

## IAG Comments on REGDOC 1.2.1

### General Comments

In general, the document lacks focus and clarity and is in need of significant editing to correct run-on sentences, redundancies and reconcile inconsistencies. The purpose and scope are not well defined and therefore, several questions arise as one reads the document. There is a lack of flow in the presentation, as the reader is unsure why certain sections exist and how they are related to the scope of the document. The technical content is general in nature without specifics; however, this may be the goal of the document.

The level of guidance provided by the document is inconsistent in detail. Section 5.3 presents more detailed guidance (on borehole drilling) than the rest of the document. The other sections in the document identify disciplines and topics that should be addressed in site characterization, but offer little guidance on how to do this. For example:

- Section 5.2 (Data Management) does not explicitly deal with data QA/QC, with no mention of measurement reproducibility, instrument calibration and standards, use of sample blind duplicates, etc.;
- Section 3.1.2 lists parameters to characterize the hydrogeology of the site, but does not offer guidance on what to measure and how to interpret the data to evaluate groundwater flow rates and directions, hydraulic conductivity, hydraulic heads and gradients, porosity, etc.;
- Section 3.1.3 lists geochemical characteristics that should be investigated, but offers no guidance what to measure and how to interpret the data to characterize the groundwater chemistry, radionuclide solubility, speciation and retardation, radionuclide diffusion rates, etc.

### Specific Comments

Title – suggest the title be reworded to “Guidance on Characterizing a Site for a Deep Geological Repository” or “Guidance on Site Characterization for a Deep Geological Repository”. Similar terminology is contained in the body of the document and should be changed as well.

Preface – If this is a “guidance” document, should include the term “guidance” in the initial statement and reduce the use of the term regulatory (used four times) if possible. The use of “site characterization stage of the siting process” is not appropriate given how the siting process is defined in Section 2 as four stages; the third being the “site characterization stage”. This relates to the focus and clarity of the document. Suggested rewording might include “Information gathered to characterize a site for a deep geological repository may be used in subsequent licence applications. Accordingly, regulatory document REGDOC-1.2.1 sets out regulatory guidance for the site characterization.”

Section 1 Introduction – the introduction should use clear and concise terminology that is consistent with the purpose and scope. Sections of the introduction would benefit from rewording. Vague terms like “several” in “several hundred metres” should be avoided. There is a need to be consistent throughout the document; e.g. why doesn’t geology appear alongside “hydrogeology, rock mechanics,

geochemistry, etc.” in the second paragraph when it does later in the document. Why single out the “preliminary stages” in the third paragraph when the guidance document applies to the siting process? This creates confusion for the reader in terms of where this guidance should be used. The third and fourth paragraphs create confusion as to the scope of the document as it not clearly defined in the introduction. May want to remove the term “early” in the fourth paragraph to convey that the consultation is ongoing throughout the process.

Section 1 – fourth paragraph – the goal of this paragraph is unclear and the wording awkward. Suggested rewording might include “Regulatory agencies other than the CNSC will have jurisdiction over site characterization activities that are undertaken before a licence from the CNSC is required. It is recommended that site characterization activities be conducted in consultation with the relevant regulatory bodies early and throughout the process to ensure that regulatory expectations, permitting, licensing or other requirements are clearly understood and complied with, and potential issues associated with data acceptance are identified and mitigated”

Section 1.1 Purpose – the purpose of the document should be clear to the reader. Suggestion to replace “the site characterization stage of the siting process” with “site characterization”. It is unclear as to what exactly is included in the “siting process” at this stage in the document. In addition, does this guidance only refer to the site characterization stage (stage 3 noted in Section 2) of the siting process?

Section 1.2 Scope – the scope of the document should be clear from the outset and provide the overall structure and layout of the content that follows. It should state that the document provides guidance on site characterization during all stages of the siting process as defined in section 2. Section 1.2 should provide an overview of the sections that follow. For example, Section 1.3 places the guideline in the context of relevant legislation. Section 1.4 emphasizes the need for regulatory involvement early and throughout the process. Section 2 provides an overview of the siting process to which this guidance applies; i.e. from the desk-top study through data obtained via a potential underground research facility (URF) and the construction of the DGR. Section 3 outlines the site characterization that should be considered in assessing the geological or subsurface environment and the surface environment. Section 4 ... etc.

To improve clarity and highlight the quality of the data, the fourth paragraph of Section 1.2 could be reworded as follows “This document does not provide guidance on finding or selecting a site. Its guidance is intended to ensure that site characterization will provide sufficient data and information of adequate quality to confirm the technical suitability of a site and be fit to be used in a licence application.”

In the fifth paragraph, should refer to “tens or hundreds of thousands of years” or reflect the regulatory requirement.

Section 1.3 does not provide a clear overview of how this guidance document fits within the regulatory framework.

Section 2 – first paragraph – what is the “accessible environment”? Proper terms exist to describe this.

Section 2 – fifth paragraph – replace “begins at the earliest stage of the investigation of a site” with “begins at stage 1” as this is clearly defined in the previous paragraph.

