Minnesota Minerals Database Project:

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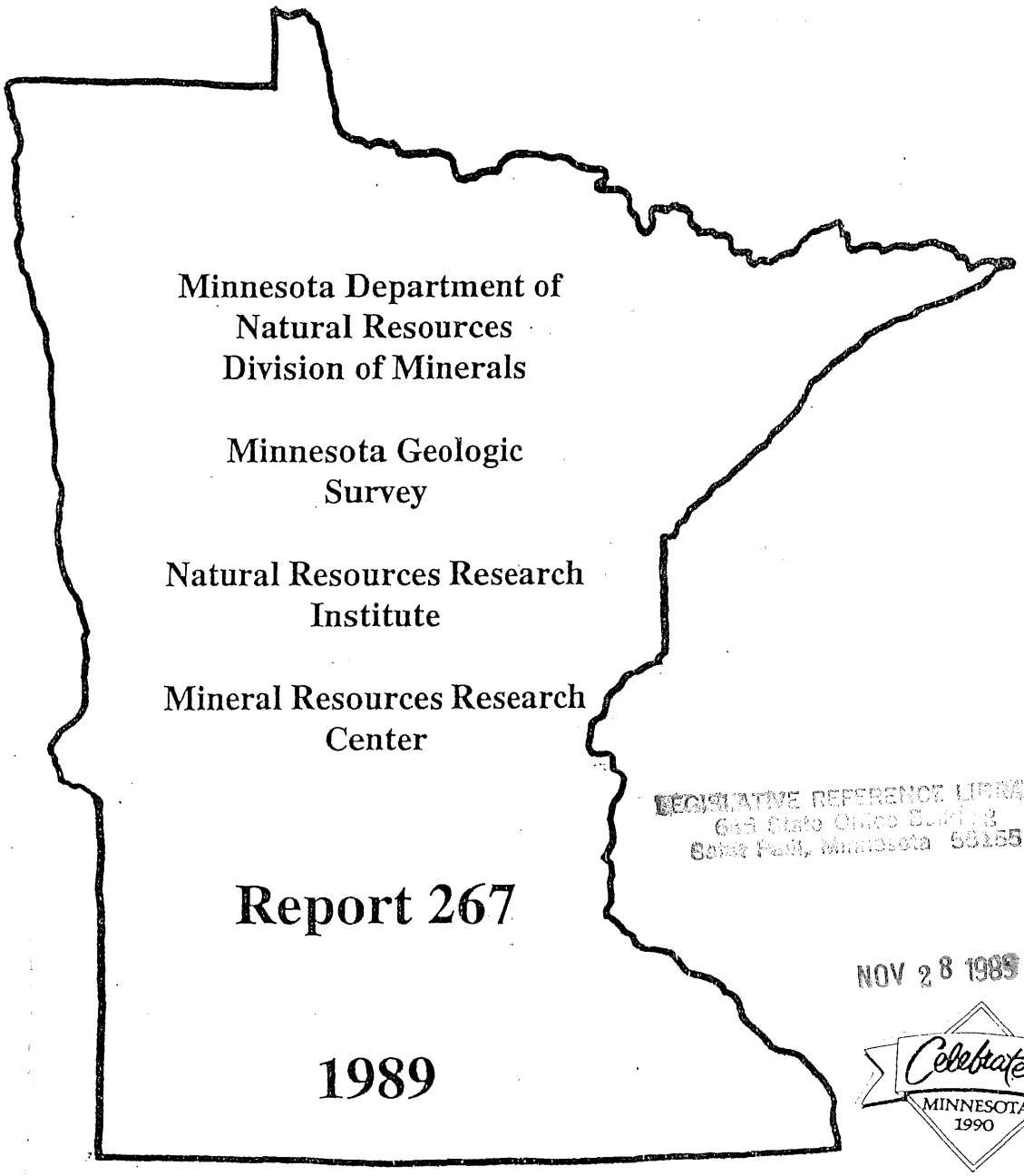

