DEPARTMENT OF NATURAL RESOURCES

# Minnesota Minerals Coordinating Committee
# Drill Core Library Workshop

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# Minnesota Minerals Coordinating Committee Drill Core Library Workshop

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# 1. Summary

The Minnesota Minerals Coordinating Committee sponsored a workshop on November 16, 2022, to gather stakeholder input on the policies and procedures for the Minnesota Department of Natural Resources (DNR) Drill Core Library (DCL), located in Hibbing, Minnesota. DNR staff identified the need to update these policies and procedures based on a 2022 inventory of DCL holdings and storage capacity, an assessment of projected core submissions, participation in a National Geological and Geophysical Data Preservation Program (NGGDPP) data management workshop, and a review of the policies and procedures of the United States Geological Survey (USGS) and peer repositories.

Workshop participants represented the mining/mineral exploration industry, government agencies, academic institutions, and consulting firms, and typically visit the DCL several times each year. Workshop exercises and surveys focused on the mission of the DCL, the prioritization of storage for various materials, sampling policies, and database enhancements. The participants were encouraged to consider potential short- and long-term constraints on DCL storage capacity as they offered input on DCL priorities, policies, and procedures.

This forum was used by workshop participants to stress the importance of the DCL and the value it offers to researchers, the local mining and mineral exploration community, and the citizens of Minnesota. They identified the preservation and enhanced online access to archived drill core as a key priority for the DCL, even when intervals of archived core fall outside of targeted zones of mineralization. Suggestions were made in favor of retaining pulp and reject samples derived from bedrock core, while acknowledging the potential for material to degrade over time. Retention or acceptance of surficial materials were generally assigned a relatively low priority for the DCL, unless the samples of outcrop or sediments had historical significance or were from areas with restricted access. Participants encouraged the DNR to consider strategies that might optimize storage capacity or lower retention costs, such as standardized containers for unconsolidated materials or off-site storage of lower priority samples within the collection. Input was provided on DCL policies for the return of thin-sections and unused core materials provided to patrons for off-site examination or analysis, and for public access to any data derived from that archived public core. Participants also offered ideas on enhancing online access to DCL holdings and associated datasets.

DNR staff used input from the workshop and a review of mission statements from the USGS and peer repositories to create a mission statement for the DCL. The feedback and relevant policies and procedures at other core repositories will help the DNR to make curational decisions that support that mission statement on topics such as the prioritization of storage, development of operational policies, enhancements to associated databases, and future decision-making. These decisions will be reflected in a future published update to DCL policies and procedures.

# 2. Introduction

The Lands and Minerals Division of the Minnesota DNR manages, curates, and maintains a Drill Core Library in Hibbing, Minnesota. The DCL is the single state-owned facility in Minnesota for archiving public drill core and other geological materials that were obtained in the state. The DCL consists of three buildings on the campus of the Hibbing Lands and Minerals office (Fig. 2.1). The public repository is an important facility that attracts visitors from around the world. Their research and review of archived DCL materials supports geological mapping, searches for new mineral deposits, environmental impact investigations, and improvements in the understanding of Minnesota's geological history. Curation activities also support DNR research projects and the sound management of the state's natural resources.


**Figure 2.1.** *Google Earth imagery with annotations to show the location of the three buildings that compose the Hibbing Drill Core Library Campus.*

Since most of Minnesota's bedrock surface is buried under glacial sediment, the importance of providing public access to thousands of drill cores and subsurface samples of geologic materials cannot be overstated. Mineral management statutes (MN Statute 93) and mineral leasing rules (MN Rule 6125.0700) establish the basis for state retention and management of earthen material samples obtained from state lands. Minnesota exploratory boring rules provide the framework for submitting exploratory boring samples to the DNR from both public and privately-owned lands, including any data associated with mineral exploration (MN Statutes 103I.601 and 103I.605). The DCL also archives and makes historical mineral exploration and scientific data publicly available. These data are mostly from work conducted on state-owned lands, but also include work on private lands and data from sampling of archived materials. In areas of the state that lack outcrop exposures, drill cores and associated geochemical and/or geophysical data are the only glimpses of the bedrock that underlies thick layers of glacial sediment. These archived materials have been used for bedrock aquifer mapping, environmental studies, mineral exploration, and geologic research.

## 2.1. DCL background and history

The DCL was first established in 1972 to preserve, make available, and reuse drill cores and other geologic materials. The DCL is a public facility that is open during regular business hours, and no fees are required to access data or material stored in the DCL (MN Statute 93.61). The storage capacity of the DCL needed to expand over to fulfill statutory obligations. (Fig. 2.1). Building 1 was constructed in 1972 with the capacity to store up to 400,000 linear feet of core and Building 2 was constructed in 1979 with the capacity to store up to 600,000 linear feet of core (Figs. 2.1 and 2.2). In 1986-87, the U.S. Bureau of Mines transferred approximately 325,000 linear feet of core to the Hibbing DNR office. Building 3 was initially constructed in 1989 and expanded in 1995 and 2009; in total it can accommodate up to 2.9 million ft of core (Figs. 2.1 and 2.3). The three-building facility is currently at 95% of its total storage capacity. The amount of core that has been recently drilled by active exploration programs within the state would easily overwhelm that residual capacity if or when that core is submitted to the state. A fourth building to store up to 3 million linear feet of core has therefore been designed and, depending on a legislative bonding package, is planned for construction within the next two to five years.

**Figure 2.2.** *Core Buildings 1 and 2 (left and right, respectively) taken from E 16th St in Hibbing. View is facing toward the northwest*

**Figure 2.3.** *Core Building 3 taken from 1st Ave N. View is facing toward the southwest. Note the change in siding on the right-hand side of the image is related to building expansion in 1995*

The inventory of DCL holdings and the types of materials that were accepted into the facility has evolved over time. Initially, the inventory of DCL holdings was managed with hard copy paper documents. Eventually, these hard copy records were transcribed digitally and transferred first to a Microsoft Access database, and then in 2018-2019 they were transferred to a spatial database engine (SDE) for use with ArcGIS. Mostly since the 1995

expansion of Building 3, different types of noncore geologic materials were accepted into the DCL, such as pulps, rejects, and various surface samples (Table 2.1). Given these significant transitions and the turnover of DNR staff over this time period, an accurate and sustained inventory of materials in the DCL has never been achieved.

**Table 2.1.** *Examples and descriptions of non-core geologic materials accepted into the DCL over the last couple of decades.*

| Material | Description | Potential Future Use |
|---|---|---|
| Rejects | Split portion of coarsely crushed sample material that was not used for geochemical analysis | Rejects can retain mineral textures and may be suitable for mineral liberation analysis. They can also be pulverized to generate pulp samples. |
| Pulps | Split portion of finely pulverized sample material that was not subsequently used for geochemical analysis | Pulps can be used for duplicate analyses that evaluate anomalous results or help evaluate the quality assurance/quality control (QA/QC) procedures of an analytical laboratory. They can also be used for mineralogical analyses (e.g., X-ray diffraction), more expansive geochemical analysis, or for a comparative evaluation of newly developed analytical procedures. |
| Hand Samples | Trimmed rock fragments with at least one freshly broken surface and associated location information. DCL collection includes MGS hand samples from outcrops across the state; the historic Winchell Collection; various other collections | Winchell Collection has historical value and is only suited for nondestructive analytical methods. Well-documented hand samples can inform future field studies and can be cut for thin sections or processed for geochemical or mineralogical analysis. There is higher curational value for hand samples collected from areas that have been mined out, encumbered, or are otherwise inaccessible. Rock samples that lack locational information (i.e., metadata) have relatively little value. |
| Surface materials | Containers of grab/shovel samples of unconsolidated geologic material (e.g., glacial till) or peat and their associated location information. | Representative sediment samples collected for mapping of surficial geology or aggregate resources can support new or more detailed mapping projects. Duplicate samples of glacial till collected during indicator minerals surveys may be reanalyzed or used for pebble counts. Peat samples may be used for future climate change studies but may degrade rapidly over time. Curational value is higher when sample collection sites are encumbered or inaccessible. |

## 2.2. Bay-by-bay inventory project

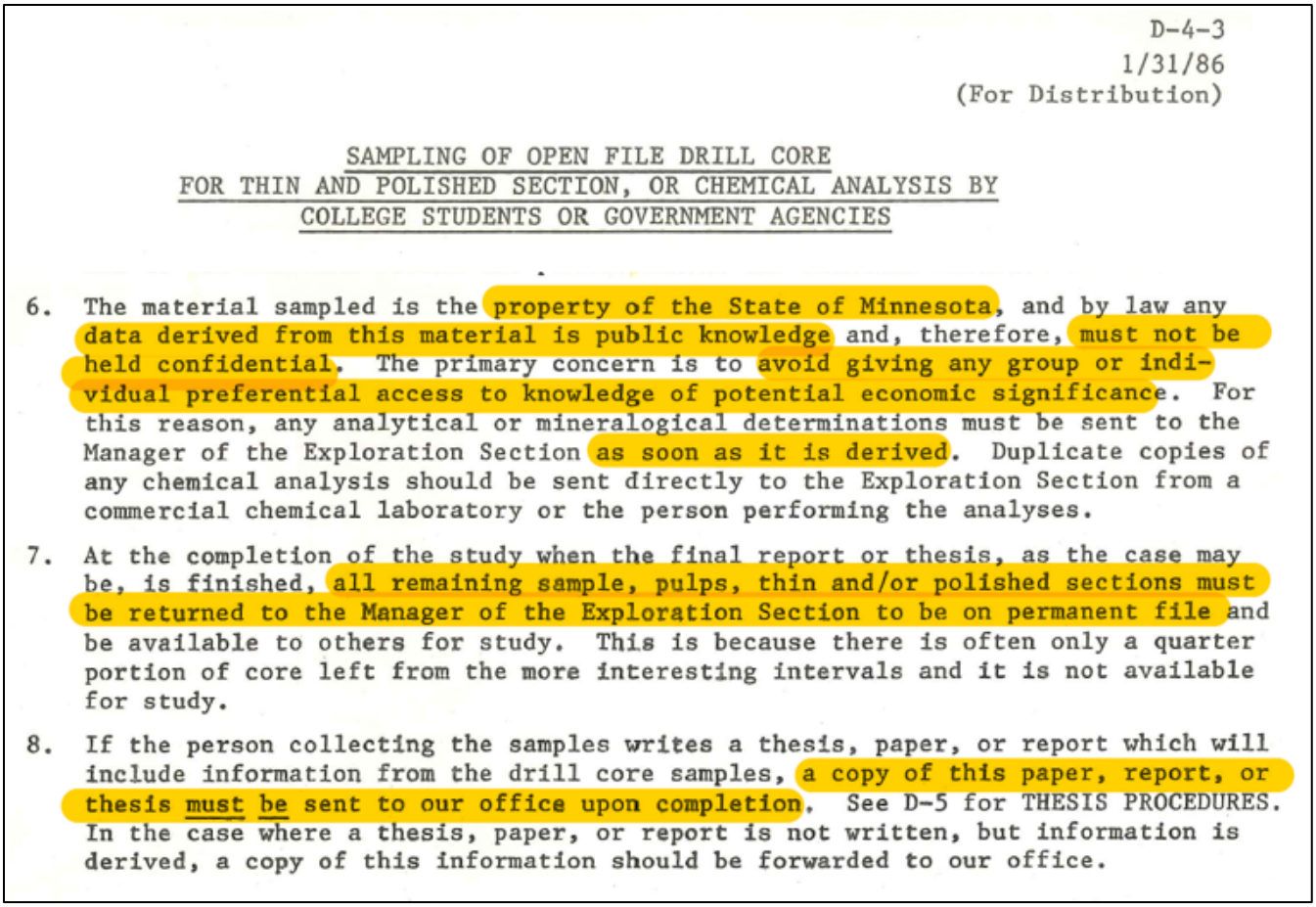
DNR staff completed a bay-by-bay inventory of the DCL's holdings from the fall of 2021 through the summer of 2022. Increased funding to the United States Geological Survey's (USGS) National Geological and Geophysics Data Preservation Program (NGGDPP) from the 2021 Infrastructure Investment and Jobs Act made the inventory project possible. A grant from NGGDPP was awarded to the Minnesota Geological Survey and a subaward was granted to the DNR.

During the project, DNR staff collected detailed information from each bay, such as a box count, container type, material type, space availability, follow-up issues (re-boxing, relabeling, etc.), and safety hazards. Completion of this NGGDPP-funded inventory project helped identify a need to develop clearer policies and procedures for both visitors and DNR staff.

## 2.3. Established DCL policies

With the exception of some minor updates in 2015, current DCL polices date back to 1986. Policies from 1986 for government agencies and academic researchers stated that any data derived from public core were deemed public knowledge. It was a requirement for those collecting data to submit their results as soon as they were derived to prevent giving preferential access or knowledge of potential economic significance to a particular group (Fig. 2.4). Data submissions are kept confidential for one year, except if protected by a lease or as otherwise provided by law (MN Statute 13.793). Furthermore, all samples, pulps, thin sections, or other remaining materials were to be returned at the conclusion of an academic thesis or report, and a copy of the publication, report, or thesis was required to be sent to the DNR.

Around 2015, minor updates were made to DCL policies and procedures. Patrons are required to provide DNR staff two weeks' notice to schedule a visit and provide information about their visit. A new sampling request form was created to better track sampling of DCL materials. The sample request form records the requestor's contact information, the DNR number and drillhole name of the sampled core, the sampled intervals, a patron-derived ID for each sample point, the reason for sampling (i.e., type of analysis), and how much core material remained within the sampled intervals. Guidelines for sample requests repeat some of the 1986 policies, such as having analytical results delivered directly to the DNR, that any extra materials must be returned and/or a copy of a thin section must be created, and that ¼ portion of core must be preserved. In addition, it was noted that only DNR staff are allowed to handle and cut cores to be sampled, and that patrons would be responsible for any shipping costs associated with sampling. Guidelines were also established for core deliveries, such as proper core box stacking, pallet dimensions, and preferred delivery methods.



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SAMPLING OF OPEN FILE DRILL CORE
FOR THIN AND POLISHED SECTION, OR CHEMICAL ANALYSIS BY
COLLEGE STUDENTS OR GOVERNMENT AGENCIES

6. The material sampled is the property of the State of Minnesota, and by law any data derived from this material is public knowledge and, therefore, must not be held confidential. The primary concern is to avoid giving any group or individual preferential access to knowledge of potential economic significance. For this reason, any analytical or mineralogical determinations must be sent to the Manager of the Exploration Section as soon as it is derived. Duplicate copies of any chemical analysis should be sent directly to the Exploration Section from a commercial chemical laboratory or the person performing the analyses.

7. At the completion of the study when the final report or thesis, as the case may be, is finished, all remaining sample, pulps, thin and/or polished sections must be returned to the Manager of the Exploration Section to be on permanent file and be available to others for study. This is because there is often only a quarter portion of core left from the more interesting intervals and it is not available for study.

8. If the person collecting the samples writes a thesis, paper, or report which will include information from the drill core samples, a copy of this paper, report, or thesis must be sent to our office upon completion. See D-5 for THESIS PROCEDURES. In the case where a thesis, paper, or report is not written, but information is derived, a copy of this information should be forwarded to our office.

**Figure 2.4.** *A screenshot of DCL policies from 1986 for college students or government agencies with relevant sections highlighted in yellow*

The way in which sampling of core has been tracked has also evolved over time. Sampling records, mostly transferred from hard copies, are well-cataloged in a digital database from 1987-2008 and from 2015-2022. The sample requestor, the footages, and the reason for sampling were recorded, and a sampling card was inserted into the appropriate core box that notes the same information. Copies of reports, theses, and other publications as well as the associated analytical results were customarily sent as hard copies to the DNR prior to 2008. Sampling records prior to 1987 are less well known and are thought to be preserved on microfilm in the Hibbing Lands and Minerals office. DNR staff plan to investigate and transcribe sampling records from microfilm in 2023. Sampling records were collected via hard copy between 2008-2015 but have yet to be curated. Inconsistent enforcement of DCL policies have persisted since 2008, but there has been a recent effort to get patrons to follow through with established policies (i.e., return sampled materials, deliver analytical results, etc.). DNR identifies tracking and publishing sampling results as needing modernization with enhanced databases and web-enabled accessibility of information.

