**Supplementary Material 3:**

**Protocol for extracting data on mines undergoing impact assessment**

Supplement to:

Westwood et al. Mines, mines, & more mines: A spatiotemporal analysis of mining projects assessed under impact assessment laws and regulations in Canada. *FACETS*.

**Corresponding author:** Ben Collison, [b.collison@dal.ca](mailto:b.collison@dal.ca)

# Context

The impact assessment (IA) process is used to assess potential environmental, social, health, and economic impacts associated with infrastructure and natural resource development projects across Canada. Depending on the nature of the proposed development, the IA process may be regulated by a federal regulatory body (Impact Assessment Agency of Canada; MacKenzie Valley Environmental Impact Review Board), a provincial/territorial authority (e.g., British Columbia Environmental Assessment Office), or a combination of both (e.g., a “joint” project review). At the end of the IA approval process, the relevant decision-maker (often a federal or provincial Minister) issues a ‘decision statement’ outlining the rationale used to decide whether a project may proceed or is rejected. For projectapprovals that are approved, a set of regulatory conditions are set out for proponents to abide by as they pursue other regulatory permits and conduct construction, operation, decommissioning, and monitoring activities over the project’s lifetime.

The overarching objective of this project is to compile a comprehensive database connecting mining projects in Canada to IA law and policy across jurisdictions. We will conduct a spatiotemporal analysis of this database to set a foundation for the history of regulated mining projects in Canada and potential implications of the modern mineral rush. We will directly share our study datasets with communities and policy-makers and post them in an open-access repository.

# 

# Data Extraction Protocol

## Study Scope

The study scope includes all mine or quarry projects in Canada that have **completed** the IA process (accepted or rejected) as of **12-31-2023**, through any federal, provincial, or territorial regime. The scope includes all projects that target base metals (e.g., copper, zinc, nickel), precious metals (e.g., gold, silver, platinum), non-metals (e.g., coal, oil sands, diamond), or industrial materials (e.g., gravel, sand, limestone). **Mines or quarries that were not initially assessed under a legislated IA process (e.g., pre-date IA law) are not included within the study scope, even if IA was used to amend/change the project subsequently**. Projects that were withdrawn by proponents or terminated by IA agencies at any stage of the IA process, abandoned/closed mines that underwent a separate IA solely for purposes of site remediation/cleanup, IAs conducted solely for mineral exploration, and projects that were registered for IA but screened out of the legislated process are also not within the study scope.

## How to locate documents

We will extract data from project documentation available through (1) online public IA registries, or (2) *Freedom of Information* request results. These sources will be supplemented with directed web searches to find missing documents as needed. A shared Excel spreadsheet houses the project list. Links to each jurisdictional IA project registry are below in the relevant section.

The IA process in all thirteen jurisdictions follows the same general format; there may be some variation in terminology/wording, but three key IA stages *should* have documents associated with them (although sometimes not all will be publicly accessible without an *FOI*):

1. Proponent submits their ‘**IA application’** document (project description, technical proposal, environmental impact statement (EIS), development application, etc.). In some jurisdictions, a brief ‘project description’ is the first step to trigger the IA process, used for soliciting public comment/feedback and expert review before the full EIS application is made. It is also common for a regulating agency to respond to the preliminary IA application made by proponents and request that the application be re-submitted with more information about certain aspects of the project;
2. IA regulating agency produces an **‘effects assessment’** of the proponent’s IA application document (also known as a comprehensive study, assessment report, screening review, etc.);
3. The government/agency Minister or Executive Director produces a **‘decision statement’** document (sometimes including the operating terms and conditions for approved projects).

For data extraction, the **document we will target for data extraction is the proponent-submitted IA application (i.e., the finalized EIS**). We want to ensure that the extracted data comes from the IA application that was most **recently submitted** and was subject to the **final approval or rejection** decision of the regulating agenc(ies). Sometimes, an ‘executive summary’ of this IA application (e.g., a document with dozens of pages instead of thousands) will be available, and may contain all required variables or data extraction. An executive summary or similar can be used in place of the full application document if all required information is located within them.

**If the (1) IA application document is not available,** we will then look to extract data from (2) the regulator’s assessment/summary of application, (3) the Ministerial decision statement, and as a last resort, (4) a search of proponent websites about the project. We expect it will be more difficult to locate information for projects assessed prior to the year 2000 than for more recent ones.

## Extraction assignments

One of the lead researchers will assign each reviewer with the jurisdictions and projects they will review. Links to each jurisdictions’ online registries as well as information for searching that registry are provided in Table 1.