Minnesota Department of Natural Resources
Division of Minerals

Minnesota Geologic Survey

Natural Resources Research Institute

Mineral Resources Research Center

Report 267

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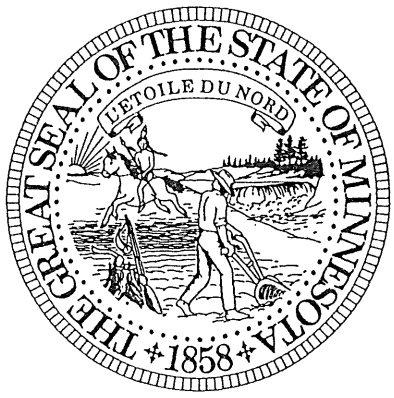

Minnesota Minerals Database Project:

Report on Preliminary Systems Analysis

By:

R.W. Ruhanen, *Department of Natural Resources, Minerals Division*

P.L. McSwiggen, *Minnesota Geological Survey*

S. Hauck, *Natural Resources Research Institute*

R. Lipp, *Mineral Resources Research Center*

A
Minnesota Minerals Coordinating Committee
Project

1989

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This report is on file at various major libraries in Minnesota. It may be purchased at the Hibbing office, DNR Minerals Division. For further information contact Richard Ruhanen at (218) 262-6767

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Abstract

The Minerals Database Subcommittee was established in February of 1988 with the task of doing a feasibility study towards the creation of an inter-agency, unified minerals database. The goals for the biennium were twofold: To catalog data, computerized and manual, existing at each agency, and to canvass the potential end users of such a database as to their needs regarding geoscience information.

A systems analyst and a geological database consultant was contracted to oversee these activities and report to the subcommittee. In addition, a workshop was held to involve potential end users and gain from their insights of the project. The results of this work are presented in this report.

Introduction

Personal computers are revolutionizing the availability of earth science data. They allow the geoscientist to access, manage and manipulate very large data sets with relative ease. Computers make it possible to integrate different data sets from a given geographic area without the necessity of handling and creating many different hardcopy maps and files. Sophisticated software used for the integration and statistical analysis of spatial data that was once available only on mainframe computers can now be used on personal computers, making these computing capabilities more generally available.

The geoscience community is now in need of geotechnical data in a digital form that will allow them to determine what data is available, easily access the data they need, and then manipulate and output the data in a form most beneficial to their needs. When creating a digital information system it must be designed from the perspective of the desired end results. The first step is to determine what the potential users want out of the system. Knowing what the function of the data will be determines what data belongs in the system, how it will be formatted and how the data will be acquired and entered into the system.

The Mineral Database Subcommittee began a systems analysis process to address these considerations. Information systems consultants were contracted to aid in developing a project strategy, interview potential end users of the system, and inventory existing information systems at each of the four geoscience agencies involved with the project.

Summary

The first meeting of the Minerals Database Subcommittee was held during February of 1988. During this and subsequent meetings the decision was taken to adopt a two fold approach to the analysis task before the subcommittee. While a systems analyst inventories the functions and existing information systems of each of the participating agencies, a geoscience information system consultant would assist in giving direction to the project.

A systems analyst was not available through state agencies, so a programmer/analyst with CAP Gemini America was contracted to begin this work. While not being experienced in the geoscience area, he has worked on projects similar to this one, involving the unification of several large, diverse data sets into an integrated information system. The tasks of this systems analyst were to identify the data needs of the potential users and to inventory the existing information systems, both manual and digital, at each agency. To accomplish this the analyst first developed a number of forms to collect information about the present activities of the agencies and the information they house. He held interviews with staff members from all four geoscience agencies and supervised the cataloging of their information systems. These tasks focussed on identifying individual data needs and where and in what form that data resides. The systems analyst's report is Appendix B to this report. Cataloging of the data elements in each agencies information systems has not been completed due to staff shortages. The Database Subcommittee is presently prioritizing the information systems and an inventory of their individual data elements will begin this next fiscal year.

