and concentrations of contaminants from the settling ponds, and then composition and concentrations of contaminants from the modular treatment plants.*

				(vii) *The list of final effluent discharge criteria reviewed and accepted by water quality experts (scientists) of MECP's RTSS.* *(viii)* *Detailed record of public consultation, particularly impacted indigenous communities.*
MECP/EPB/IPSW-05	*Appendix C.5, Table 6.16, PDF p.112* *Appendix C.5, Table 5.4, PDF p.304*	**<u>Effluent limits</u>:** Canada Nickel proposed a list of effluents limits for the mine effluent (*Appendix C.5, Table 6.16, PDF p.112*) and indicated that the limits were derived based on assimilative capacity assessment. They further indicated that, they considered the Ontario PWQO and MECP's Policy B-1-5. For parameters with no PWQO values, they relied on Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (CWQG-FAL). They also provided a list of proposed effluent limits for the sanitary sewage (*Appendix C.5, Table 5.4, PDF p.304*). They claimed that these are treatment technology limits recommended by technology suppliers, but no supplier name was mentioned in the report.	*I note the effluent limits proposed by Canada Nickel. However, confirmation of their validity falls under the mandate of water quality experts (scientists) of the MECP's RTSS. Confirmation of the validity of these limits is crucial as the engineers of the Industrial & Private Sewage Works (IPSW) unit at MECP will rely on those limits at the ECA permitting stage to evaluate the technical engineering design documents of sewage works anticipated by Canada Nickel for this mining project; prior to making recommendation whether an industrial sewage works ECA should be issued to Canada Nickel or not. I think, it is important pointing out that the proposed effluent limits for the mine effluent do not include sulphate, although it is well known that sulphate in wastewater can, under anoxic condition, contribute to enhance the production of methyl mercury.*	***1**-Considering the large amount of sulphate in the treated effluent for this project and no proposed limits for sulphate, Canada Nickel should clarify whether sulphate will be a concern, in terms of methyl mercury production, for this project or not and why?*
MECP/EPB/IPSW-06	*Chapter 15, Table 15.7, PDF p. 42-43* *Appendix C.5, Table 7.2, PDF p.314 and Table 7.3, PDF p.316*	**<u>Residual effects:</u>** As per Canada Nickel assertion, it is noted that the first assessment identified as "**conservative regulatory scenario**" was conducted assuming high effluent concentrations, maximum Final Discharge Point (FDP) discharges rates, low flow in receiver (7Q20) and poor water quality in the receiver (75th percentile local baseline). The second assessment identified as "**normal operating scenario**" was conducted assuming average effluent concentrations, average FDP discharge rates, mean annual flow rate in receiver and average water quality (mean local baseline). Canada Nickel noted that under both scenario, full mixing of effluent with the receiver will be achieved within 200 and 1200 m downstream of the FDPs.	*<u>During construction and operation</u>:* *Although Canada Nickel concluded (Chapter 15, Table 15.7, PDF p. 42-43) that the maximum average total phosphorus concentration at the point of complete mixing in West Buskegau River and North Driftwood River is predicted to be below the PWQO value of 30 ug/L, I note that this is not reflected in the predicted results shown in Appendix C.5, Table 7.2, PDF p.314, and Table 7.3, PDF p.316).* *While Canada Nickel recognizes the potential increase eutrophication 3.6 km from the FDP within North Driftwood. It is*	*<u>During construction and operation</u>:* ***1**-Canada Nickel should clarify how they will mitigate the occurrence of increase eutrophication 3.6 km from the Final Discharge Point within North Driftwood.* ***2**-Considering the large amount of sulphate in the treated effluent for this project and no proposed limits for sulphate, Canada Nickel should clarify whether sulphate will be a concern, in terms of methyl mercury production, for this project or not and why?* *<u>During decommissioning and passive closure</u>:* ***1**-Canada Nickel should demonstrate how seepage quality will improve through natural attenuation during downgradient migration?* *<u>During post-closure and pit full</u>:*