Section 2 – replace “from one stage to another” with “from one stage to the next”.

Section 2 – seventh paragraph – the characterization activities also support the engineering design.

Section 2.1 – clarify or reference the “desktop data compilation and interpretation” referenced earlier in the numbered list (paragraph four). This will remove the confusion regarding the term screening in Section 2.2.

Section 2.2 – reword the second sentence or remove it as the terms “engineering concerns and environmental constraints” are not clear or defined elsewhere.

Section 2.3 – final statement of this section should be clarified and/or the term “site” made plural. Does the NWMO’s APM process suggest a comparative analysis of the preliminary safety assessments for different sites as a means to identify the desired site or to identify additional site characterization needed to identify the desired site?

Section 2.4 – second paragraph – replace “in combination with geologic and hydrogeologic information” with “in combination with information such as geology and hydrogeology” as there are other sources of important information.

Section 3 – first paragraph – shouldn’t the site characterization program provide more than a “general understanding” of the site; a detailed elucidation or detailed conceptual understanding of the site.

Section 3 – third paragraph – the baseline data “will describe the biosphere and geosphere” not “include”. Again the term “understanding” is vague and too general.

Section 3 – fourth paragraph is unclear. Site characterization is not done only to collect “baseline” data. The document doesn’t define “criteria”? Reword to reflect that the guidance provided is in no specific order or priority and is not limited to the elements, approaches and techniques identified.

Section 3 – final paragraph is not needed as the exact same paragraph appears in Section 1.2.

Section 3.1 – a list of key characterization factors is provided in bullet form but it should state that this list is not exhaustive. For example, add “ and any other information deemed pertinent” to the first bullet and “ and any other potential perturbation” to the second bullet. For the second bullet, replace “orogeny” with “the impacts of orogeny”. For the sixth bullet, should the mechanisms be identified as this may limit them; in addition, this would imply the host rock should have reactive properties. Suggest rewording as “characteristics favorable for limiting contaminant release and transport away from a DGR”.

Section 3.1 – should clarify what is meant by “geological environment”, “geological information” “geological factors” indicating the “geological” includes ...

Section 3.1.1 – should clarify “predictability” and how this should be assessed or measured. In addition, this list is not exhaustive and maybe should include “etc.” as the final bullet. In the final statement, remove “preferably” and state “quantitatively”.

Section 3.1.2 – shouldn’t the list include the identification of preferred pathways and estimates of velocities and residence times? It is not ideal to include a list of attributes some of which are a subset of others. Alternative would be to add a statement at the end to identify that these data will help identify preferential pathways, velocities, residence times, etc. or is this part of the interpretation and integration?

Section 3.1.3 – first bullet replace “petrographic study” with “petrography”; fifth bullet should read “Geochemical impact of groundwater on engineered barriers”; add a bullet for “microbiology”.

Section 3.1.4 – how is the “resistance of the site” assessed – clarify?

Section 3.1.5 – add “potential to withstand glacial events” and “etc.” to list.

Section 3.2 – first statement – baseline data will not ensure anything but is needed to be able to assess impacts – reword.

Section 3.2.1 – should include a reference to the impacts of climate change on these processes; note snow is a form of precipitation.

Section 3.2.2 – what are the radiological aspects of soil quality? Purpose of the final statement is unclear; if a component is important but doesn’t involve a lot of interactions then the level of detail needed is less?

Section 3.2.3 – what is meant by the “confining capacity” of a site?

Section 3.2.4 – may want to include shallow seismic techniques and drilling to characterize the overburden.

Section 4 – first bullet should include surface water resources and petroleum resources; second bullet should include surface water use (recreation, hydro, etc.)

Section 5 – first statement should state “should” rather than “would”. Does “traceable” mean documented with proper QA/QC?

Section 5.2 – second paragraph – should the data be available to the public?

Section 5.4 – the integration and interpretation of the site characterization data are extremely important. The language and terminology used in this section needs to be tightened up to improve clarity. Should these tasks be included in the guidance on site characterization and are they addressed in other documents; e.g. safety assessment? The final statement references a “geosynthesis report”; is there a guidance document for this? In the first paragraph reference is made to a conceptual model (or understanding); should clarify that this is not a numerical model. The third paragraph discusses models and it is not clear if these are numerical models or conceptual models supported by data? Later in the paragraph, model appears to refer to a numerical model used to predict evolution with time and in response to future events. Geosynthesis should be defined and used early in this discussion rather than mentioned at the end. What about analogues?

Section 6 – first paragraph – to provide “a representative environment”

Section 6 – third paragraph – clarify what is meant by “available underground research facilities”; should this statement read “build support and research capacity by participating in international programs at URL facilities (e.g. ...)”.

Section 6 – fourth paragraph – replace “early” with “well in advance of initiating research activities”. Not clear what is meant by “those site characterization activities”. Isn’t one objective of the URF to verify, support and confirm the conceptual model developed based on the site characterization activities to date? Should “identify those site characterization activities” be “identify the site characterization activities to be conducted”?