Alaster Currie, a geoscience database consultant from Toronto, Ontario, was contracted to recommend strategies and direction for the project. His experience as a field geologist and as a Senior Review Geologist at the Geoscience Data Center of the Ontario Geological Survey makes him well qualified to perform this service. Currie met with the Database Subcommittee in late September of last year for an overview and discussion of the project. He gave a presentation at the database workshop in which he outlined the concepts involved. A report with his recommendations are included as Appendix A to this report.

In order to canvas non-agency data users, a workshop, "The Minerals Database Forum", was held in October of last year. A mailing list consisting of 400 persons was developed and questionnaires were sent to each along with an invitation to participate in the workshop. Approximately 10% of the questionnaires were answered, and 30 responders attended the workshop. The workshop proceedings are available for purchase from the DNR Minerals Division, Hibbing, MN.

Discussion

Systems analysis is a generic term for the task assigned to the Minerals Database Subcommittee. It involves unifying an enormous amount of data archived in both digital and hardcopy formats at the four geoscience agencies represented by the Minerals Coordinating Committee. This process has been subdivided into four phases which build on one another to form the final product. These phases are:

1. Feasibility and preliminary design,
2. prototyping a functional system,
3. implementing and evaluating the system, and
4. operation and maintenance of the system.

One of the keys to the success of any information system lies in its value to the end user community. This community has to be brought into the analysis at an early stage, since their insights determine how the system will function and identify any deficiencies in the existing data. The end user will be consulted throughout the systems development work. Since end users tend to see the system application in their own narrow terms, a cross section of all potential users - from government, private industry, and academia - will be asked to participate in the evolution of the system. The Minerals Database Forum constituted the starting point of end user involvement.

A major part of systems analysis involves the construction of a detailed catalog of information systems existing at each agency. This catalog will provide a listing of each agencies information systems and the elements contained within each system. This information will outline areas of overlap between agencies, and will show where data is missing from the perspective of the overall system. This catalog will also be a starting point for standardizing data definitions and for an application programmer to begin developing the software to handle this information.

Phase 1 has been initiated but is far from completion due to limited funding during the 1987-1989 biennium. End users have been interviewed and a preliminary catalog of information systems has been made.

The interviews and the Minerals Database Workshop have shown that there is a general consensus regarding the future direction of the minerals information system. In general, most users would like to see a centralized repository for geotechnical data as a single source for all the available information on Minnesota geology. The original data would be maintained by the agency that created it, but a computerized copy would be collected by the Mineral Database Subcommittee to be included into the overall system. Contributions from each agency would be determined by the respective agency and the subcommittee. This will give each agency control over its own data and also access to the total database. This centralized minerals information system would also be the focal point for public inquiries and requests for data. This data will be available to all in several standard ASCII formats on magnetic media suitable for personal computers and for uploading to larger systems. For Geographic Information System (GIS) compatibility, appropriate data files will contain geographic references - Public Land Survey, UTM, and latitude/longitude coordinates.

The Mineral Database Subcommittee is involved in defining both the short and long term strategies of this project with the short term being two years or less and the long term

being six years or more. In order to make progress and keep the project visible, it is felt that a concrete product should be produced each biennium. These short term projects would constitute intermediate steps designed to achieve a long term goal. One project that is in demand by end users is an index to the datafiles of each agency. This will be an outgrowth of the system cataloging phase referred to earlier. Once phase 1 is complete, a prototype of the system can begin to be developed. This is a longer term project but can be accomplished in stages. Good candidate sites for such a study would be northern Itasca County and/or several townships in Lake county.

Conclusions and Recommendations

Both shorter term and longer term goals are recognized for this project. The goals are not presented in detail because many of the details are yet to be worked out; they must emerge from the information system data element cataloging and system standards which have not been completed.

The organizational structure may be thought of in three levels:

Level 1 would be the four individual agencies. Since each agency would input data to the database, they will be responsible for the quality and error-free nature of the data.

Level 2 would be the database managing and publishing functions. One of the agencies involved with the project will be the centralized minerals database repository. Both Charles Hanselman and Alaster Currie have recommended the DNR Minerals Division for this role; the Land Management Information Center (LMIC) should also be considered. The database repository would be for public inquiries; individual agencies would also have a complete set of the data for their own use.