## 2.4. Policies and procedures of peer core repositories

The policies and procedures of domestic and international core repositories were investigated in the spring of 2022 to help DNR staff prepare for the workshop and to compare how other facilities are managed. Most of

these peer facilities store and curate similar types of materials that the DCL stores (i.e., cores for mineral exploration hosted in metamorphic and igneous rocks). Facilities that were reviewed included: the Geologic Materials Center in Anchorage, AK, the Wilson M. Laird Facility in Grand Forks, ND, the University of Texas at Austin's Core Research Center, USGS core repository facilities, the British Columbia Oil and Gas Commission's Core Research Facility, the Department of Natural Resources 6-facility network of core repositories in Newfoundland and Labrador, Canada, the Drill Core and Materials Storage Facility of New Brunswick, Canada, the Londonderry Core Library run by the Geological Survey of New South Wales, Australia, and the Western Australia Department of Mines Industry Regulation and Safety Core Libraries (Perth and Kalgoorlie Joe Lord Core Libraries). While the review focused on policies and procedures for sampling and associated analyses, accession/acceptance, and deaccession/disposal, other policies that may be relevant for managing the DCL were also noted (Tables A1.1-A1.4).

### 2.4.1. Sampling and associated analyses

Variability in the policies for sampling and/or viewing of core at peer facilities were noted (A1.1). Six of the nine facilities require advanced notification or an appointment to view or sample core. Of those that want to be notified, only three specify how much of a notice they required, either 48 hours (n = 1) or one week (n = 2), the others did not specify (n = 6). Once samples are removed from the facility, it is indicated that samples must be returned in a timeframe of 3 months (n = 2), 6 months (n = 1), 12 months (n = 3), unspecified (n = 2), or proposal-dependent (n = 1). Eight of the nine facilities indicate that a portion of the core must be preserved, with most indicating the preservation of one quarter to one third of the core, otherwise it depends on the proposal or the decision of the facility manager. If thin sections are made from core samples, three facilities require that thin sections are returned within 3-, 6-, or 12-month periods, whereas the other six facilities did not specify a requirement to return thin sections. Analytical results are required to be delivered within 1 month (n = 1), 3 months (n = 1), 6 months (n = 1), 9 months (n = 1), or 12 months (n = 3) from when they are derived, whereas two facilities did not specify. While seven of the nine facilities did not indicate when they would make data from core samples public, one notes that the data are public upon receipt and another facility states they would become public after a year.

### 2.4.2. Accession/acceptance of materials

Four of the nine facilities have information on the acceptance of material into their facility and require a formal transfer of ownership for the materials to be accepted (Table A1.2). One of the facilities indicates that the materials would become public immediately upon acceptance, two of them had timeframes of 1 to 2 years (depending on policies or privacy agreements), and one facility did not indicate a timeframe. Only two of the facilities with acceptance policies have some criteria to guide facility managers on whether the materials should be accepted. Strategic criteria, the presence of geologic features, cost, and core condition are the main categories used to help facility staff to evaluate materials for acceptance (Table A1.2).

### 2.4.3. Deaccession/disposal of materials

Three of the nine facilities list policies about deaccession/disposal (Table A1.3). The main considerations for disposal include excessive volumes of samples from a parent material that have already been studied in detail, duplicate materials, unsafe/hazardous materials, or materials that lack metadata (e.g., sample location, reason

for sampling, etc.). Prioritization of limited storage space is given to whole cores over partial cores, newer cores over deteriorated cores, materials with greater geologic significance, and/or materials that were difficult to reproduce (factoring in cost and accessibility). It is recommended that cores are relogged and photographed prior to their disposal, and that any leaseholders/stakeholders are notified before final deaccession.

### 2.4.4. Other policies

Eight of the nine facilities list other notable policies (Table A1.4). Some of the facilities either require a proposal for sampling or the curator is involved to decide whether the scope of sampling is allowable. For instance, sampling would not be permitted if the proposed sampling would duplicate recent analytical work, damage type-section cores, or have little benefit to the scientific community. One facility has a 50-element minimum requirement for destructive geochemical analysis, and the element list must be provided to the curator before sampling. Specific labelling or data formatting for analytical results are a requirement by a few facilities. Three of the repositories require that students provide the contact information for their academic advisor, and presumably the advisor and their affiliated institution are responsible for returning the samples if their student fails to do so. Four facilities require that the facility is acknowledged in reports, publications, and theses. Three facilities state that if materials or data were still outstanding or overdue that the patron would be restricted from the facility until satisfying the facility's requirements. Safety for patrons or a waiver is required to be signed by visitors at three facilities. And, a few facilities do not accept hazardous materials, such as materials that have radioactivity above a certain level or those containing asbestiform minerals.

## 2.5. USGS guide to planning for and managing scientific working collections

In August 2022, DNR staff attended the 2022 AASG/USGS Data Preservation Workshop in Butte, Montana. The goal of this workshop was to share information on data management strategies and highlight successful efforts to preserve and disseminate information about archived geological data and materials. During this workshop, several presenters referenced the USGS's 2019 *Guide to planning for and managing scientific working collections in the US Geological Survey*. USGS staff suggested that workshop attendees might find the curational policies and procedures within this guidebook relevant for the management of their own core repositories.

This guide was developed to manage a range of materials and collections that were primarily obtained by USGS staff for scientific projects. Maintaining the integrity of USGS projects includes data that support interpretive results, which are retained and made available to the public. The USGS considers many aspects of existing and legacy collections to determine their disposition. Factors include frequency of their use, whether there is a plan in place for the collection in question, and how difficult it would be to replicate the collection. Cross-agency collaborations or loans may also affect retention decisions.

If a collection lacks a plan, a 5-point standard is used to assess its fate. The five leading questions within this standard include (Fig. 2.5):

- *"**What**: Do the materials or samples have identification numbers or can they be assigned numbers?"*
- *"**Where**: Do the samples come with locality information or can that information be recovered without undue burden?"*
- *"**Who**: Is it known who collected the samples?"*
- *"**When**: Is it known when the samples were collected?"*
- *"**How**: How were the samples collected and stored?"*

USGS curators are also prompted by the guidelines to ask why the retention of a collection would support the repository's mission statement. The USGS core repository mission statement is (personal comm.; Johnson, M., 2022):

> *To facilitate the storage of and access to geological materials, to reduce storage and curation costs, and increase the reuse of valuable materials.*

Options are offered for collections that do not support that mission statement, or otherwise fail to meet minimum retention criteria (Fig. 2.5). Deaccession involves transferring the collection to an interested party, using it for educational or outreach purposes, or (as a last option) disposal. Curators are strongly encouraged to thoroughly document this transfer process.

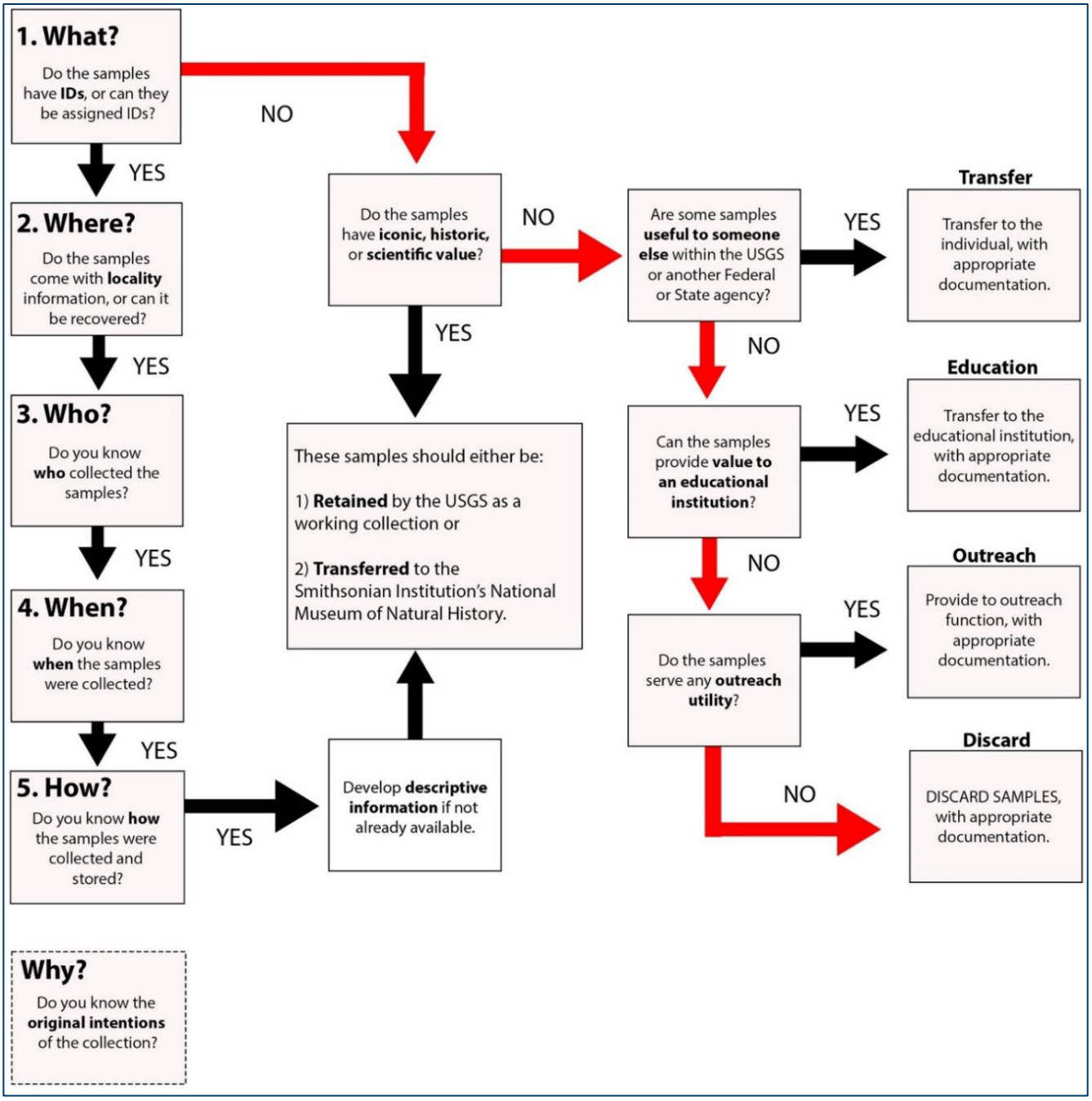


**Figure 2.5.** *The USGS collection evaluation flowchart from the 2019 Guide to planning for and managing scientific working collections in the US Geological Survey.*

# 3. Workshop format

DNR staff recognized a need to update the policies and procedures of the DCL considering the NGGDPP-funded inventory project on the DCL's holdings, the review of the policies and procedures of peer repositories, participation in the NGGDPP workshop in August 2022, and examination of the USGS's guide to managing collections. DNR staff determined that it was vital to get feedback from a representative cohort of DCL users before updating policies and procedures that may affect their future use of the facility.

A one-day workshop sponsored by the Minnesota Minerals Coordinating Committee was held on Wednesday, November 16, 2022, in the auditorium of the Cloquet Forestry Center. It involved presentations by DNR staff, as well as in-person exercises and open discussions with participants. Informal topical conversations over lunch, during scheduled breaks, and after the workshop were also useful. The following workshop topics were conducted:

- Background history and information on the DCL
- An update on the status of the DCL since its closure in June 2022
- An interactive exercise to gather input on a mission statement for the DCL
- Several sessions to gather feedback from participants on the acceptance and prioritization of storage of materials, sampling and data submission policies, and database enhancements

Throughout the sessions, an online polling application (Slido) was used to gather real-time feedback from participants. Notes were taken by DNR staff during open discussions, and to capture the comments from participants who were unable to use Slido during the workshop.

Sixteen of the thirty invited stakeholders attended the workshop. Half of the participants were from the mining/mineral exploration industry, whereas others were affiliated with government agencies, environmental consulting companies, and academic institutions (Fig. 3.1). Most of the participants who attended the workshop either use the drill core library multiple times per year or were affiliated with others who frequently use the facility. After the workshop concluded, an anonymous post workshop survey was sent to participants to gather additional insights and feedback.

The workshop will help develop and improve policies, procedures, and functions of the facility in advance of the anticipated construction of Building 4, as well as to inform long-term curational policies and procedures.

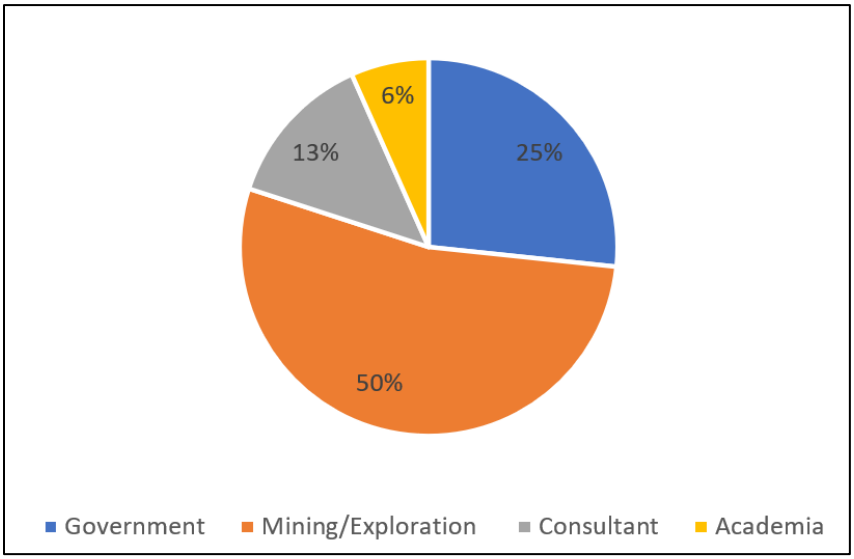


**Figure 3.1.** *Pie chart showing the distribution of workshop participants based on their affiliation.*

## 4. Preworkshop survey

An anonymous preworkshop survey was sent to invited stakeholders to gather information about how their organizations use the DCL. Since the workshop had space limitations, those invited were encouraged to distribute the survey to their peers and colleagues in order to reach a broader group of DCL users. The survey included the following multiple choice, multiple answer, and open text questions:

- Which of the following best describes you or your organization as a user of the DCL?
- Under normal circumstances, how often do you or your organization visit the DCL?
- How do you or your organization interact with the DCL? Check all that apply.
- Please rank the following materials based on your or your organization's level of interaction (i.e., sample, view, donate) on a scale from (1) little to no interaction to (5) frequent interaction.
- In your view, what roles or functions should the DCL fulfill as the state's designated repository?
- What DCL policies or procedures work well (i.e., sample requests, material submission, visitation requests)?
- Do you have any suggestions for improving DCL policies or procedures?

The survey was completed by 19 respondents who were mostly affiliated with academia (n = 8) or mineral exploration (n = 6). Others indicated an affiliation with government agencies, consultants, mining, and fee holders (Fig. 4.1). A majority of the respondents visit the DCL multiple times per year (Fig. 4.2), and when they visit, they usually interact with the DCL by viewing and interacting with core (n = 16), submitting core samples (n = 13), requesting samples (n = 12), and/or checking core out from the facility (n = 7). As shown in Figure 4.3, fewer respondents use the facility for training (n = 2) or tour the facility (n = 4). Survey respondents more frequently interact with diamond drill core and rotosonic core, whereas they have less frequent interaction with grab/surface samples, processed materials, and thin sections (Fig. 4.4).