**Table 1**: Links to the public IA registries in each Canadian assessment regime

| **Jurisdiction** | **Registry Link** | **Responsible office** | **Contact email address** | **Are all IA documents available Y/N?** |
| --- | --- | --- | --- | --- |
| Canada | [IAAC Registry](https://iaac-aeic.gc.ca/050/evaluations) | Impact Assessment Agency of Canada | [registry-registre@iaac-aeic.gc.ca](mailto:registry-registre@iaac-aeic.gc.ca) | No  Documents for most archived projects (assessed prior to CEAA 2012) are not available.  An easy way to narrow down to EIS documents is to check the 'additional information' box in the left-hand panel when searching for a project. |
| British Columbia | [EA registry](https://www.projects.eao.gov.bc.ca/projects-list) | Environmental Assessment Office, Ministry of Environment and Climate Change Strategy | [eaoinfo@gov.bc.ca](mailto:eaoinfo@gov.bc.ca) | Yes  Use advanced filters and select 'application materials' to narrow down to EIS documents |
| Alberta | [EA registry](https://www.alberta.ca/environmental-impact-assessments-historical-projects.aspx)  [Public decision registry](https://webapps.aer.ca/pod) | Environment and Parks | [environmental.assessment@gov.ab.ca](mailto:environmental.assessment@gov.ab.ca) | No  IAs are approved by the Energy Regulatory Board (or its predecessor/s). The easiest way to locate decisions is to search using project name or the application number associated with the IA as keywords in <https://www.aer.ca/regulating-development/project-application/decisions>Decisions are also available at <https://had.aer.ca> While it doesn’t provide an exact date or document link, it can be used to locate application number(s) to perform searches in the link mentioned above. |
| Saskatchewan | [SK publications centre](https://publications.saskatchewan.ca/#/categories/81) | Environment | [centre.inquiry@gov.sk.ca](mailto:centre.inquiry@gov.sk.ca) | No |
| Manitoba | [EA registry](https://www.gov.mb.ca/sd/eal/registries/index.html) | Environment, Climate and Parks | [publicregistry@gov.mb.ca](mailto:publicregistry@gov.mb.ca) | No  Most, but not all, documents are available but the registry has no functionality to filter for and select only mining projects.  The license (approval) date on the registry landing page is the most recent version of the license. The revision history in this document needs to be searched to find the original license approval date. Amendments to a license are denoted with suffixes after the license number. The most common one is for changes that are denoted by adding an ‘R’ at the end of the license. For example, the original license number may be 305 and later versions with amendments would be 305 R, 305 RR, etc. Similarly, project amendments are numbered. For example, 2755.00, 2755.10, 2755.20, etc. |
| Ontario | [EA registry](https://www.ontario.ca/page/environmental-assessments) | Environment, Conservation and Parks | [enviropermissions@ontario.ca](mailto:enviropermissions@ontario.ca) | No  Very few documents are available. |
| Quebec | [EA registry](https://www.ree.environnement.gouv.qc.ca/index.asp) | Environment, The Fight against Climate Change, Wildlife and Parks | [acces@environnement.gouv.qc.ca](mailto:acces@environnement.gouv.qc.ca) | No |
| New Brunswick | [EA registry](https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html) | Environment and Local Government | [IAEIE@gnb.ca](mailto:EIAEIE@gnb.ca) | No |
| Nova Scotia | [EA registry](https://novascotia.ca/nse/ea/projects.asp) | Environment and Climate Change | [EA@novascotia.ca](mailto:EA@novascotia.ca) | No  Documents for projects assessed prior to 2000 are not available |
| Newfoundland and Labrador | [EA registry](https://www.gov.nl.ca/ecc/env-assessment/projects-list/) | Environment and Climate Change | [EAprojectcomments@gov.nl.ca](mailto:EAprojectcomments@gov.nl.ca) | No  Documents for projects assessed prior to 2000 are not available |
| Yukon | [EA registry](https://yesabregistry.ca/) | Environmental and Socio-Economic Assessment Board | [yesab@yesab.ca](mailto:yesab@yesab.ca) | Yes  Filtering to identify the target documents is difficult.  Clicking on a document triggers a download so there is no URL to save.   Please note the document # provided in the comments to allow subsequent tracking of information sources. |
| Northwest Territories | [EA registry](https://reviewboard.ca/registry/) | Mackenzie Valley Environmental Impact Review Board | [admin@reviewboard.ca](mailto:admin@reviewboard.ca) | Yes  Documents are sorted by category which makes accessing them easier.   However, an EIS is typically split up into a number of pdfs which are not arranged sequentially and often do have user-friendly naming conventions. |
| Nunavut | [EA registry](https://www.nirb.ca/application?strP=r) | Nunavut Impact Review Board | [info@nirb.ca](mailto:info@nirb.ca) | Yes  Filtering documents is difficult |
| Prince Edward Island | [EA registry](https://www.princeedwardisland.ca/en/feature/projects-under-environmental-review-undertakings) | Environment, Energy and Climate Action | [dethompson@gov.pe.ca](mailto:dethompson@gov.pe.ca), [gbwilson@gov.pe.ca](mailto:gbwilson@gov.pe.ca) | Yes  There are no options to filter by type of activity or document type. |