Level 3 would be the project management function. The minerals database subcommittee will be responsible for:

1. Overseeing the information system development,
2. reporting the system's progress to the Minerals Coordinating Committee, and
3. coordinating of funding and equipment requests.

The role of a database project manager will be most critical in the development of this system. This individual (see #1 under **Project Lifetime** below) will oversee its day to day construction and operation, and will report to the Minerals Database subcommittee; during the development stage of the system, a database project manager independent of the four agencies involved will be most effective. Therefore, it is recommended that a person with earth science information system experience be hired to assume the role of database project manager. This database project manager will interact with any outside consultants brought in at various stages in the project to help in planning, software development, etc. and will be responsible to the database subcommittee for items one through three listed above.

In order to implement this database system, a substantial investment in computer equipment and personnel is needed at each agency. Staff must be allocated to finish the data element cataloging, and system standards must be established. To supply a complete geographic information service to the end users, digitizers, plotters, computers, and the staff to operate them must be funded. However, if we focus on the data itself, rather than supply Geographic Information System tools to use with the data, substantial savings may be made in terms of hardware, software, and personnel. Geographic Information System capabilities will be built into the data with these services added in the longer term as demand dictates, while those with GIS capabilities would be able to use the data in that capacity immediately. Certain geographic areas of the state will be prioritized and the backlog of existing data brought on line over time. Also, certain tasks, such as digitizing and other data entry, could be completed under contract to businesses specializing in these functions.

In summary, essentially two approaches are possible for this project: Build a complete Geographic Information System with workstations at each agency, modem access, and custom outputs, which will make this project very expensive over the next 6 to 8 years or more (this is recommended in the long term); or, build an inter-agency relational information system founded on geographic locators, which would be much less costly in terms of hardware and software. The major cost involved with either project would be in creating digital files from the huge backlog of data residing at the Minnesota Geologic Survey and the MN DNR Minerals. This data should be prioritized by geographic area and encoded in "chunks" so that the ares covered by the minerals information system may be built over time, perhaps with funding from different sources such as LCMR. The system standards discussed above must be established in order to begin construction of the system.

Following are the recommendations of the Database Subcommittee:

Project lifetime.

1. Hire a Database Project Manager.

Our experience has shown that this project cannot be undertaken without the proper staffing and funding. Also, the Database subcommittee members have full time tasks at their respective agencies and thus cannot devote the time and effort needed for a project of this magnitude. In view of these facts, it is strongly recommended that a database project manager be hired. This position would report directly to the database subcommittee and be under its control; it is imperative that this position be independent of the respective agencies. This person will be responsible for implementing the policies and priorities of the subcommittee as previously mentioned above; this person will be responsible for the day-to-day system development work as well as such topics as funding, staff, and equipment needs for given short or long term tasks.

2. Hold workshops at regular intervals.

In order for these digital databases to be of use, continuous input must be solicited from potential end users. The Minnesota Minerals Database Forum was the first of these workshops. Similar meetings should be held regularly throughout the project to keep the end users of the database involved with the project and ensure that useful products are produced. As an alternative, end users could select a small group to represent their interests in the project.

3. Participate in the MN NRGIS Consortium

The Minnesota Natural Resources Geographical Information Systems Consortium has been established to provide a forum for communicating and sharing information among the growing community of environmental and natural resource geographic information system users and data producers in Minnesota. NRGIS consists of resource subcommittees (ie. Hydrology, Wildlife, Transportation), one of which is Minerals. The NRGIS provides a vehicle to bring together other parties, besides the four Minnesota Minerals Coordinating Committee agencies, who have a vested interest in mineral resources. Work taking place within the NRGIS on Data Standards and Exchange will be integrated into the development of a Minerals Information System.

Short term.

1. Complete the systems analysis phase of the project. The database subcommittee hired a systems analyst who began cataloging the information systems at each agency. Based

on the subcommittee's priorities, information systems should be cataloged at the data element level. This will identify data links, overlapping information systems, and missing data elements. Also, the standardization of formats (system standards) for key data elements, such as geographic location, drill hole numbers, company names, etc. will be possible during and as a result of this process. This information is needed to build a general system design and prototype.