		During construction and operation: Canada Nickel concluded that the maximum average FDP **total phosphorus** discharge concentration is predicted to be below the PWQO value of 30 ug/L. They also concluded (*Chapter 15, Table 15.7, PDF p. 42-43*) that the maximum average total phosphorus concentration at the point of complete mixing in West Buskegau River and North Driftwood River is predicted to be below the PWQO value of 30 ug/L. Canada Nickel claimed that the **total inorganic nitrogen** (TIN) discharge from the FDPs to West Buskegau River is not expected to cause a substantial increase in eutrophication within the River (*Chapter 15, PDF p. 43*). This is not the case for North Driftwood River where an increase eutrophication is expected 3.6 km from the FDP as noted by Canada Nickel. Canada Nickel noted that **mercury** is not anticipated to increase as a result of mining operations. Nevertheless, they recognized that potential exists for increase mercury due to flooding of organic soils during the construction of the North Driftwood Division Channel (*Chapter 15, PDF p. 43*). However, they claimed that the predicted average **methyl mercury** concentration is 37 times less than the CWQG-FAL value of 4 nanogram per litre (ng/L). They further claimed that the concentration of **total mercury** in the North Driftwood River and West Buskegau River would be below CWQG-FAL value of 26 ng/L. *During decommissioning and passive closure:* With regards to the evaluation of the residual effect during **decommissioning and passive closure**, Canada Nickel reported that, mine surfaces rehabilitated with vegetation soil cover will produce non-contact runoff which will not require treatment. They indicated that, the quality of water seeping from the rehabilitated RIF and TMF is predicted to be below the MDMER criteria during passive closure. Canada Nickel anticipates that seepage quality will improve through natural attenuation during downgradient migration (*Chapter 15, PDF p. 44*). *During post-closure and pit full:*	*unclear to me how Canada Nickel will mitigate the occurrence of such increase eutrophication.* *Under anoxic conditions, sulphate can be used by sulphate reducing bacteria to enhance methyl mercury production. Sulphate concentration after full mixing of the effluent with the receiver has not been predicted by Canada Nickel (Appendix C.5, Table 7.2, PDF p.314 and Table 7.3, PDF p.316). It is unclear whether the large amount of sulphate predicted in the treated effluent (66,906 ug/L to 95,385 ug/L on average and 102,300 ug/L to 220,100 ug/L maximum) compared to the baseline concentration (900 ug/L in West Buskegau River and 1000 ug/L in North Driftwood River) will be a concern for this project or not?* *<u>During decommissioning and passive closure</u>:* *Canada Nickel anticipates that seepage quality will improve through natural attenuation during downgradient migration. But, it does not appear clearly that the anticipated improvement of the seepage quality through natural attenuation during downgradient migration has been demonstrated by Canada Nickel.* *<u>During post-closure and pit full</u>:* *I understand that Canada Nickel used **GoldSim** model to predict the water quality in the pit lake. It is crucial to clarify how the model was calibrated. I also think that the review of results of the GoldSim modeling, to confirm their validity, falls under the mandate of water quality experts (scientists) of the MECP's RTSS.*	***1**-Canada Nickel should clarify how the GoldSim model used to predict the water quality in the pit lake was calibrated.*

		With regards to the evaluation of the residual effect during **post-closure and pit full**, Canada Nickel claimed that, GoldSim model predicted the water quality in the pit lake to be below regulatory guidelines values (PWQO or CWQG-FAL). Therefore, they noted that there would be no mixing zone in North Driftwood and West Buskegau rivers when overflow from the pit lake discharges in those rivers.	*The confirmation of the validity of these results is important as they have a direct impact on the proposed effluent limits, which the engineers of the IPSW unit at MECP will rely on at the ECA permitting stage to evaluate the technical engineering design documents of sewage works anticipated for this mining project.*	

Please insert additional rows as necessary.