## Data extraction instructions

Using documents present on the public IA databases in each jurisdiction (federal, provincial, and territorial), we will extract the variables below into the shared Excel spreadsheet. If data for a given variable cannot be located (e.g., lack of access to information or poor reporting in the EIS), **the reviewer will write ‘COULD NOT LOCATE’** in the relevant cell. As documents are often very large, it is recommended that reviewers use CTRL+F to search for relevant keywords.

**For the target variables below (except for the first three variables), please add comments (‘Review’ à ‘New Comment’) in the spreadsheet with a page number, section of text, any relevant calculations/conversions, and the document link for where the data was sourced from.**

1. **Reviewer initials**
2. **Project name**
3. **Proponent name**
4. **IA Jurisdiction (Province/Territory/Federal)**
5. **Pursuant IA law**
   * Include the name of the statute(s) or regulation(s), followed by the year of enactment (e.g., *Environmental Assessment Act*, 2002).
   * Please pay special attention to ensure that the piece of legislation or regulations extracted here reflect the IA process that took place. **Example:** *CEAA 2012* was enacted while many projects were actively undergoing assessment under *CEAA 1992*including the Dumont Nickel Project which submitted its project description on [Mar 15, 2012](https://iaac-aeic.gc.ca/050/evaluations/document/88473), triggering an IA under *CEAA 1992*. *CEAA 2012* came into effect on July 6, 2012 and is listed on the final decision statement of the project ([Aug 8, 2015](https://iaac-aeic.gc.ca/050/evaluations/document/102013)). However, because the IA started before the new law was enacted, the IA was subject to terms of reference outlined in *CEAA 1992*, which would be the pursuant IA law in this case (not *CEAA 2012*).
6. **Mine or Quarry**
   * Mine: an industrial development that extracts buried material below the Earth’s surface.
   * Quarry: a type of open-pit mine (usually smaller in scale) that extracts materials directly from the surface of the Earth.
7. **Target Material Class**
   * We developed a classification using inputs from sources such as [ICMM](https://www.icmm.com/en-gb/mining-metals/metals) and the [Shanghai Metals Market](https://www.metal.com/). Projects may target materials in multiple classes, in which case multiple classes should be listed.
     + Precious materials: gold, silver, platinum, palladium, diamonds
     + Ferrous metals: iron, cobalt, molybdenum
     + Base metals: all other metals (e.g., copper, zinc, nickel, tin, lead, lithium), including rare earth elements (e.g., neodymium, cerium, scandium, terbium, dysprosium)
     + Energy sources: thermal coal, oil sands, uranium. For coal mines, **please specifically check for the intended use of the coal as metallurgical coal is included in a different material class.**
     + Industrial materials: all other non-metals (e.g., potash, metallurgical coal, phosphate rock, aggregates)
8. **Target Mineral(s)**
   * Please list all target materials being mined.
9. **Size** (**production capacity in tonnes per day)**
   * The average quantity of target material to be extracted per day. Please note that some older documents may report this in ‘tons’ which is an imperial measurement (907kg) and needs to be converted into the metric equivalent. We are aiming to identify the rate at which the target material is expected to be extracted from the earth (i.e., the production capacity). However, the materials also undergo processing/milling at on-site facilities and the language used in the documents may not clearly distinguish between the two. Therefore, please note the **production rate where available**, and if it is not available or unclear which metric is reported, please include a comment to link the page number and section of text that includes this terminology. Where possible, we will aim to **source average extraction rates**, rather than peak or nominal rates (see examples below).
     + Example: An EIS provides an anticipated production capacity broken down by every year of the mine’s active lifespan (construction, operation, and closure of mine workings). To calculate production capacity for this variable, the reviewer would sum the total amount of ore expected to be mined over the lifespan of the mine and divide by the number of years, and divide the resulting value by 365 (number of days in a year) to obtain a daily average.
     + Example: An EIS reports a peak milling rate for the project but does not provide the anticipated total amount of ore that is expected to be produced by the mine. As no further details can be found, the reviewer inputs this peak milling rate in the relevant cell and includes a comment that quotes the section of text, page number, and document link, making it clear that the numerical value is a peak rate, not an average (which could not be obtained or calculated).