2. Complete an index of data held at each agency. This will be an indirect result of (1) above. A paper index for all prioritized data systems extant at each agency will be available upon the completion of the systems inventory phase. For a digital index suitable for distribution, smaller segments of data would have to be processed individually and, from these segments, the larger index will be built over time. An example of a data segment would be drill core and outcrop data from the Vermillion district.

3. Publish data sets as they become available. This could be a group of data from any or all of the agencies involved in the project. The data would be georeferenced (UTM, Lat/Long). By publish we mean distribute on magnetic and paper media to the public. As a corollary to data distribution, query interfaces could be developed for certain data sets and distributed with the data so that the recipient would be able to search the database without purchasing a specific software package.

Long term.

1. Build a graphical interface for the data index. This would allow the user to see the relationships of each data set on a map. It would be linked to a data location index for any given item on the map of an area, such as a township.

2. Build a Geographic Information System for use by the public on workstations at the various agencies. Once the data is properly formatted, this task becomes a matter of hardware, software and personnel needs; these needs will be determined by the database project manager and his or her staff. Workstations would need to be established at each agency along with accompanying software, documentation and support personnel.

Appendix A:

Report on Direction and Implementation of Mineral Databases

by:

Alaster Currie

Database Consultant

Appendix A

Executive Summary

The State of Minnesota has established a minerals diversification program to broaden Minnesota's minerals industry. The State has created a Minerals Coordinating Committee with members from the academic community and government agencies (Minerals Division of the Department of Natural Resources, Minnesota Geological Survey, Mineral Resources Research Center and Natural Resources Research Institute) which has formed a Subcommittee for a Minerals Database. This Minerals Database Subcommittee is responsible for the initial phase of designing a cooperative interagency Minerals Database.

This report is to advise the Minerals Database Subcommittee of directions to pursue in order to establish a Minerals Database.

The formation of the Minerals Coordinating Committee, as the name implies, was in response to the need for integrated management of minerals activities and information. Users of geoscience information services are increasingly expecting to have access to the data they require in an integrated way. A goal of the Minerals Coordinating Committee should be to establish an integrated information service to clients through the Minerals Database System. The emphasis should be on the Service to Clients and not on the System. The Minerals Database should be focussed on the long and short term needs of "minerals" clients.

A management function, which could be carried out by the Minerals Database Subcommittee, will be required to draft policy and make priority proposals so that the Minerals Database functions in a truly integrated fashion and that the needs of users are met in a practical way.

The provision of information services is an operational task and thus it is suggested that the Minerals Division of Department of Natural Resources be the publisher of the Minerals Database. Each agency would continue to manage the minerals data sets they currently manage. The Minerals Division, in its publishing role, would be a source from which users should be able to access to all available digital minerals information managed by the four agencies.

The Minerals Database Program should be viewed in two time frames:

1. *long term view over 6 years and*
2. *short term view over two years.*

The long term view will be concerned with integration of all the minerals data sets, the creation and conversion to computerized format of minerals data sets, and the evolution the Minerals Database into a "Geographic Information System" with computer produced minerals maps.

Two short term projects are proposed. The first project is to publish the digital files describing the drill core in the Hibbing Drill Core Library. These files, with some upgrading, could be distributed to clients in an easy to use format within one year. The second project is proposed in response to users, who at the Minerals Database Forum, stated that a pressing need they have is for an integrated digital index to all Minerals Data managed by the four agencies. This index project could be completed within two years.

Introduction

The Minerals Coordinating Committee was directed by the State Legislature to prepare and adopt a ten-year plan for mineral diversification. This committee includes the directors of the Minerals Division of the Department of Natural Resources, Minnesota Geological Survey, Mineral Resources Research Center and Natural Resources Research Institute. The Minerals Coordinating Committee established the Minerals Database Subcommittee to conduct the initial phase of designing a cooperative, interagency Minerals Database. The purpose of this report is to advise and provide direction for the Minerals Database Subcommittee so that it can implement the Minerals Database.