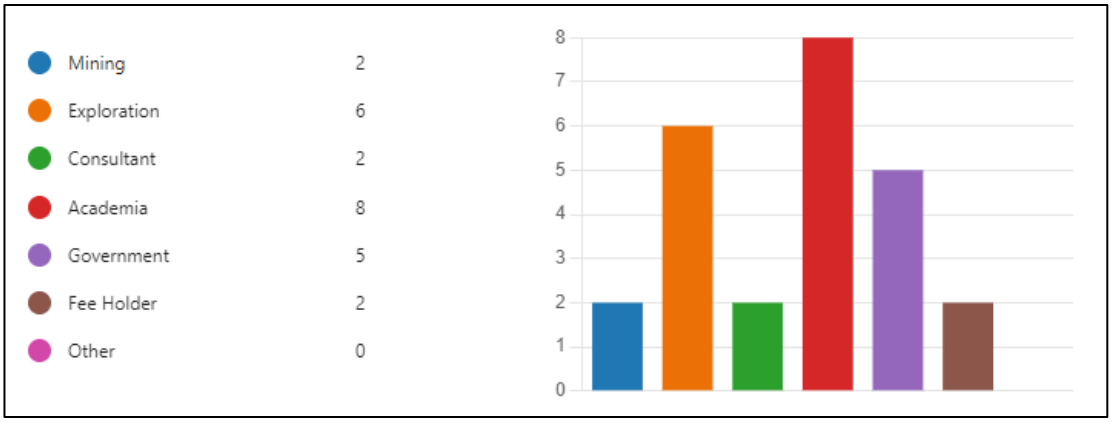


**Figure 4.1.** *Bar graph showing the distribution of survey respondent's affiliation(s). Note that respondents were allowed to check more than one affiliation*

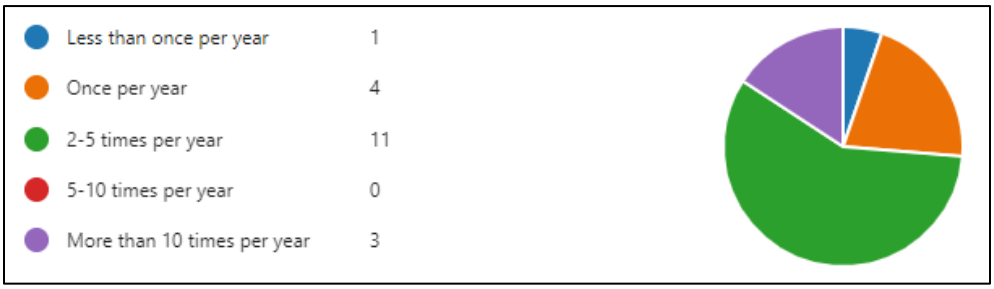


**Figure 4.2.** *Pie chart showing the distribution of annual visits per respondent. Note that over 75% of the respondents visit the DCL more than one time per year*

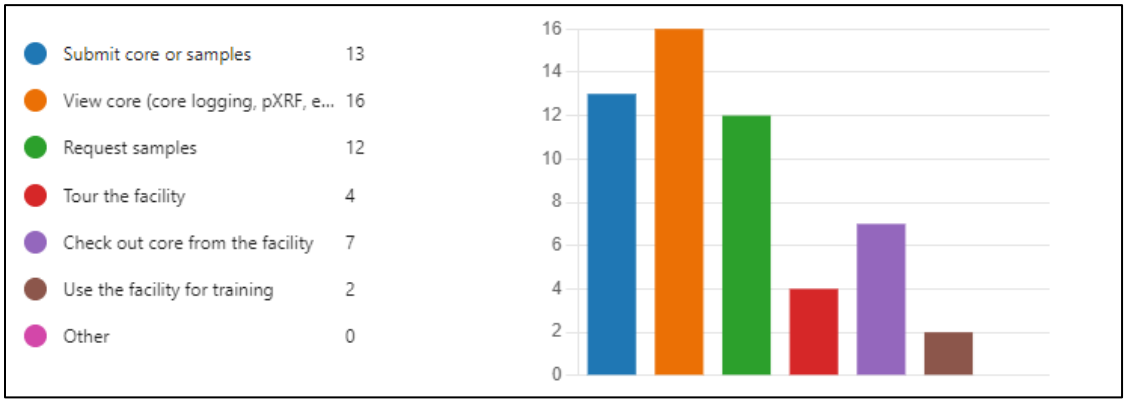


**Figure 4.3.** *Respondent selections for how they interact with the DCL when they visit. Note that respondents were allowed to check more than one choice.*

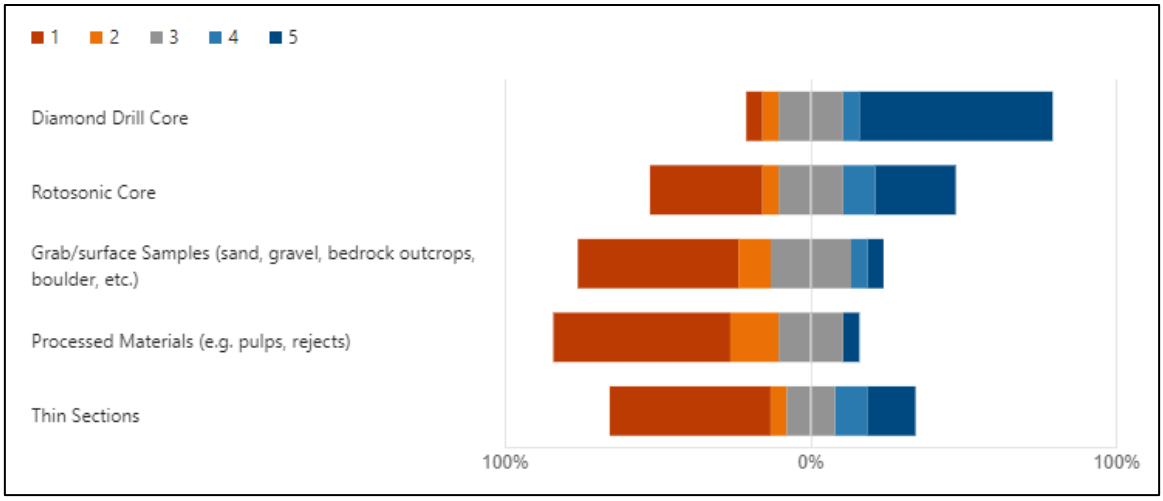


**Figure 4.4.** *Bar graph showing ranked choice voting of how frequently users interact with different materials from (1) little to no interaction to (5) frequent interaction. Note that respondents most frequently interact with diamond drill core (dark blue), whereas they have the least frequent interactions with grab/surface samples, processed materials, and thin sections (red).*

Sixteen respondents provided answers to the question on what roles and functions the DCL should fulfill as the state's designated repository. Eight participants indicated that the DCL functions to accept and store drill core, historic samples, and associated data for preservation, and recommended that storage should be prioritized for geologic units that have fewer representative drillholes. Seven responses mentioned the DCL should allow access to sampled material and associated data from the subsurface and representative surface samples from across the state, and two participants mentioned it should promote exploration activity and general outreach.

There were broad-ranging comments from single respondents on the roles and functions of the DCL, summarized such as:

- Assembly of this material has entailed tens of thousands of hours of effort from the private sector and individuals and hundreds of millions of dollars in expenditure. Most of this material would entail similar effort to recollect at great expense and unnecessary environmental impact. In the case where core, cuttings, and samples came from mines, the material is literally irreplaceable
- Collaborate with other state agencies to make digital data about these subsurface geologic materials available to the widest possible audience
- Strive toward improving policies and procedures, updating facilities and equipment, and updating collections databases
- Provide timely service for site visits, samples, and data requests

Survey respondents provided feedback on what DCL policies and procedures work well. Thirteen respondents were either satisfied with current policies or procedures or did not provide additional comments for this question. Two of them had concerns with recent access issues but acknowledged that the COVID-19 pandemic and the recent closure for safety reasons have been the cause of their concerns. One person expressed a worry about a lack of established policies and procedures and their enforcement, but recognition and appreciation of a renewed focus on policy enforcement was provided.

Many of the survey respondents provided informative feedback on how to improve the facility, policies, and procedures, such as:

- Desires were expressed for the following improvements, functions, and/or access issues:
    - A core photography setup for the public (n = 2)
    - Public list of complete inventories of core, cuttings, and other samples
    - Improve workflow for accepting, processing, and incorporating additional data and comments into the metadata, e.g., updated drill collar information, sample results or records, etc.
    - Increase staff to ensure timelier visits, sampling, etc.
    - Additional lab space for core viewing
    - Locations to fill up spray bottles and personal water bottles
    - Disability-accessible and non-gendered bathrooms
    - Breastfeeding space
    - Coordinating schedules with other visitors and a desire to have a publicly accessible visitation calendar to help speed up visitation request times
    - Ability for onsite sampling to reduce transportation between different facilities
    - Improve sample request documentation and enforcement of safety policies, particularly in Buildings 1 and 2 that have traditionally had self-service
- Respondents expressed cautions or concerns regarding:
    - The timeframe for returning thin sections from state core samples, especially those used on multi-year projects (n = 2)
    - Disposing materials

Many positive comments by survey respondents indicated that the DCL is doing a sufficient job with its function as the state's repository of geologic materials. Many of the desired features or functions identified by survey respondents are currently available at the DCL, which suggests that improvements might be needed for communication, labelling, and ease of accessibility. The DNR did not comment on these expressed desires or concerns when they were presented during the workshop.

## 5. Drill core library background and status update

A presentation on the background of the DCL and a status update on its temporary closure was given following a presentation and discussion of the pre-workshop survey results. The history of the DCL, the NGGDPP-funded inventory project and results, a new 3D model for Building 3, the types of materials and available space in the facility, and architectural plans for a future Building 4 were summarized.

During and after the presentation, there were several questions, comments, and discussion points raised. One participant asked what initiated construction of DCL and where was core stored before that. It was explained that prior to the establishment of the DCL in 1972, core was stored in the DNR Hibbing office and the U.S. Bureau of Mines office in St. Paul. Ernie Lehmann's lobbying efforts for core retention and the development of exploratory boring law were also mentioned, which generated the need for a repository like the DCL.

A second stakeholder commented on the importance and significance of the DCL. They mentioned the Inco strike of 1974-75, which indirectly led to the destruction of a core facility and the total loss of the original Spruce

Road cores. It was emphasized that this disaster represented a significant economic expense and loss of geologically relevant core. They recommended caution on any type of disposal of archived materials in the DCL.

A few participants expressed interest in the iron ore boxes stored in Building 2. They wanted to know what they were, where did they come from, how useful they were, and how often DCL visitors asked to examine them. During the discussion, it was identified that these samples were obtained from outdated drilling methods (e.g., churn drilling), which produced ground up material from discrete depth intervals and rarely produced core. However, these boxes may contain the only record of subsurface materials since the rock they came from may have been subsequently mined. Their value was not directly discussed, but if the materials are ground up and old then they may have oxidized and do not represent the original material. Few DCL patrons have utilized these samples, but because of their age many of them are not well-cataloged in the DCL database.

# 6. Role of the Drill Core Library and mission statement

The DCL currently lacks a mission statement. DNR staff identified a need to develop a mission statement based on the recommendations to evaluate collections in the USGS's 2019 *Guide to planning for and managing scientific working collections in the US Geological Survey*. DNR staff designed an exercise to seek input from users on the role and purpose of the DCL as the state's sole public repository of public core and presented a draft mission statement to compare with stakeholders' perceptions.

## 6.1. Stakeholder exercise – what is the purpose/role of the DCL?

Each workshop participant was given a stack of post-it notes and encouraged to write down at least three statements that reflected their views on the role played by the DCL. These statements were read out loud by the participants, and then grouped on-the-fly into different categories by DNR staff with some guidance from the participants.

There were fifty-nine statements generated during this exercise, which were organized under the following categories (see Appendix 2 for individual statements):

- Facilitate/Serve (9 comments)
- Archive/Preserve (12 comments)
- Impact minimization/Cost savings (2 comments)
- Support state government roles and mining (5 comments)
- Attract interest (11 comments);
- Science and Research/Development (4 comments)
- Data (4 comments)
- Opportunity (10 comments)
- Miscellaneous (2 comments)

Some of the stakeholder statements and groupings described what the DCL was, rather than what roles the DCL plays. There was also a fair bit of duplication, which was expected given that stakeholders were asked to work on their statements independently. The workshop-generated statements were used to develop the following generalized statements on the role of the DCL:

- Archive and provide public access to public drill core, geologic materials, and historical exploration data, in support of state statute [ARCHIVE]
- Support the advancement of our knowledge of the state's geology and mineral resources, by serving as resource for research, training and development within the state's colleges and universities [RESEARCH]
- Serve as a resource for testing new analytical techniques, new ideas, and unanticipated applications that could be deployed in the future to help identify prospective targets for mineral exploration within the State [TESTING]
- Support regional and statewide economic development for a diversified mineral economy that may create jobs and encourage mineral exploration companies to invest in new exploration programs within the state [ECONOMIC]
- Conserve financial and environmental resources by reducing the need to drill new exploratory borings in areas where archived core is available [CONSERVE]
- Support DNR land management activities and revenue generation on school and other trust lands [STEWARDSHIP]

Once the statements were grouped, the workshop participants were invited to comment and discuss the groupings. One person stated that they could think of a half-dozen research projects that could be completed using material from the DCL archive. Another participant said that the DCL supports the ambitious goal of helping the program work of environmental groups, and to better inform the public about the work that they do. They also expressed the opinion that past geological and mineral research has been largely done in an idiosyncratic way. They suggested that the DCL could serve as a bridge that fostered a "totally new dimension for collaborative efforts."

## 6.2. Draft mission statement

The following draft mission statement for the DCL was created by LAM staff and presented to workshop participants once the collaborative exercise was completed:

> *The Drill Core Library preserves geologic materials that attracts a worldwide audience of mining industry professionals and companies, researchers, and students. With space for viewing and examining core, thin sections, and other materials, the Drill Core Library is a facility that supports discovery about Minnesota's geology and mineral resources and sparks new mineral exploration in the state.*

While there was insufficient time during the workshop to collaboratively evaluate this draft statement in light of the associated exercise, participants were asked for feedback in an open discussion. One participant asked how long a DCL mission statement would be valid, given a potential change every four years in the governor's office (and by association, the DNR commissioner's office). A second participant stressed the need for the statement to be forward-thinking, while a third asked whether there would be an associated DCL vision statement. It was noted that the DNR served a nonpartisan purpose that extended beyond the tenure of any given governor, and that it was desired to craft a mission/vision/goal statement(s) that would ideally endure across election cycles and changes in administrations while fitting within the framework of strategic planning.

# 7. Prioritization of storage

This session sought input for the prioritization of storage for various geologic materials in the DCL. Prior to seeking feedback, participants were informed of the state's role as a fee holder and their obligation to grow various state trusts and reminded of the limited storage space currently available in the DCL. And while an earlier presentation mentioned plans to significantly increase storage capacity through the construction of a fourth building in the next two to five years, participants were encouraged to frame their thoughts and comments on storage priorities with the expectation that this new building will also be filled eventually. Working with limited space, the DNR must balance optimal strategies for accepting new materials with existing collections. Before feedback was sought, participants were also asked to consider how retention decisions for materials might be based on their cost in storage and duplication, geologic significance, and the availability of analytical data (recent vs. historical). Slido questions revolved around materials that are less frequently requested such as pulps, rejects, surface hand samples, and core above mineralized zones followed by an open discussion on the topic in general.

## 7.1. Poll questions

Answers to Slido poll questions are summarized in this section, and Slido-compiled responses to open-ended questions are available in Appendix 3.

### 7.1.1. Pulps and rejects

Five of the 16 respondents (31%) indicated that they do not currently use or have not previously used pulps, whereas half of the respondents have stored, or are currently storing, their pulp samples for future use. However, 63% of the respondents use pulps for either sampling or resampling purposes (Fig. 7.1). Most of the participants who responded to a question about the stability of sample pulps suggested that pulps have a limited shelf life, particularly when they contain reactive minerals (e.g., sulfides). One respondent suggested that the shelf life of pulps might be extended if they are stored in climate-controlled conditions (Fig. A3.1).