* To most accurately locate production capacity, use these considerations based on target material.
  + - * Metal mines – Rates are usually reported for ‘ore’.
      * Diamond mines – Rates are usually reported for ‘ore’ and/or ‘kimberlite’.
      * Coal mines – We will aim to source production rates of run of mine (RoM) coal, which is the material extracted from the ground. This is different from ‘clean coal’ which is the product that is left after processing the material to remove impurities like rock/gravel and low grades of coal. Clean coal is the product typically sold by the mine operator. Please note the production rate of clean coal only if data related to RoM coal is not available.
      * Industrial Quarries – Capacity denotes the amount of rock/aggregate/gravel/sand that will be extracted.
      * Oil Sands – The material extracted from the ground is a mixture of bitumen and sand (or other aggregates). For strict comparability with other types of mines and quarries, we would like to report the quantity of this mixture that is extracted. However, it is rarely reported, and the documents typically state the amount of bitumen that is extracted from the mixture, which is often a small fraction (typically 8-12%) of the total. Therefore, **we will use the amount of bitumen produced**. Some projects may report both the mined bitumen and the refined/processed product which is ready to ship via pipeline or rail. If available, please report the former to ensure consistency across projects. The figures are often reported using volumetric units (barrels or m3). To report in a standardised metric, an assumed density of 1 tonne per cubic metre or 0.159 tonnes per barrel is acceptable. If reporting volume, please add the units or add an asterisk (\*) to highlight that value is not the standard unit (tonnes per day).
      * Peat – Most projects’ documents do not mention the production rate. Two projects which do (Pasquia Bog Peat Harvest Project & Peat Mine - Ramsay Point Bog) provide production rates in volumetric units (m3). Please note the volume in the spreadsheet and highlight with an \*.
      * Uranium – Projects often provide the amount of yellowcake (output from the milling/leaching stage) rather than the quantity of ore processed. Please be careful of this distinction while collecting data on uranium mines and highlight with an \* if reporting the amount of yellow cake.
      * Other materials – Please use your best judgement, leave a comment bubble, and check with Ben/Sugeet.

1. **Lifespan** (years) – The *active* duration of all three major phases (construction, operations, closure/remediation) of the mine. By ‘active,’ we mean that physical work is being carried out at the project site by humans. Do not include post-closure ‘monitoring’ or ‘abandonment’ phases that extend past when the project is expected to be closed and/or passively remediated (i.e., where natural processes continue until a target equilibrium state is achieved).
   * + Example: An EIS contains a table that breaks down the anticipated phases of the project (below). Here, the reviewer would sum the construction (5), operations (45.5), and closure and on-site remediation (3), for a total project lifespan of *53.5* years. A comment would be added to that cell with the table number, page number, calculations performed, and link to the document.

|  |  |
| --- | --- |
| **Anticipated project phase** | **Duration (years)** |
| *Exploratory permitting and drilling* | 5 |
| *IA permitting* | 2 |
| *Construction* | 5 |
| *Operations* | 45.5 |
| *Closure and on-site remediation* | 3 |
| *Post-closure remediation* | 150 |