The data sets managed by the four agencies cover a wide range of geoscience data sets, from printed geological reports and maps to digital files describing core in the Drill Core Library. The great variety of data types as well as the large number of data sets (more than 100 data sets) make the creation of an integrated Minerals Database a task that has to be approached systematically and with a clear sense of purpose. Considerable effort will have be made to make it possible to build data sets that are managed by their respective agency which, when queried by the end user, will seamlessly integrate with all other data sets. The task will have to be approached by each agency in a manner that reflects the unified nature of the total Minerals Database. Ad hoc changes to the structure of a data set, by the agency that manages the data set, will no longer be possible as these changes would break down the high level of integration required by the Minerals Database. All changes to the structure of a data set will have be done in a coordinated way across the Minerals Database.

The high level of integration required of the Minerals Database is a result of the way in which geoscience users carry out their exploration activities. They use multiple data sets in a specific area of interest and quite rightly expect to be able to move from one data set to another, using, for example, a drill hole number that is standardized across all data sets.

Review of Existing Databases

The four agencies, that will contribute their data sets to the Minerals Database, manage just over 100 data sets. These range from digital map data sets such as the Platinum Map Database of NRRI, which was developed using AutoCad, to the Reclamation Library of DNR, an informal collection of reclamation and related literature. These data sets were developed to meet the needs of individual projects not developed as part of an all encompassing integrated minerals database.

After the inventory of data sets is complete it would be extremely useful to look at the interrelationships between each data set and the other data sets. The results from this work would produce clusters of related data sets which would make the planning process for integration of the data sets much more straight forward. Once it is clear which data sets are related to each other then the content of each data set could be modified. For example, adding explicit links in each record so that the user can query one data set and then continue to query other data sets without being aware that they are different data sets, possibly managed by different agencies. Some data sets will not be included in the Minerals Database (eg collections of literature for use of staff).

The fundamental requirement for future data set integration is the standardization of how geographic location is recorded in database. Location should also be recorded

precisely as possible (ie UTM or Lat/Long) rather than using only section, township and range'. Section, township and range can be derived from the location in UTM if required, to maintain uniformity with the older records.

For future costing exercises it would be useful to have an accurate estimate of the size of each data set.

Review of Minerals Database Forum

The Minerals Database Forum took place at Natural Resources Research Institute, Duluth on October 4, 1988. Thirty people attended the Forum. The day was split in two parts. The morning was reserved for talks and the afternoon was for working groups composed of the attendees. The talks in the morning were designed to provide a context for the discussions that would take place in the working groups in the afternoon.

After the working groups had reached their conclusions an open discussion took place with all the attendees. Each working group had prepared a list of conclusions. Several important conclusions were common to many of the working groups. The ability to use several data sets in an integrated fashion was thought to be extremely important. Good information on geographic position was thought to be critical in the future when alphanumeric data sets would be used in Geographic Information Systems.

Another suggestion was to develop highly practical projects which would provide existing data to the end user on the users own computer equipment. One such proposal, which does not use data assembled currently in one data set, was for an overall digital index to all minerals data managed by the member agencies of the Minerals Coordinating Committee. It was felt that this index to all data, digital as well as hard copy, would be of major benefit to users.

Future Directions

Database projects should be user driven. The focus should be on designing and managing the project so that the needs of the user form the basis for design and management decisions. In a project as large and long term as the Minerals Database project, the project has to be split into several components. These components are:

1. design of user services both long and short term,
2. creation of new databases by conversion of hard copy databases to computerized format
3. database design and
4. the organizational framework within which the project is managed.

A management function, which could be carried out by the Minerals Database Subcommittee, will involve drafting of policy, overall coordination and proposing priorities for proposals for the Minerals Database project. It is extremely important that the Minerals Database functions in a truly integrated fashion which will require that all agencies coordinate their effort in the design and creation of data sets that fit into the overall database. Considerable thought will have to be given the methods used to distribute digital data to users so that the needs of users are met in a practical way.