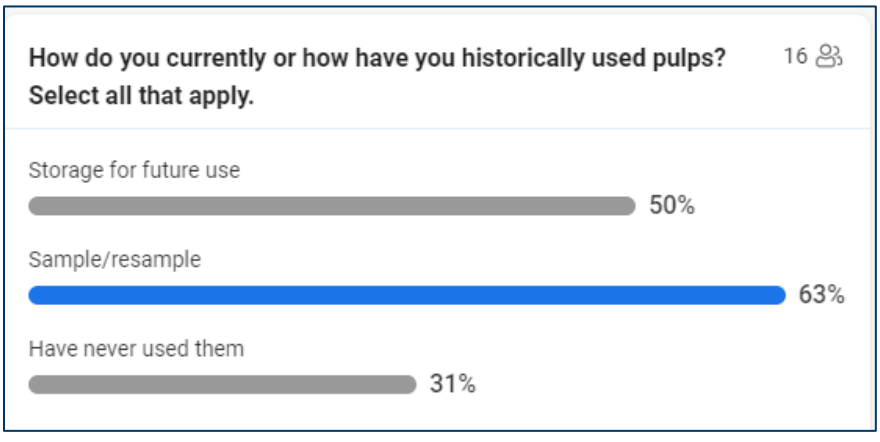


**Figure 7.1.** *Slido poll results for stakeholder use of sample pulps.*

There were several substantive responses on the benefits of storing and sampling pulps (Table 2.1; Figure A3.2). Respondents noted that retention of sample pulps allowed them to obtain analytical duplicates for laboratory QA/QC evaluations, facilitated comparative results from different analytical methods (e.g., X-ray diffraction), and created a potential opportunity to compare results when new analytical methods were developed in the future. One participant noted that from a curational standpoint, using sample pulps or rejects to obtain additional analytical data instead of using the original core sample is better for core preservation.

The same questions about pulps were posed to the group about rejects. Two of the 14 respondents indicated that they do not currently use or have not previously used rejects, eleven (79%) have stored their reject samples for future use, and half the respondents use rejects for either sampling or resampling purposes (Fig. 7.2).

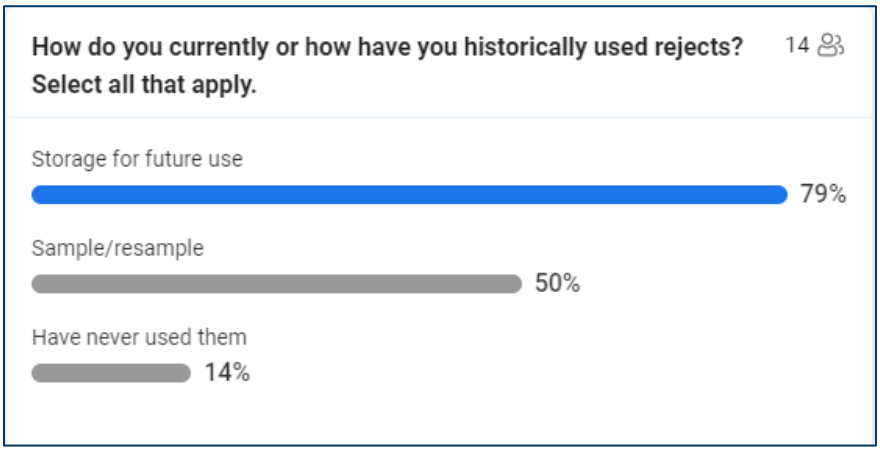


**Figure 7.2.** *Slido poll results for stakeholder use of sample rejects*

Workshop participants were invited to compare the relative shelf life of sample pulps and rejects. The general view was that rejects had a longer shelf life than pulps, given the much lower amounts of exposed surface area (Fig. A3.3). The identified benefits of retaining rejects were a longer shelf life compared to pulps, that they could be used for mineral liberation analysis (while pulverized pulps could not), and that they could potentially preserve mineral texture relationships (Fig. A3.4). For these reasons, there was a stated preference for retaining rejects over pulps. One participant, however, did note that the reuse of stored rejects would require extra time and cost for pulverization prior to laboratory analysis.

When asked whether the availability of recent analytical data for pulps or rejects might serve as a substitute for long-term storage, respondents overwhelmingly (82%) indicated that that analytical data would not be an adequate surrogate for culled samples of pulps or rejects (Fig. 7.3). The responses on pulps and rejects indicate that there is value in these kinds of materials and that analytical data may not be a sufficient substitute for them.

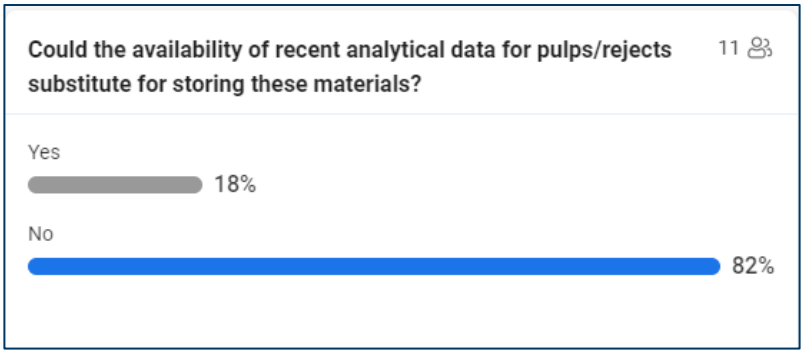


**Figure 7.3.** *Slido poll results for stakeholder input on analytical data as effective surrogates for retained pulps and rejects*

### 7.1.2. Retention of surface samples

Workshop participants were asked whether the DCL should include samples of surficial materials (e.g., rock, sediment, peat) within its archive of geological materials and sought feedback for their retention (Table 2.1). Ten of the thirteen respondents (77%) supported the inclusion of surficial material within the DCL's collection (Fig. 7.4). Participants also provided feedback on what criteria could be used to evaluate surface sample collection (Fig. A3.5). Common themes for criteria to retain samples were cost and access of recollection, geologic significance, and whether metadata are available for the samples.

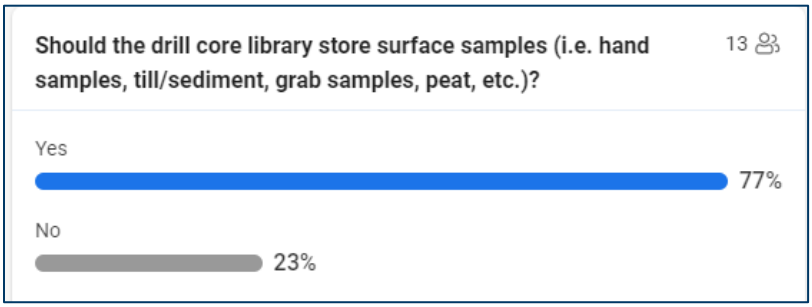


**Figure 7.4.** *Slido poll results for stakeholder input on DCL curation of surficial samples of geologic materials*

### 7.1.3. Retention of drill core intervals that are outside of a mineralized zone

Workshop participants rated the relative importance of preserving intervals of archived core that fall outside of mineralized zones with an average score of 8.4/10 (Fig. 7.5), with almost half of the respondents (43%) giving a 10/10 score (equivalent to "very important"). Those that rated this type of core as important also provided input on the uses this core may have in the future (Fig. A3.6). Archived core from exploratory borings that failed to intercept mineralization may still intercept alteration zones or include other pathfinder indications of the targeted mineral (or even a completely different type of mineralization). And when drill core does intercept a targeted mineralized zone, respondents identified several ways in which adjacent unmineralized core sections could support the potential development of that resource. Hanging wall or footwall core intervals can be useful for geotechnical studies that may impact mine development (e.g., open pit vs. underground), baseline

hydrogeological assessments, and environmental investigations (e.g., waste rock characterizations, reactivity testing).

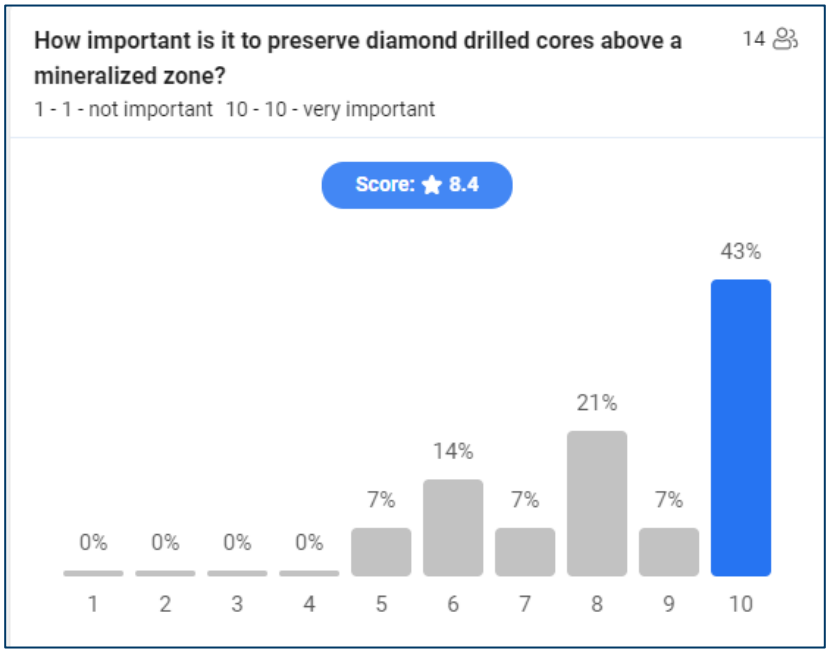


**Figure 7.5.** *Slido poll results for stakeholder input on importance of retaining core intervals outside of an identified mineralized zone*

## 7.2. Stakeholder comments

After the Slido polls, participants provided feedback in an open discussion, and were encouraged to discuss their own experiences in dealing with pulps, rejects, surficial samples and core intervals outside of their targeted zones of interest.

The open discussion focused on the limited shelf life of pulps and rejects mirrored those provided in the Slido poll question, with the added observation that archived peat samples would have the shortest shelf life. Rejects were generally deemed to be more representative of the original coherent rock sample than pulps owing to their longer shelf life. However, there were concerns over the potential for preferential breaks along alteration fractions during crushing. It was noted that while oxidation can change the composition of certain mineral phases, the bulk chemistry does not change much, which allows for qualitative determinations of chemical composition.

During a discussion over archived iron ore samples, a participant stated that unpulverized rejects are “the gold standard of sample saves” for taconite mining operations, since a one-kilogram sample is suitable for mineral liberation analysis and is a key analytical tool in their industry. They therefore saw little need for the DCL to archive pulp samples that were less than a kilogram in weight, unless a new analytical technique was developed that could work on smaller sample sizes.

One workshop participant asked whether these categorical decisions were necessary and wondered if sample location mattered just as much (if not more) than the physical state of the archived material. Using a location-

based assessment, it might be more prudent to save both pulps and rejects from geologic terranes with high mineral potential, and not archive either material type from regions with relatively low mineral potential. Alternatively, the shelf life of archived pulps or rejects might be deemed determinative. This foreshadowed subsequent conversations where the preservation of opportunities for serendipity and unanticipated discoveries was championed.

When questions were raised about the cost/benefits of freeing up shelf space currently devoted to archiving pulps and rejects, some participants suggested that it might be more productive to evaluate more efficient ways to store these materials. One noted that bags of rejects samples are often stored in open crates that are difficult to stack. Another participant stated that typical coarse reject containers are flimsy, easy to collapse, and "invariably suspect." As a result, they considered it quite normal to see pallets with leaning stacks of rejects containers returned from an analytical laboratory. It was therefore suggested that the DCL might benefit by requiring reject samples to be stored in standardized, sturdy, and stackable containers when they are submitted to the facility.

Off-site storage was also presented as a potentially viable option for expanding DCL capacity for storing pulps and rejects. One workshop participant noted that they had championed the purchase of shipping containers and interior storage racks at their company. A second wondered whether curated materials in the DCL needed to be equally accessible, suggesting that the content least likely to be retrieved for public review might be moved to less-expensive off-site storage. A third participant then cautioned that it might cost more to disassemble and move archived content than to simply leave this less-valuable content on the shelf and increase storage capacity through building expansions.

In contrast to the statutory requirements to submit exploratory drill core to the state, mineral exploration companies are not obligated to retain and turn over to the state samples of pulps and rejects (MN Statutes 103I.601 and 103I.605). One participant suggested that the DNR therefore consider the perceived value placed on archived pulps and rejects by the mineral exploration companies that collected, retained, and ultimately submitted them to the DCL. Another pointed out that the DCL does not currently have processing or analytical capabilities and implied that the DCL cannot do anything more than store pulps and rejects samples.

Archived outcrop and surficial sediment samples were generally viewed as the best candidates for deaccession, given that it would be far easier and less costly to obtain duplicates when compared to pulps, rejects, and core. It was deemed more important to retain (or accept) surficial samples that would be harder to replicate when the sample location was either inaccessible or no longer existed (e.g., within an open pit mine). Replacement costs were also central to a participant's suggestion that economists should be just as involved as geologists in any discussions about deaccession.

Prior to enactment of the exploratory boring statute, some of the drill core submitted to the DCL was skeletonized, limited to intercepted zones of mineralization, or otherwise incomplete. When the idea of potentially prioritizing certain "higher value" intervals of archived core was offered for discussion, several workshop participants championed current DCL practices to retain complete intervals of archived core and insisted that new core submissions should be complete and continuous. It was stated that core intervals outside of mineralized zones were highly valued by geologists. These zones can help determine how mineral deposits form, and they could potentially host pathfinder minerals or trace elements or alteration patterns that are markers for proximal mineralization. The successful use of these types of indicators at the Eagle Mine in

Michigan was offered as a prime example of the value of preserving core outside of mineralized zones, and these techniques could be applied on similar types of deposits in Minnesota. It was also suggested that retaining core that highlights what has already been discovered mattered less than archiving core that might help reveal what has yet to be discovered.

The status of the DCL as a public repository that is managed for the benefit of Minnesota's citizenry was raised during the discussion. It was suggested that curational decisions should not be solely based on whether a sample was collected from state-managed lands. The archival of materials from private lands can also lead to new discoveries, which could help fulfill state obligations to support the diversification of the state's mineral economy (MN Statute 93). Therefore, the DCL is obligated to focus more on the long-term than a private core repository or a mineral exploration company.

# 8. Policy Development: Materials Acceptance, Sampling & Data Submissions

This session of the workshop gathered feedback of past, current, and future policies related to materials acceptance, sampling, and data submissions. Baseline perceptions were first gathered from participants on the timeframe users should be allowed to retain samples, thin sections, and when to provide the DNR data derived from sampled materials (Fig. 8.1). Most respondents indicated that samples and thin sections should be returned within 6-12 months. However, some participants indicated that they thought it would be acceptable to retain samples and thin sections for up to 5 years or longer, and compared to samples, more of the group were comfortable with retaining thin sections for a longer amount of time (Fig. 8.1). Opinions varied on when they thought it was required to deliver data derived from public core to the DNR, with some saying it should be delivered immediately, whereas others thought one year or greater was an acceptable timeframe.