1. **Footprint** (hectares) – The total **surface area** that a project is anticipated to disturb. The footprint should include all mining infrastructure associated with the project, including the mine workings, rock dumps, tailings storage, roads, utility corridors, processing plants, office and residential buildings, landing strip for aircraft, etc. The total footprint if often reported as one value; however, in some cases, the footprints of multiple project components may need to be added together to ensure that all mining infrastructure in/around the project is included in the total. Note: footprint *does not mean* areas of mining claims, exploration licenses, or other types of exploration permits. Footprint also does not include subsurface workings, which are often much larger than disturbed features on the surface.
   * Example: The reviewer finds the following quote in an EIS related to physical works: “*the project construction will involve site preparation activities covering an overall area of approximately 90 hectares (ha). Approximately 20% of the project area is brownfield, which means less than 75 ha will require clearing. [The proponent] will implement a number of mitigation measures to limit or avoid adverse environmental effects as a result of project-related construction activities.*” The project footprint in this case would include both the greenfield (previously undisturbed) and brownfield (previously disturbed) areas of the site, meaning that the total disturbed area would be 90 hectares.
2. **Mine layout**
   * Open Pit: surface mining method where rocks & minerals are removed from an open pit near the earth's surface.
   * Underground: a form of mining used to extract ore from below the surface of the Earth. These are often used for deep and/or highly concentrated deposits as the cost of underground methods is typically far higher than those employing open pits.
   * Open pit and Underground: projects which plan to use both methods for extracting the target material.
   * Underground (solution mining): a mining method which injects large quantities of water into underground deposits of salts and pumps the solution to the surface for extracting the salt.
3. **IA start date** (MM-DD-YYYY)
   * The start date of a project is critical variable. However, identifying the specific date is not always a straightforward process. The IA process is usually triggered when an IA regulator **receives** the first project document, usually a project description that fits within the criteria/scope/threshold for an IA in that jurisdiction. Most jurisdictions also provide a notification of the start of the IA process as a brief letter addressed to the proponent. As there are many dates for various steps of the process, it is important to note the most appropriate one. For example, the federal (IAAC) registry landing page for each project mentions a ‘start date’ which *may* be the date when IAAC starts reviewing information provided by the proponent. However, as we are looking for the date when the proponent’s first document (project description) was received by the regulator, this information should be sourced from the corresponding document directly. An example is provided in the screenshots in Appendix A below. In that case, the project start date should be noted as 06-23-2017 (and not 09-01-2017). There might be similar nuances in other registries to watch out for. If a project description submission date is not available or was not submitted, please note the date when the earliest available subsequent document (such as the regulator’s notice of the start of assessment, invitation to public for comments on the description, the EIS, etc.) was submitted instead.
   * In cases where only a month and year is given, the reviewer will enter the 15th (middle) date of the month.
   * For older projects where physical copies of project documents were submitted to the relevant regulator, there may be delay between the dispatch of documents by the proponent and their receipt by the regulator. This may be especially true for projects in the territories which have longer lead times for mail service. In such cases, please note the date that the documents were *received* by the regulator. This is often reported in the registry and is also stamped on the documents which are subsequently scanned and uploaded to the registry.
4. **Project approved date** (MM-DD-YYYY), if applicable
   * The IA process ends when a regulator decision statement is issued to the proponent, usually by the Minister that oversees the IA regime in that jurisdiction. If a decision statement cannot be located, a review panel recommendation report (applicable to certain projects assessed under *CEAA 1992* and *CEAA 2012*) will suffice for extracting an approval/rejection date. Reviewers should ensure that the decision statement corresponds to the appropriate jurisdiction and reflects the **date of issuance**, not the date when the letter may have been posted to the public registry.
   * Example: the Mt. Milligan Mine was assessed under *CEAA 2012* (approved by IAAC on 2009-12-01) and the BC *EAA 2002* (approved by BCEAO on 2009-02-26). This project has a separate row in the database for each of these assessments (one provincial and one federal), and as such, each will have a different date corresponding to each decision statement.
5. **Project rejected date** (YYYY-MM-DD), if applicable
   * Refer to the previous variable (project approval date) for guidance on extracting the correct date, as the process will be the same.
6. **Nearest town/city, and province**
   * Is often provided directly in the project summary or in a map showing the location of the project.
7. **Latitude (Decimal degrees, up to 5 decimal places)**
   * There are multiple ways to extract coordinates for a project’s location. If coordinates for the proposed project site are directly listed in the IA application in decimal degrees, these can be noted directly in the spreadsheet. If coordinates are listed but in an alternative format (e.g., degrees-minutes-seconds, UTM coordinates, or Township and Range in the prairie provinces), the reviewer will need to convert the coordinates to decimal degrees. Online converters, can be used to streamline this process (e.g., [here](https://www.engineeringtoolbox.com/utm-latitude-longitude-d_1370.html), [here](http://www.legallandconverter.com/) and [here](https://www.latlong.net/degrees-minutes-seconds-to-decimal-degrees)).
   * In most cases, a map will be present in the IA application documents. It is possible to calculate the project location using these maps (and utilizing the above online converters, if needed).
   * If the coordinates cannot be sourced using the above methods (e.g., when IA documents are not available), please use any relevant information to locate the project on Google Maps (some major projects are also tagged in Google Maps), then right click and select ‘copy coordinates’ with the cursor near the approximate center of the project site. The default setting in Google Maps is decimal degrees.
8. **Longitude (Decimal degrees, up to 5 decimal places)**
   * Refer to the previous variable (latitude) for guidance.
9. **Did the document have text searchability (CTRL-F)?**
   * Please note whether the documents could be searched using Y/N.
10. **Link to the IA document used for data extraction**
    * Please copy and paste the link to the document that was used to extract data for the majority of the variables. If more than one document was used to source the information, please note all document links or provide the landing page for the EIS document which contains links to all the documents used. **Note**: this link should also be included within the comment bubbles for the appropriate cells, which may include links to other documents as well.
11. **NOTES (anything noteworthy about data availability or the IA process itself)**

**Appendix A**