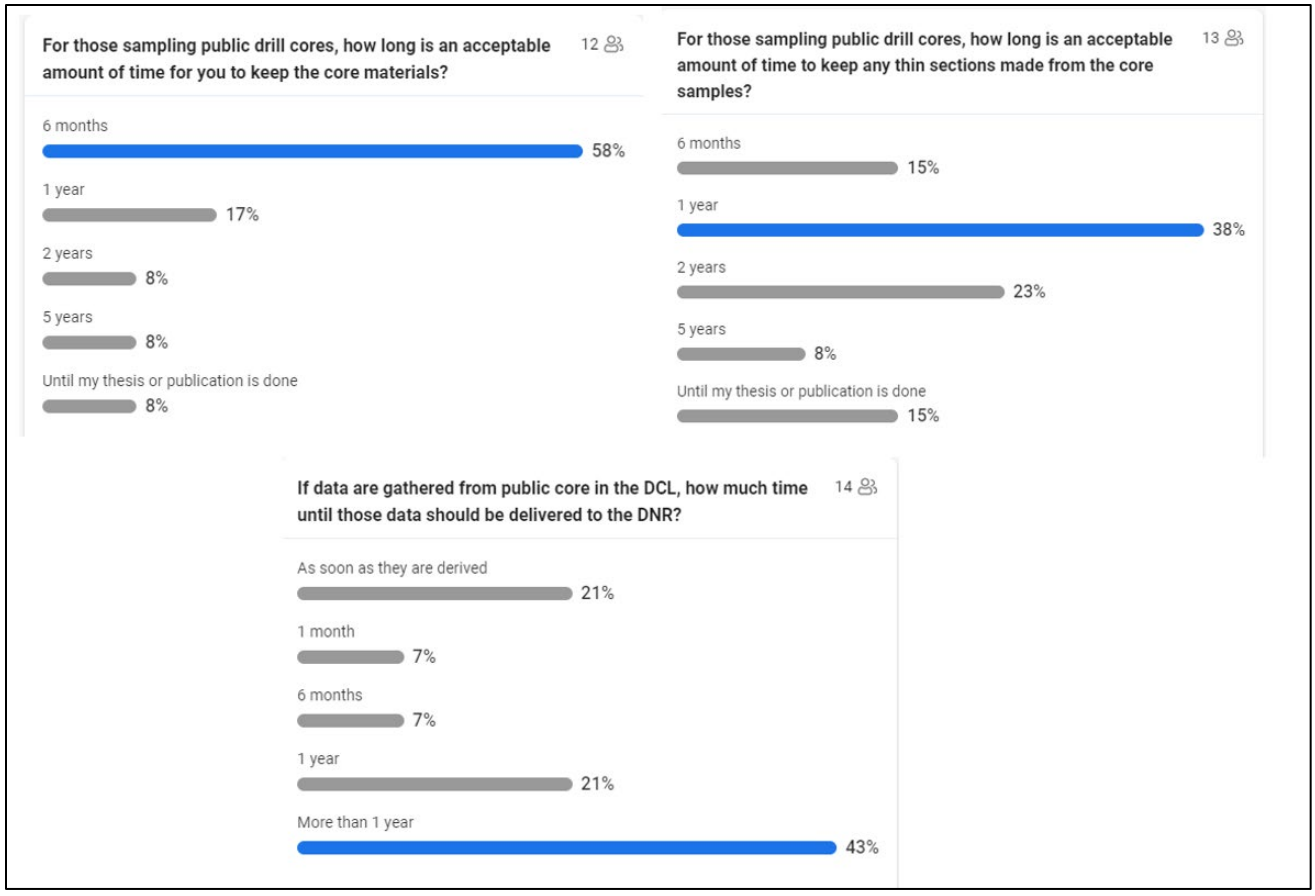


**Figure 8.1.** *Results of questions posed to workshop participants about their perceptions on current DCL policies*

DCL policies on sampling archived core and associated data (Section 2.3) as well as relevant state statutes regarding mineral data were presented at the workshop (Fig. 2.4). A summary of the policies and procedures of external repository facilities were also presented. Workshop participants were asked for general feedback in an open discussion format about their personal sampling experiences at the DCL and how procedures could be improved.

There were concerns expressed with archived DCL drill cores that had intervals that were either missing or less than the one-quarter minimum. The missing core may have been the result of oversampling (assisted in part by deficiencies in curational oversight) and/or the failure of an exploration company to submit the required minimum one-quarter portion of continuous core. As an example, the lack of historic oversight on oversampling is particularly evident within a ten-foot interval of core from archived drillhole MGS-8, which displayed ejecta features associated with the Sudbury impact event (Fig. 8.2). It was strongly suggested that sampling requests should be discussed with the patron to determine the appropriate size and amount of sample, rather than providing them with a half core by default. A workflow to help identify the amount of material needed for a given analytical technique (e.g., thin section vs. assay) was also proposed. In addition, it was suggested that bar codes could be placed on all core boxes to assist with the administration and tracking of sample requests.

**Figure 8.2.** *Image of an oversampled interval of the MGS-8 core. Note the number of sample cards that are in this core box (left center).*

This session included a discussion on thin sections created from public core. It is DCL policy that any thin sections cut from archived core for off-site research be returned to the DCL once that research has been completed. It was noted that some grant-funded projects may last for multiple years, and some participants were concerned with potentially needing to return thin sections before a series of related research projects were completed. Additionally, some academic institutions have acknowledged that their thin section archives currently include samples derived from DCL core. During this discussion, it was suggested that the DCL could maximize the value of thin sections cut from archived core by mandating that each section be uncovered and doubly polished to allow for multiple analytical uses (e.g., petrography, fluid inclusions, electron microscopes, etc.) once that thin section was returned to the facility. It was also emphasized that when cutting a core interval that orientation matters; in some cases, patrons may want the sample to be cut parallel to bedding/fabric, whereas others may want sections perpendicular to bedding/fabric.

## 9. Database enhancements and queries

A workshop session on database enhancements included a brief review of the current capabilities of the interactive web map (i.e., the DNR's Drill Core Library Application), which is available through the DCL's webpage. A brief brainstorming session was conducted on how to add value to (and expand the reach of) the DCL's online presence.

The DCL web map provides basic information about the exploratory borings that have core archived in the DCL, including single-click identification of the drill hole name, DNR inventory number, total depth, who the boring was drilled for, and when it was drilled (Fig. 9.1).

Detailed information about each boring can be obtained by selecting a borehole of interest. Related tables associated with this expanded record include a link to the associated well and boring report within the Minnesota Department of Health's (MDH) Minnesota Well Index (MWI). The MWI logs include basic stratigraphic information that is provided by the driller, and when bedrock is encountered, they sometimes include an interpretation of the associated bedrock formation. One workshop participant noted the amount of stratigraphic information available for each boring within the MWI and asked whether there was a way to integrate or provide a better interface between the DNR and MDH web map applications. A second participant said that it would be nice if the DCL web map included stratigraphic information that could be queried (e.g., "Which DCL drill holes have archived core intervals of the St. Peter Sandstone?").

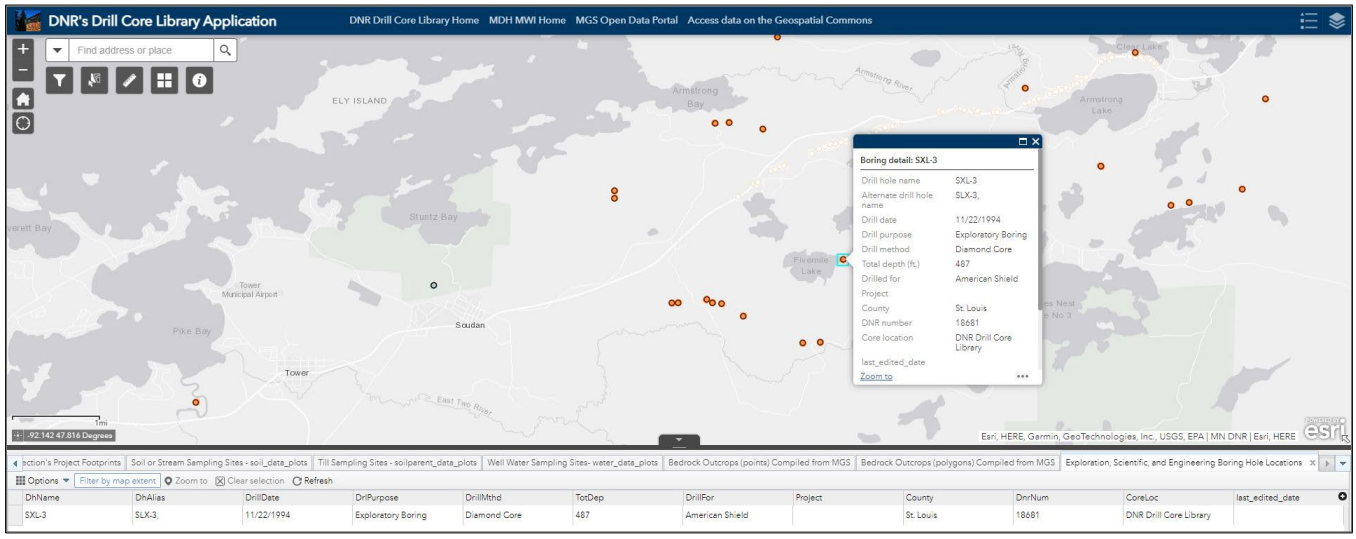


**Figure 9.1.** *Screen capture image from the DCL web map*

Historical exploration records associated with archived DCL core can be retrieved from the DCL web map application through a geospatial layer that identifies the mineral exploration footprint of the company that did the exploratory drilling. A workshop participant expressed a desire to have the exploration data and records that were directly linked to a boring be more easily retrievable and more closely linked to the boring's map entry.

Offered examples included identifying the core intervals that had associated analytical data or intervals where thin sections are available.

A workshop participant commented on the accuracy of the DCL web map, stating their belief that some of the identified boring locations are inaccurate. They desired an improvement to the metadata for each boring, as well as a way for DCL stakeholders to provide drill hole collar locations that may be inaccurately plotted on the web map. A second participant voiced their support for an online forum for DCL-related topics where input might be received.

DNR staff used this session to get input on the potential costs and benefits of obtaining photographic images of archived DCL core and making those images available online. Would this be valued, cost-effective, or even practical, given the level of effort that would be required to document hundreds of thousands of core boxes? Workshop participants noted that it has become standard procedure for mineral exploration companies to obtain digital images of both wet and dry core during their drilling campaigns. These digital images could be provided to the DCL when the drill core was submitted, avoiding the need for the DNR to duplicate their efforts.

## 10. Closing remarks from workshop participants

As a concluding exercise, each workshop participant was given an opportunity to share their final thoughts about the workshop, the DCL, and key action items. Their comments generally fell under three themes: an appreciation for the workshop and the opportunity to provide input on the DCL, the importance and value of the DCL, and suggestions for improvements on DCL policies and procedures.

A majority of workshop participants used all or part of their time to speak positively about the workshop. They commended the DNR for seeking input from external DCL stakeholders and valued the opportunity to provide input on policies and procedures that will have an impact on how they use the DCL as a resource for their work and research.

While a primary goal of the workshop was for the DNR to listen to DCL stakeholders and learn from their experiences, many of the stakeholders expressed an appreciation for what they themselves learned from the other participants. One person stated that the gathering had revealed an amazing amount of expertise and experience that was external to the DCL, while another noted the benefit of bringing together stakeholders with common interests but differing perspectives.

Most workshop participants also used all or part of their time to comment on the value of the DCL for researchers, the mining and mineral exploration community, and the citizens of Minnesota. Favorable comparisons were made to jurisdictions that lack a comparable well-organized facility, or in some cases, when core was allowed to deteriorate in outdoor storage locations. Some participants highlighted the DCL's role in attracting investments in mineral exploration campaigns that benefit local and regional economies. The DCL was also acknowledged as an important resource for existing mine operations in the state. One participant urged that the value of the DCL be conveyed to state legislators to garner financial support for DCL expansion.

Some participants offered suggestions for improving DCL policies and procedures in their closing remarks. One participant used their time to reinforce one of their earlier comments about the importance of retaining complete core intervals, rather than focus on just targeted or mineralized intervals. A second argued against only retaining core from representative drill holes in areas with closely spaced infill drilling, for fear that future tests or analyses of concepts might require more sample material than would be available from a single drill hole. A third participant lobbied for an expanded online presence for the DCL that would make more data available up front and facilitate DCL visits that were more targeted and efficient.

# 11. Post-workshop survey

Workshop participants were sent a post-workshop survey to seek additional feedback. The survey included the following questions:

- Please rate your overall experience at the DCL workshop
- Please rank how easy it was for you to express your viewpoints and ideas from (1) difficult to express viewpoints and ideas to (5) very easy to express viewpoints and ideas
- Please provide any feedback about the day (i.e., food, duration of meeting, different methods of providing input, meeting space, topics, longer breaks, etc.)
- Do you have any additional comments on:
    - the role and mission of the DCL?
    - the prioritization of storage?
    - on policy as it relates to sampling, data submissions, and the acceptance of materials?
    - about enhancements to the DCL database?

Eight participants responded to the survey, but some did not answer all the questions. Respondents had a positive workshop experience (average of 4.88 out of 5) and felt at ease expressing their viewpoints (average 4.75 out of 5). Regarding the day of the workshop, respondents indicated that it was efficiently run, set up well, informative, and interesting. However, a few indicated that the agenda was a bit too much for the time allotted and that some of the material felt rushed; they also desired time for networking.

Some respondents provided additional feedback on the four session topics. They emphasized that the DCL is an important and valuable asset for the state and its identified mineral potential. Some encouraged the DNR to pursue new branding and messaging efforts so that the public may better understand its value and support it. Others suggested that the DNR should consider whether the mission statement was for an internal or external audience, or both, and to focus the statement on the range of stakeholders, whether they be from academics, industry, land management, etc.

A variety of concerns and recommendations were made regarding the prioritization of storage. A few respondents emphasized a point made during the workshop that decisions should be related to the cost of reproducing that sample, placing greater importance on diamond drillholes from less accessible places vs. surface sample grabs. Others indicated that all materials should be saved by all means necessary unless it was demonstrably shown that the materials had no future value or use. Rejects were also recommended to have priority over pulps, and that standardized storage containers be determined and enforced for deliveries. The DNR was encouraged to review its own collection of materials from its past research projects for potential disposal. One respondent suggested that DNR staff separate short-term/interim storage priorities that are needed now vs. long-term storage priorities that may include additional storage space in Building 4.

A few participants commented on future policy development. There were concerns about policy enforcement, and a recommendation for the noncompliance of policies should face consequences for future sampling and facility use. Another comment expressed concern that some materials submitted to the DCL remained nonpublic and they asked the DNR to consider making all submitted materials public immediately upon acceptance.

Several database enhancement suggestions were related to tying together multiple digital datasets to make it easier for users to find information. There was a recommendation to update the user guide for the DCL web map. One response wanted to see the digitization of sampling records so it could be better understood which cores and intervals have been sampled, among other information. Another respondent suggested that DNR staff use a targeted and phased approach for photographing specific archived core of perceived mineral potential that may support future lease sales.

# 12. Discussion

## 12.1. Mission statement

The draft DCL mission statement that was presented at the workshop (Section 6.2) included statements about both what the DCL is and what it does. Most of the generalized statements that were developed by workshop participants about the role of the DCL are reflected within the draft mission statement (Section 6.1; Table 12.1).

In working toward a finalized version of the DCL mission statement, DNR staff considered the feedback provided by workshop participants (Table 12.1; A2.), and the mission statements of the DNR and the USGS Core Research Facility (Denver, CO). The mission statement for the Minnesota DNR is:

> *The mission of the Minnesota Department of Natural Resources (DNR) is to work with Minnesotans to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.*

The USGS Core Research Facility (Denver, CO) mission statement is (personal communication, M. Johnson, 2022):

> *To facilitate the storage of and access to geological materials, to reduce storage and curation costs, and increase the reuse of valuable materials*

Both of these statements are largely purpose-based and focus on their functionality. These aspects were strong considerations in creating the final draft of the DCL mission statement. It was also decided that the DCL statement should be designed for a diverse external audience of visitors. Revising the draft DCL mission statement to mirror the format of the DNR's mission statement and incorporate internal and external feedback has led to the following DNR-approved mission statement:

> *The Minnesota Department of Natural Resources Drill Core Library provides access for visitors to examine publicly owned geologic materials and exploration data. Curation activities support a diversified mineral economy, environmental research, the management of state minerals, and a better understanding and awareness of the state's natural resources.*

**Table 12.1.** *Comparison of workshop-identified roles of the DCL with language in the draft mission statement.*

| **Workshop-identified role** | **Language within the Draft Mission Statement** |
|---|---|
| Archive and provide public access to public geological materials and exploration data from Minnesota [ARCHIVE] | *"The Drill Core Library preserves geologic materials…"* |
| Serve as a resource for academic and public sector research and training that advances our understanding of Minnesota's geology and mineral resources. [RESEARCH] | The DCL preserves material that "*attracts… researchers, and students*." It also "*…is a facility that supports discovery about Minnesota's geology and mineral resources…".* |
| Support the testing of new analytical tools and ideas that could be deployed to evaluate the mineral potential of lands more effectively within the state.<br>[TESTING] | General references to the DCL supporting *"discovery about Minnesota's geology and mineral resources"* and "*sparking new mineral exploration*." |
| Support economic development and facilitate mining company investments in new exploration programs within the state.<br>[ECONOMIC] | No reference to DCL's role in supporting regional or statewide economies. The DCL preserves material that "*attracts… mining industry professionals and companies*." It also "*…sparks new mineral exploration in the state*." |
| Conserve financial and environmental resources by reducing the need to drill new exploratory borings in areas where archived core is available<br>[CONSERVE] | No comparable language. |
| Support DNR land management activities and revenue generation on school trust lands<br>[STEWARDSHIP] | No comparable language |

## 12.2. Materials acceptance and storage priorities

Data and samples (i.e., at least ¼ portion of core) from any exploratory boring in Minnesota, regardless of land status, must be submitted to the commissioner within 180 days after lease termination (MN Statutes 103I.601 and 103I.605). The DCL was initially established to serve as the state's repository to store cores submitted by various exploration companies. In recent decades, scientific and engineering cores were accepted into the DCL, and in the mid-1990s notable amounts of noncore materials, such as pulps, rejects, and surface samples, were also accumulated. The DNR has also used the DCL to store geological materials (peat, sediment, dimension stone, etc.) associated with internal projects. Today, the DCL is at 95% of its total storage capacity and space must be created to accommodate additional materials to meet statutory requirements for accepting core.

While the DCL provides guidance for packaging and submitting rotosonic and diamond drill hole core, there are no comparable policies for procedures for other types of geologic materials that have been added to the DCL archive. Few peer repositories have published rigorous guidelines that help their staff determine whether to accept certain materials, whereas many others have no publicly available guidance (Table A1.2; A1). Strategic criteria, the presence of significant or unique geologic features, cost, and core condition are the main criteria used by peer repositories to evaluate materials for acceptance. Submitted materials that are identified as hazardous (e.g., samples with high radioactivity levels or asbestiform-bearing minerals) are not accepted into their facilities. Workshop participants also emphasized that cost, current and future accessibility, geologic significance, drill hole density, complete core intervals, and metadata/collars are important factors for accepting materials and assessing their storage prioritization. It was emphasized by both workshop participants and the policies of peer repositories that priority should be given to archived material that would be costlier to replicate or come from collection sites that would be difficult to access. Complete diamond drill hole cores with some degree of geologic significance are also considered more valuable when compared to other materials.

The Lands and Minerals Division of the DNR has an obligation to manage state trust lands and this responsibility must also be considered while evaluating DCL policies for the acceptance and storage prioritization of materials. It is recognized that drill cores and other materials from private lands may help diversify the mineral economy and could lead to new scientific discoveries. However, given the fiduciary responsibility of the DNR to generate revenue on school and other trust lands, materials collected from privately-owned lands that are contiguous or proximal to state lands may be given higher storage priority than geological materials that are collected from private lands that are more distant from state-managed mineral rights.

Although there are many factors to consider for acceptance and storage priorities, core clearly has a higher value compared to noncore materials and should have storage priority over other types of materials. Pulps, rejects, buckets of sediment, and various containers of hand specimens are currently taking up storage space in the DCL (Fig. 12.1; Table 2.1). Background research on peer repositories and feedback from workshop participants have helped DNR staff conceptualize criteria for materials acceptance and potential deaccession.

### *12.2.1. Pulps and rejects*

The DNR's bay-by-bay inventory of the DCL identified several shelving units devoted to pulps and rejects (Section 2.2; Table 2.1). Almost 9,500 boxes of pulps and rejects are in Building 3, over 200,000 boxes of processed iron ore material are in Building 2, and numerous cabinet drawers are filled with pulps in Building 1

(Fig. 12.1). Collectively, these materials occupy approximately 10% of the total storage capacity of the DCL. In addition, there are currently dozens of pallets with wooden crates full of processed materials that are in temporary storage and have yet to be shelved in the DCL. Compared to other noncore materials, pulps and rejects occupy the most space in the DCL.

The workshop poll questions facilitated a comparison of the relative benefits of pulps vs. rejects, should the DCL be forced to consider favoring one type of archived content over the other to free up shelf space for higher prioritized unprocessed core. Both pulps and rejects have value to stakeholders and are worth preserving if possible. These split portions of processed core samples could be reanalyzed using new techniques or tests that offer higher precision and accuracy, lower detection limits, or an expanded suite of analytes. For example, archived drill core originally obtained in the 1900s while exploring for direct shipping ore had subsequently been sampled for taconite, showing the unanticipated value of archiving core associated with a product that was no longer marketed. Pulps and rejects can be used for QA/QC assessments, and their use precludes a need to further consume the original core (Section 7.1.1; Table 2.1). The fine grain size of pulps causes them to degrade faster than reject materials, particularly in an unheated and unconditioned space like the DCL. Over time, the bulk chemistry of the pulp will likely not change, but certain mineral phases may change in as little as months to a year. Once pulps have degraded, they may be less useful for future analyses. Further, grain boundaries are not preserved in finely pulverized materials like pulps. For these reasons, the DNR believes that rejects likely offer higher curational value, particularly over storage periods that are greater than a couple of years. On the other hand, rejects take up a greater amount of storage space compared to pulps.

Most bays in the DCL are full of standardized core boxes that allow for efficient storage in the facility (Fig. 12.1). The DCL has not set standards for the packaging and submittal of other types of geological materials. In some cases, this has led to stack heights that are much lower than shelf heights, creating inefficient dead space. In other instances, stacked containers of unconsolidated material have been submitted with partially filled containers in the middle or at the bottom of a stack, which has caused stacks of boxes to lean and tilt over time (Fig. 12.1). Both DNR staff and workshop participants identified the need to adopt standards for the containers used to store archived pulps and rejects. This may help to improve storage efficiency and correct stacking issues with packages of processed materials. While DNR staff plan to address restacking, relabeling, and repackaging issues for some of the archived materials identified in the bay-by-bay inventory project, the associated gain in storage capacity would need to be balanced against the associated costs of staff time and materials for the complete repackaging of archived processed materials.


**Figure 12.1.** *Example of DCL storage of archived materials. Note the efficient storage of core boxes on shelf I-4, whereas sample bags on shelf I-6 take up an entire bay and could be better packaged. Stacked packages of processed materials in the lower left are tilting and require restacking*

### *12.2.2. Surface samples*

The DCL archive includes many different types of surficial materials (Table 2.1). Some samples were collected and cataloged for DNR projects, and include peat, dimension stone, buckets of sediment, and hand specimens. Two significant collections were donated by the Minnesota Geological Survey. One is of historical significance and is a suite of hand samples from the state's first geological survey by Newton Winchell. This collection also includes samples from outside of Minnesota, such as those collected during the 1874 expedition to the Black Hills led by General George Custer. A collection of outcrop samples by MGS staff is also stored in the DCL. This collection is well-organized and cataloged, and has geographical information associated with each sample.

Collectively, surface samples occupy approximately 8% of the total storage capacity of the DCL. They are variably packaged in buckets, sample bags, miscellaneous boxes, and in dedicated cabinets that were delivered with the MGS collections. While most of these dedicated cabinets do not occupy shelf space in the DCL, the other containers take up shelf space that could be repurposed to store boxed core (Fig. 12.1). In addition, as is the case with archived pulps and rejects, opportunities exist for standardizing surface sample containers and repackaging archived materials to maximize the utilization of existing storage space.

From 1976 to 1982 peat samples were collected as part of a statewide peat inventory project. Detailed information about each sample and their location are available and some samples were retained in the DCL. While peat samples have the shortest shelf life and quickly degrade in quality over time, they may offer a historical record of what types of plants were growing at a specific location and specific point in time and could be important for future climate research.

A majority of workshop participants were in favor of including surficial samples within the DCL's portfolio of archived geologic materials (Fig. 7.4). There was agreement that if there were pressing space constraints that surface samples were the best candidates for potential deaccession given their relatively low replacement costs. It was recommended that surface samples are given priority for acceptance or storage space if there was limited access to a sample collection site (either now or in the future), or if there was a historic significance that was independent of their geological significance or reproducibility (i.e., the Winchell collection). Similar to the USGS guide to managing collections, workshop participants agreed that metadata is an important piece of criteria to determine the fate of surface samples (Fig. 2.5).

## 12.3. Sampling and data submissions

Established DCL policies for visiting, sampling, and data submissions are comparable to those employed by the reviewed peer repositories (Sections 2.3 and 2.4; Appendix 1). The differences can often be explained by the fact that the DCL is operated by a state agency and must adhere to certain statutory requirements established by the Minnesota legislature. Examples include mandates to preserve at least a one-quarter portion of archived core (MN Rule 6125.0700) and the need to keep data derived from DCL visitor use of core material confidential for at least one year (MN Statute 13.793). It is also unlikely that any of the DCL's peers have their repository visiting hours set by state law (MN Statue 93.61). As a result, any modernization of DCL policies and procedures must reflect state statutes and requirements.

The DCL requires visitors to provide at least two weeks advanced notification before arriving on site to view or sample core. While this is a longer timeframe for notification compared to its peers (Section 2.4.1), this two-week period is needed to ensure that DNR staff have enough time to retrieve requested core intervals and are available during the visit to support any sampling requests. That said, depending on the amount of core and its location in the facility, DNR staff have worked with patrons in the past to accommodate last-minute requests.

While there is an expectation that samples and thin sections obtained from archived core are returned to the DCL, visitors have varying perceptions of the timeframe for their return (Fig. 8.1). Indeed, established policies do not explicitly state when these materials are due. As a result, patrons have retained samples and/or thin sections for years, transferred materials to other interested parties, and in some cases, completely failed to return them to the DCL. Recommendations by workshop participants and policies of other peer repositories suggest that materials should be returned within a year, but there was recognition that the timeframes may vary for projects depending on funding and the availability of analytical equipment.

Concerns about missing and/or oversampled intervals and the timeframes for sampling may be overcome by improving communication between DNR staff and patrons. A discussion or flowchart was recommended during the workshop to be established practice to determine the appropriate size of sample for the proposed activity. For example, a thin section requires a much smaller volume of material compared to an assay. Reviewing the

proposed activity and determining the appropriate size sample may help to preserve more material. If available, rejects or pulps could be used in place of consuming core.

The DCL has thousands of thin sections in its archive. However, some academic institutions have acknowledged that their thin section archives currently include samples derived from DCL core. There was a general desire among workshop participants to develop a statewide thin section database to document where the thin sections are housed, and their associated metadata. This database may also include descriptions and/or digital images. A future collaborative project is intended to be developed on this topic, since no decisions were made during the DCL workshop.

Analytical results are supposed to be delivered to the DNR once they are received by the DCL visitor who sampled archived core. However, like timeframes to return samples, current DCL policies do not explicitly state a timeframe to submit analytical results, which was reflected in the perceptions of workshop participants (Fig. 8.1). DNR staff are currently working on improving their databases and internal procedures so that data are more accessible and available to interested parties.

## 12.4. Database enhancements

The DNR has long recognized the benefits of projecting the reach of the DCL's digital archive into the digital realm. Online access to DCL data supports DNR program work, increases public awareness of what the DCL is and what it does, and makes it easier for patrons to effectively plan their site visits to Hibbing. And while the DNR has worked hard to develop a robust online presence for the DCL, there is much room for improvement. Workshop participants offered suggestions on how the DCL might enhance the transfer of archival data through digital platforms. The review of peer repository websites also revealed content and strategies worthy of modelling.

Enacting potential enhancements requires DNR staff time and budget, which is limited. There are many factors to consider while identifying an optimal digital strategy for the DCL. The database enhancement section was a relatively minor component of the DCL workshop, and it would be easy to justify a multi-day workshop just on this topic alone. So, while a robust discussion and recommendations on DCL data enhancements was beyond the scope of the workshop (and this associated report), there are pertinent discussion points that might serve as a launching point for a more detailed evaluation.

The DCL can set new guidelines and requirements for core submission without an obligation to bring the existing collection into compliance. This applies to both physical material and digital content, and the DCL could consider minimum standards for core-related data submissions that would make it easier and cheaper to publish this digital content online. As an example, the DCL already requires exploration companies operating on state mineral leases to submit their analytical data in digital formats. Many of these companies routinely photograph their drill core and compile these digital images. The DCL could not only require these digital images to be submitted for eventual public release but set standards for image formats and archives that would facilitate their curation (the same way that the DCL has standards for submitted core boxes).

The value of projecting the DCL's archival data onto digital platforms is underpinned by the accuracy and completeness of the underlying offline datasets. The 2022 bay-by-bay inventory of the DCL identified not only

the type of material stored on each shelf, but also which drill core was located on each shelf. The DNR is using this inventory as a quality control check for a digital drill core database that supports the current DCL web page and web map. Ensuring the accuracy of the DCL data that is currently available is arguably just as high or an even higher priority than adding new datasets to the web page. This is in line with workshop participant comments regarding the locational accuracy of the current database.

Many of the requests for database enhancements would require the extraction of vector data from archived exploration documents. This task, whether completed by DNR staff or patrons, is predicated by access to high-quality digital images of original hard copy documents that are archived within a searchable online database. The DNR is currently developing a new consolidated minerals database to replace Minarchive, which has provided online access to relatively low-resolution images of more than 2,000 exploration records for more than twenty years. This new database will include documents and data records obtained by the DCL since Minarchive was published. It will also offer higher resolution images and a modern user interface.

## 13. Recommendations and Conclusions

The DCL is an invaluable facility that archives geological materials from across the state. The holdings have involved thousands of hours of effort from the private sector and individuals and millions of dollars in expenditure and their replacement would entail similar effort and cost as well as unnecessary environmental impact.

Based on the review of peer repository policies, the workshop, and associated pre- and post-workshop surveys, the NGGDPP-funded inventory project, and numerous other discussions, the following recommendations were developed:

- Consider developing a vision statement for the facility
- Develop criteria to evaluate materials for acceptance, storage prioritization, and potential deaccession
- Establish a chain of custody for materials that are accepted into the facility
- Apply criteria to assess materials for deaccession, and if needed, determine the best venue for their transfer of ownership or disposal
- Evaluate and adopt standardized packages for noncore materials
- Consolidate noncore materials where feasible
- Consider short-term and long-term storage priorities
- Establish clear timeframes, expectations, and obligations around sampling, thin sections, and data submissions
- Collaborate with partners to establish a thin section database
- Make data delivered to the DNR more widely available and accessible
- Link public data to drillhole locations and depths
- Improve communication about visiting and sampling expectations, data availability, functions of the facility, notifications, and training opportunities
- Consider collaborating with other peer repositories to improve the curation, management, and administration of the holdings in the DCL

- Seek feedback from internal and external parties on a draft of modernized policies and procedures before they are finalized

Modernizing the policies and procedures of the DCL are a priority for DNR staff. These updates will help to improve the efficiency of storing materials, streamline curation and administrative processes, track sampling and data submission, improve databases associated with archive materials, and establish clear guidelines and expectations for users.

## 14. Acknowledgements

Support from the United States Geological Survey, the National Geological and Geophysical Data Preservation Program and the Minnesota Geological Survey is gratefully acknowledged. We thank all workshop participants who dedicated their time to attend and provide feedback as well as those at the Cloquet Forestry Center for hosting the event. We thank Saari, S., Fierst, J., and Prue, A.M. for their constructive reviews and Parenteau, A., Tedrow, O., and Sauter, M. for assistance in copy editing.

# Appendix 1. Policies and Procedures of External Repositories

**Table A1.1.** *Sampling and data delivery policies for peer repositories*

| Facility | Notification for sampling or viewing core | Months before samples due | Amount of core preserved | Months before thin sections are due | Months before data are due | Months before data are made public | Sample limit |
|---|---|---|---|---|---|---|---|
| **Alaska Geologic Materials Center** | 1 week | 12 | 1/4 | N/A | 12 | Agreed upon between curator and individual | 3 boreholes |
| **British Columbia Oil and Gas Commission Core Research Facility** | No unscheduled drop-ins | 3 | Facility manager decision | N/A | 1 | N/A | N |
| **Department of Natural Resources core repositories Newfoundland and Labrador, Canada** | N/A | 3 | Enough to preserve lithologic sequence or prevent significant gaps | 3 | N/A | N/A | N |
| **Drill Core and Materials Storage Facility of New Brunswick, Canada** | At discretion of designated official | N/A | 1/4 | N/A | 12 | N/A | N/A |
| **Londonderry Core Library, New South Wales, Australia** | 1 week | N/A | 1/4 | N/A | 3 | N/A | N |
| **Perth and Kalgoorlie Joe Lord Core Libraries, Western Australia** | Formal request and approval (timeframe N/A) | 12 | 1/4 | 12 | 12 | N/A | N |
| **The University of Texas at Austin Core Research Center** | N/A | N/A | N/A | N/A | 9 | N/A | N |
| **United States Geologic Survey** | N/A | 6 | 1/3 | 6 | 6 | Upon receipt | 100 samples per visit |
| **Wilson M. Laird Facility, North Dakota** | 48 hours | Proposal-dependent | Proposal-dependent | N/A | N/A | N/A | N |

**Table A1.2.** *Policies of peer repositories for acceptance and transfer of ownership. Note, facilities that are not listed in the table did not have policies available on their website or they may not exist.*

| Facility | Form available for transfer of ownership | Timeframe for when core becomes public | Comments |
|---|---|---|---|
| **Drill Core and Materials Storage Facility of New Brunswick, Canada** | Y | 1-2 years, depends on law | Specific criteria listed for unacceptable materials (i.e., too deteriorated, unnecessary contribution as core already exists in the area, not labelled, or no map submitted); acceptance is up to the regional geologist who considers whether it is from deep or strategic boreholes, contains important features, replacement of inferior core already stored, from an area with no representative sample |
| **Londonderry Core Library, New South Wales, Australia** | Y | 12 months in facility unless agreed upon an expiry date | Robust ranking and point system involving geologists and curators to help determine acceptance that considers strategic criteria of core in the facility, geologic features/values, cost of redrilling, and core condition; hazardous materials are not accepted |
| **Perth and Kalgoorlie Joe Lord Core Libraries, Western Australia** | Y | N/A | Core to be registered upon receipt; mostly describes how to deliver and package materials and whether there are hazardous materials present |
| **United States Geologic Survey** | Y | Upon receipt | Provides guidance on how the core should be delivered, but no criteria for core acceptance |

**Table A1.3.** *Policies of peer repositories for disposal of materials. Note, facilities that are not listed in the table did not have policies available on their website or they may not exist*

| Facility | Comments |
|---|---|
| **Alaska Geologic Materials Center** | Existing archive that lacks essential data to make them of value; excessive volumes of samples from archived parent material (i.e., pulps/rejects) |
| **Drill Core and Materials Storage Facility of New Brunswick, Canada** | Deposits with the most representative material in storage and have already been studied in detail by the survey are given first priority of discard, materials to be discarded must be reviewed (core should be relogged and sampled); retain cores to create a representative cross-section, discard entire holes (no partial holes), photograph core before disposal, prioritize retaining whole core vs. partial core, notifications are sent out to lease holders 30 days before disposal, disposal is done in environmentally responsible manner |
| **Londonderry Core Library, New South Wales, Australia** | Indefinite retention unless core is duplicated by a more recent core in better condition, or if the core has deteriorated (i.e., by oxidation), is potentially unsafe, a need for space to be created for more geologically significant materials, if geoscientific significance is no longer deemed sufficient to warrant storage, if partial disposal of materials would not take away from value, and/or if it could be replaced with digital records. Any disposal must be approved by relevant Department geoscientist |

**Table A1.4.** *Other policies of peer repositories that may be of interest to help manage the DCL. Note, facilities that are not listed in the table did not have policies available on their website or they may not exist*

| Facility | Other Notable Policies | Contact Information for Academic Supervisor/advisor Provided by Student (Y/N) | Acknowledgement of Facility in Publication Required (Y/N) |
|---|---|---|---|
| **Alaska Geologic Materials Center** | For allowing sampling of core, the curator considers whether the sample will duplicate results, amount of sample remaining, sufficient scientific evidence that proposed study will achieve the intended purpose and benefit the scientific community. In-house advanced equipment (microscope) may only be used by experienced users and with approval by curator. There are fees associated with viewing and sampling core. | Y | N |
| **British Columbia Oil and Gas Commission Core Research Facility** | There are fees associated to use viewing tables and other functions of their facility. | N | N |
| **Department of Natural Resources core repositories Newfoundland and Labrador, Canada** | A waiver must be signed by visitors to use the facility | N | N |
| **Drill Core and Materials Storage Facility of New Brunswick, Canada** | There is specific language about sampling/analytical tests on materials from non-public or confidential land and that results must be delivered to the lease owner within 30 days. There is language on safety for visitors and staff using and working in the core facility. | N/A | N/A |
| **Londonderry Core Library, New South Wales, Australia** | A 50-element minimum requirement for assays on each sample, which must include major and pathfinder elements. The proposed list of elements to be assayed must be provided to curator prior to sampling. The sawing equipment is allowed for a fee and no cutting of radioactive or asbestos-containing core is allowed. Pulps must be returned with drillhole and include sample number and depth interval. | N | N |

| | | | |
|---|---|---|---|
| **Perth and Kalgoorlie Joe Lord Core Libraries, Western Australia** | Sampling will not be approved if the same intervals have been previously sampled for the same analysis. Special reference cores or "type" sections may only be viewed but not sampled. An individual, and the project (and associated team members) and the institution to which they belong will be refused sampling on any current or future projects if results of previous sampling have not been received in an acceptable format within the prescribed 12-month period. | N | **Y** |
| **The University of Texas at Austin Core Research Center** | N/A | N | Y |
| **United States Geologic Survey** | Analytical results must be formatted in a particular way. Returned thin sections must be labeled with core name/number and depth interval. Customers will not be allowed to view or sample additional material(s) until overdue results or thin sections are returned. | Y | Y |
| **Wilson M. Laird Facility, North Dakota** | Proposal MUST be submitted for sampling in order to evaluate whether the project is deserving of sampling, whether core material is available, and that the proposed work does not duplicate a previous sampling effort. Data and thin sections must be returned/submitted, but no timeframe is provided. | Y | Y |

# Appendix 2. Specific stakeholder comments on the role of the Drill Core Library.

The following comments were submitted by workshop participants, when prompted to describe the role of the DCL. They were organized into groups by DNR staff, with input from stakeholders, during the workshop.

## Group 1: Facilitate/Serve (9 comments)

- A team of highly knowledgeable people who inform and advise everyone; [RESEARCH]
- Staff provide knowledge of minerals-related activity and knowledge and data not available elsewhere; [ARCHIVE]
- A facility that is a model for others, whose design is influenced by counterparts; [RESEARCH]
- Valuable training resource for students and workers; [RESEARCH]
- A facility encompassing geologic materials and exploration documents and industry data; [ARCHIVE]
- Potential for diamond sawing core. Saves money; [CONSERVE]
- Education of geoscientists on earth materials and processes for current/future problem solving and understanding; [RESEARCH]
- By statute, save is default. Qualified staff to decide what to accept or keep; [ARCHIVE]
- Free storage!! [CONSERVE]

## Group 2: Archive/Preserve (12 comments)

- An archive of geologic materials, saved largely for unanticipated applications, as a wise investment for the good of all; [ARCHIVE] [RESEARCH] [ECONOMIC]
- The DCL allows for retention beyond the life span of exploration so that info isn't lost as companies move on; [ARCHIVE] [CONSERVE]
- Makes easily accessible samples that are difficult or costly to reacquire (subsurface or difficult surface access); [RESEARCH] [CONSERVE]
- The DCL allows for retaining knowledge for Minnesotans of the resources under our feet; [ARCHIVE] [STEWARDSHIP]
- Preserve knowledge (in the form of the geologic record of the state) and make it available for testing/reproducibility; [ARCHIVE] [RESEARCH] [TESTING]
- A "ground truth" location where source materials are kept for reference; [ARCHIVE] [RESEARCH]
- Public archive of historical exploration data; [ARCHIVE]
- Preservation of very expensive (and valuable) data; [ARCHIVE] [CONSERVE]
- Repository for mineral projects halted/abandoned midway through development process; [ARCHIVE]
- Historical documentation/record keeping of past work in the state; [ARCHIVE]
- Stores and preserves core from historic and current projects; and, [ARCHIVE]
- Material selected for retention on the basis of wise criteria. [ARCHIVE]

## Group 3: Impact minimization/Cost savings (2 comments)

- Curation and Preservation of information. At $100/foot, equals almost a half-billion dollars of history [ARCHIVE] [CONSERVE]
- Minimizes the environmental impact of exploration activities as companies can access pre-existing data [CONSERVE]

## Group 4: Support state government roles and mining (5 comments)

- Due to DCL on large degree, MN minerals rendezvous at Hibbing. A good hub; [ECONOMIC]
- Hibbing DNR jobs; [ECONOMIC]
- Library of future school trust lands; [ARCHIVE] [STEWARDSHIP]
- Physical representative of current and future revenue for the State of Minnesota; and, [ARCHIVE] [STEWARDSHIP]
- Demonstration that there is state government support for minerals and mining industry. [ECONOMIC]

## Group 5: Attract Interest (11 comments)

- Attraction of interest in MN: exploration, condemnation, investment; [ECONOMIC]
- Investment in future exploration, mining and academia – probably a new mine in the core; [RESEARCH] [ECONOMIC]
- Area evaluation for economic minerals; [RESEARCH] [STEWARDSHIP]
- Data can support positions that favor mineral exploration and development in MN; [RESEARCH] [ECONOMIC]
- Potential to help start drilling projects. Drilling targets. [ECONOMIC]
- A library of past exploration capable of allowing current and future companies of reviewing past exploration work; [ARCHIVE] [ECONOMIC]
- Resource to help encourage exploration and responsible extraction of Minnesota minerals; [RESEARCH] [ECONOMIC]
- Attractive resource when marketing projects in MN; [ECONOMIC]
- Due diligence opportunity for potential explorers and investors; [ECONOMIC]
- Economic impact for MN. Money. Resources; and, [ECONOMIC]
- Promote access to (now) public inventories for future (unknown) applications that benefit society. [ARCHIVE] [RESEARCH] [ECONOMIC]

## Group 6: Science and Research/Development (4 comments)

- Ability to review previously generated geologic theories, data sets, interpretations; [RESEARCH]
- Wealth of knowledge for regional and statewide prosperity; [ECONOMIC]
- Resource for applying new analytical techniques; [RESEARCH] [TESTING]
- One-stop shopping, Research access point; [RESEARCH]

## Group 7: Data (4 comments)

- Access to digital data for research/exploration; [ARCHIVE] [RESEARCH] [ECONOMIC]
- Core management *Data preservation, Library Exploration*; [ARCHIVE]
- Well-organized and readily accessible – on site, online; [RESEARCH] [ECONOMIC]
- Store samples and data for future use. Changing tech could revive “old” samples; [ARCHIVE] [TESTING]

## Group 8: Opportunity (10 comments)

- Provides samples and data that inform exploration planning; [RESEARCH] [ECONOMIC]
- The DCL supports an understanding of geology on a broad scale, beyond 1 company’s work (academic support); [ARCHIVE] [RESEARCH] [STEWARDSHIP]
- Cheap resource for graduate school theses; [RESEARCH] [CONSERVE]
- Supports bedrock mapping; [RESEARCH]
- Resource for evaluating emerging opportunities/concepts [TESTING]
- Learning and Teaching resource for academic and resource organizations; [RESEARCH]
- Provides a central physical geologic record for study, available to the public or private sector. [ARCHIVE] [RESEARCH] [ECONOMIC]
- Allows for research into new ideas based on historic core and field samples; [RESEARCH] [TESTING]
- Research, Education, History; and, [RESEARCH]
- Information that allows assessment of minerals-related risks/rewards. [RESEARCH] [ECONOMIC]

# Appendix 3: Comments from workshop participants on DCL storage of pulps, rejects, and surface samples

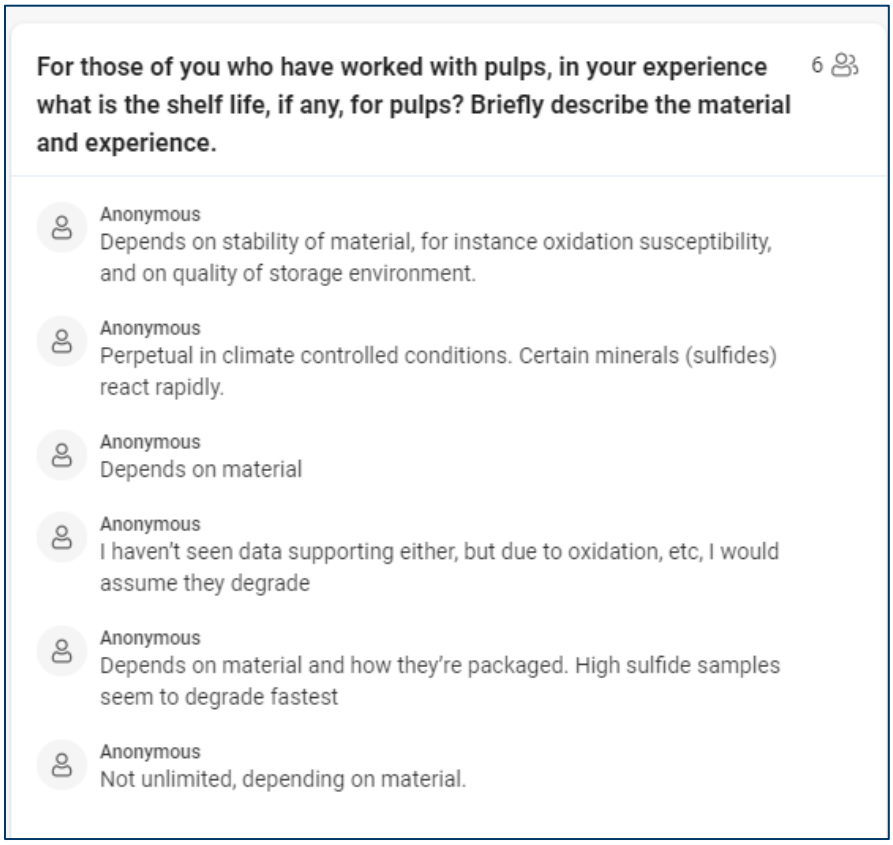


**Figure A3.1.** *Stakeholder input on shelf life of sample pulps*

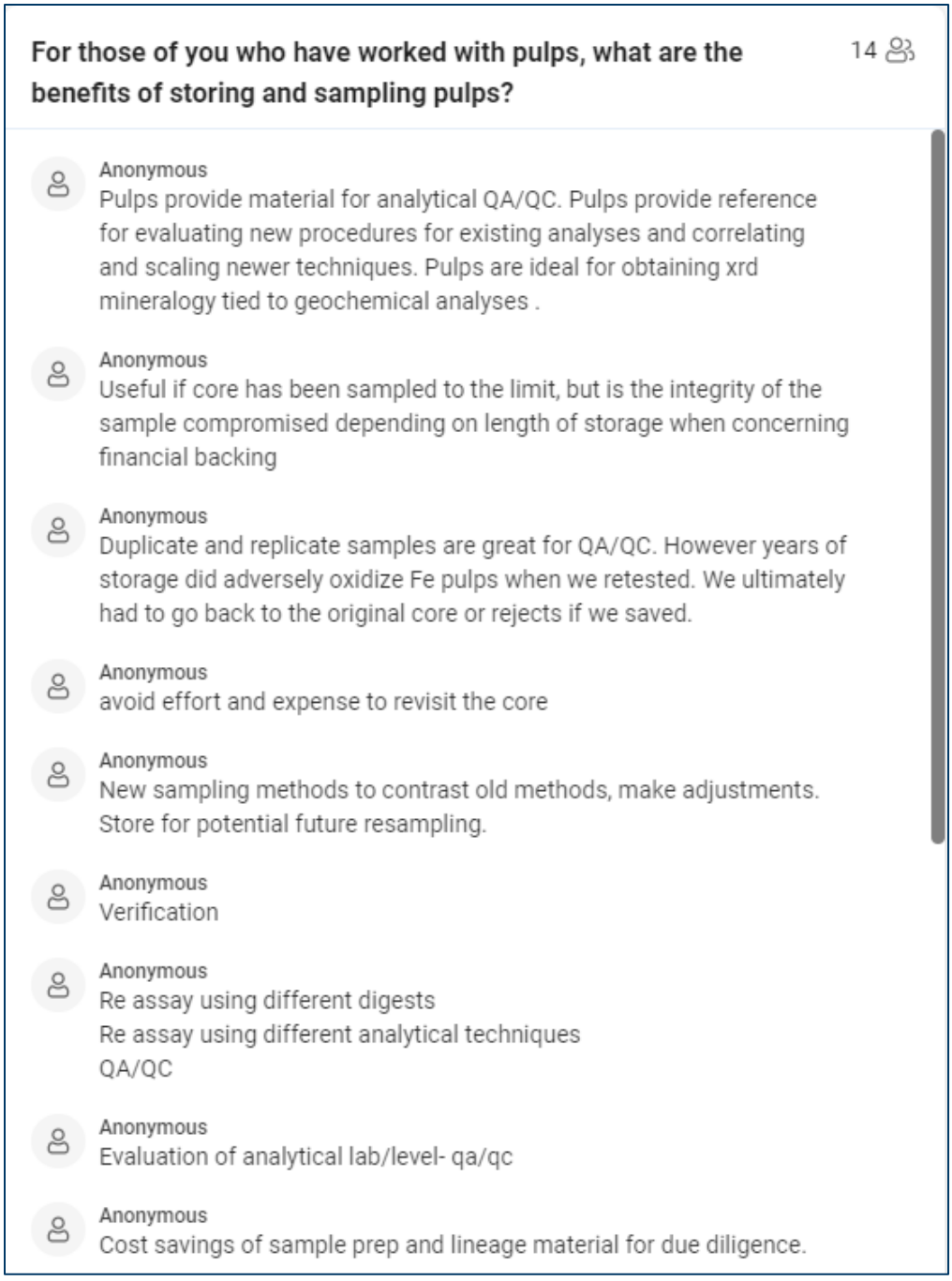


**Figure A3.2.** *Stakeholder input on benefits of retaining sample pulps*

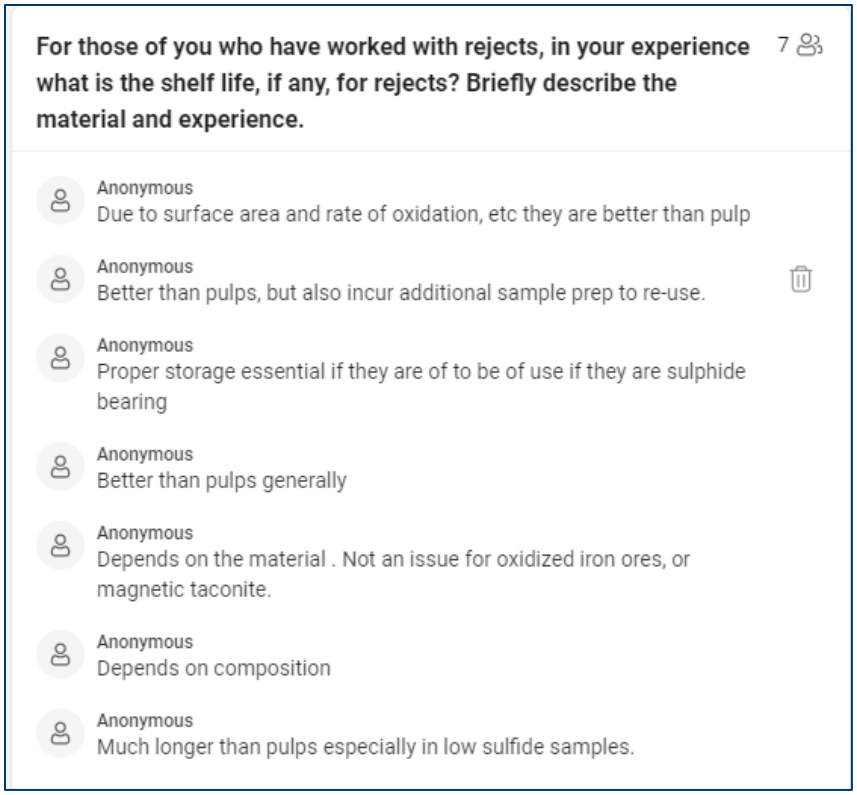


**Figure A3.3.** *Stakeholder input on the shelf life of sample rejects*

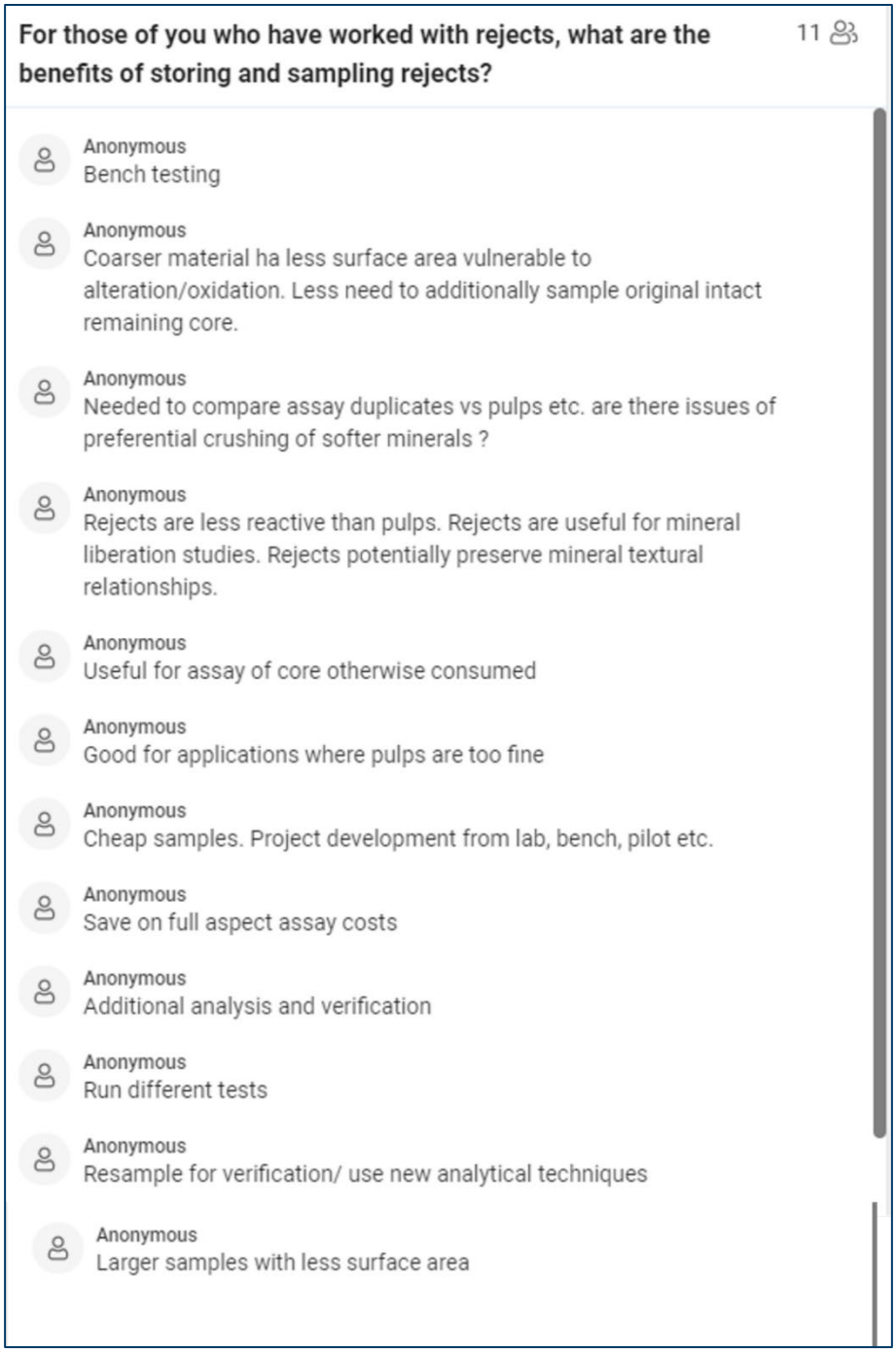


**Figure A3.4.** *Stakeholder input on the benefits of retaining sample rejects*

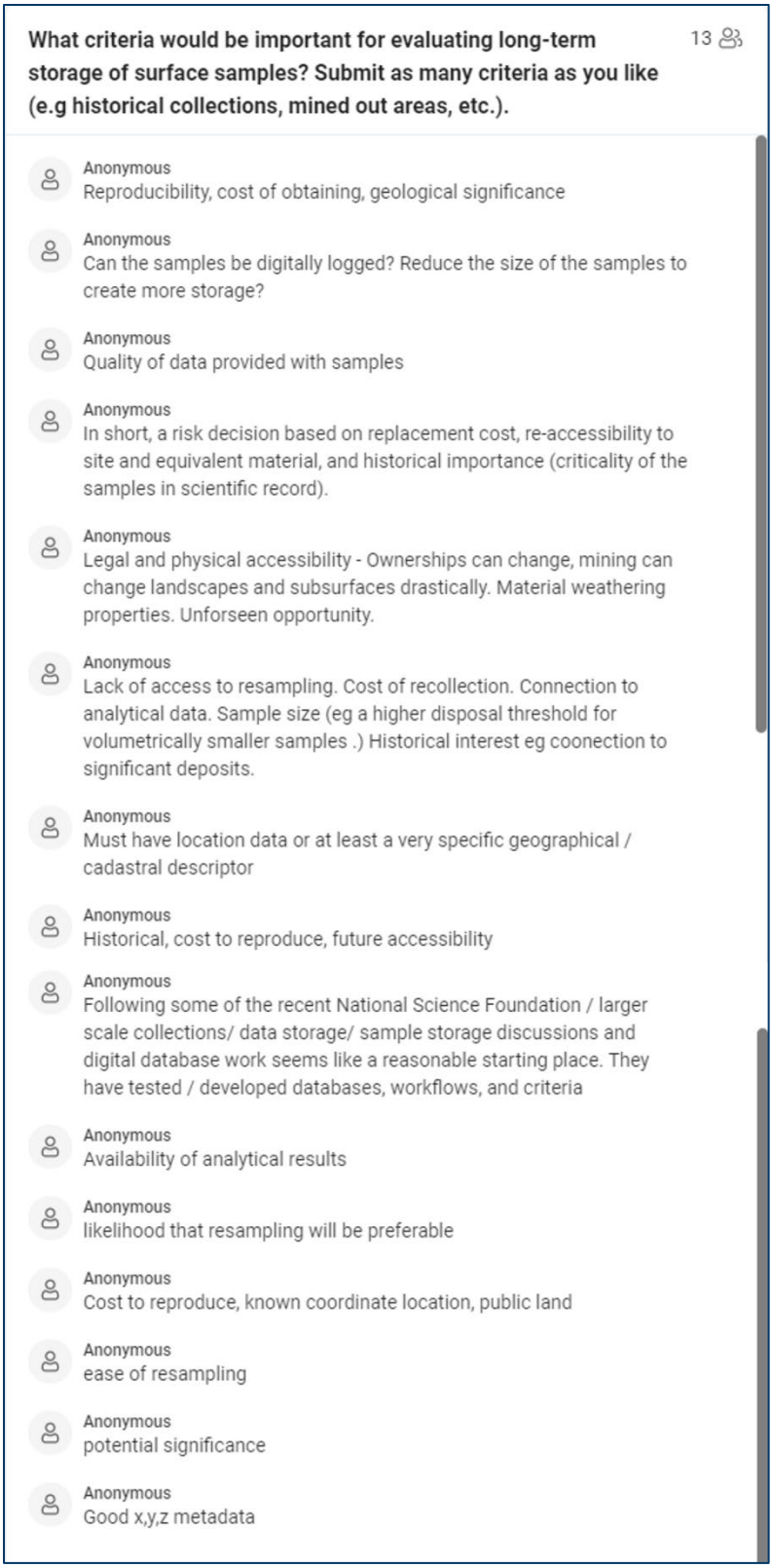


**Figure A3.5.** *Stakeholder input on criteria for accepting or retaining surface samples within the DCL collection*

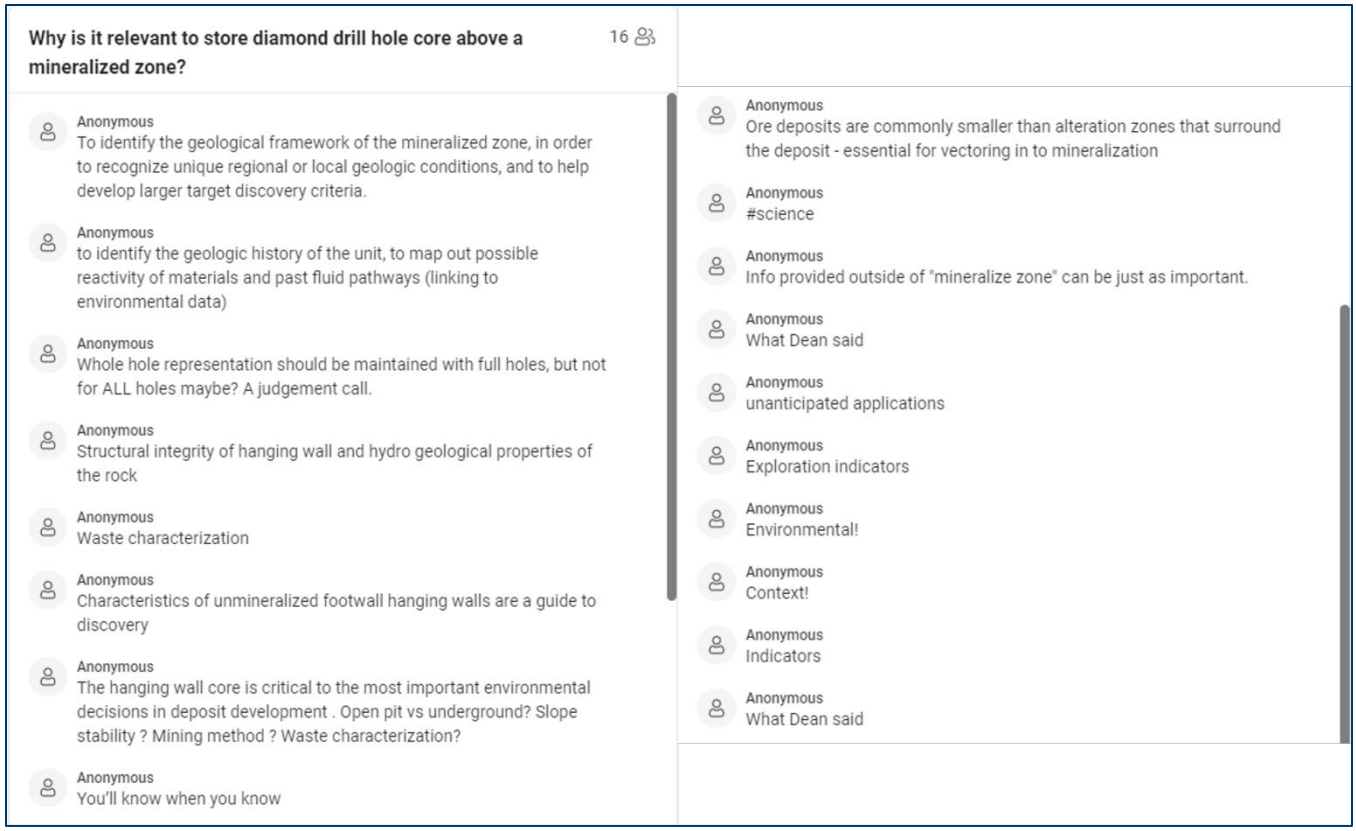


**Figure A3.6.** *Stakeholder input on the relevance of core intervals outside of identified zones of mineralization*