The distribution of digital databases to end users is a publishing task similar to book

publishing. The publishing function is operational in nature and thus it is suggested that the Minerals Division of Department of Natural Resources be the publisher of the Minerals Database. Each agency would continue to manage the minerals data sets they currently manage. The Minerals Division, in its publishing role, would be a source from which users should be able to access to all available digital minerals information managed by the four agencies.

Data integration was a major topic at the Minerals Database Forum at Duluth as well as a driving force behind the formation of Minerals Database Subcommittee of the Mineral Coordinating Committee. At the forum in Duluth two types of data integration were identified:

1. The ability to use two or more data sets, managed by one or more agencies, so that the user was unaware of the divisions between the original data sets. This requires considerable coordination between the agencies and will be a major responsibility of the Subcommittee.

2. Good quality information on the geographic location of features described in each data set. This is critical, if the existing and new data sets are to be able to be used in a Geographic Information System (eg ArcInfo at NRRI in Duluth). These systems use geographic position to integrate data from different data sets.

A commitment to using digital databases as a means to provide information to end users makes changes in the way work is carried out. Staff who are collecting and/or interpreting data need the computer equipment so that their work can be easily added to the database. The basic approach of an agency should be that the results of the effort in the collection and manipulation of data should be preserved in the database for the use of staff in future projects as well as external users. This working method requires more effort in coordination and staff time initially but the pay off in the long term can be considerable.

The period of change-over from mixed hard copy and digital data sets to fully digital data requires considerable financial support. Resources are required to equip staff so that the results of their work can be input directly into the database. This ensures that the database is up to date. The major financial commitment is the conversion of existing hard copy data sets. There are over 100 data sets managed by the four agencies with a mix of hard copy and digital databases. What is critical to establishing the cost of converting hard copy to digital format is the volume of hard copy to be converted not the number of hard copy data sets. In the absence of this data my best estimate for the conversion cost is $3 to 5 million, but conversion costs will be greater if as part of this process additional data (eg UTM) is added to enable the data sets to be fully integrated with other data sets. In selecting data sets for publication in a digital format the costs of this conversion may have considerable effect on priority setting if budgets are restricted.

Services to External Users

There are two major types of information services to users:

1. providing copies of data sets on floppy disks for them to run on their own microcomputers and
2. database services provided in agency offices for the data sets that each agency manages.

Publishing of data sets, for the reasons stated above, is best done through one agency.

The form of the published product will be determined by the number of potential clients.

For less than 100 clients it may not be cost effective to provide a compiled user query interface as well as the data set. A low cost option would be to provide each data set in several standard formats with documentation describing the files. Any user interfaces developed for internal use could also be provided to clients on an "as requested" basis. The user would have to have a copy of the same database software as the agency to use the interface developed for internal use.

For data sets with large number of users it would be economic to create fully packaged products that include a user interface, the data set and full documentation. This approach makes it possible for users with little computer experience to query to database as all the steps they have to follow are fully documented.

It would be useful if across the four agencies the user interfaces made available to the end user (ie external user) were of a common style. The user would then not have learn several query interfaces to use the Minerals Database. These interfaces for external users may not have all the features required by an agency's own staff, so that there may have to be variability in the interfaces used internally, but uniformity of user interfaces for external users.

Location of mineral data is critical to the user. A useful service that could be developed is the provision of custom plots from the Minerals Database. Custom plots would be generated using existing digital data that includes geographic location as part of the record. Using AutoCad or some other graphics software these data could be plotted with existing digital base maps or if digital base maps were unavailable then plotting could be done on a plotted geographic reference grid (UTM or Lat./Long) that would match the grid on existing paper topographic or geoscience maps. The plotted information would then be overlaid on the paper map so the user can relate the information to that on the paper map. This provides a bridge between an all digital Geographic Information System and alphanumeric printouts currently available. Plots at various scales and projections could be provided using CAD drafting software on an AT or 386 microcomputer and a pen plotter.

A considerable part of the current hard copy data sets created by the four agencies is text in the form of reports. Text currently in digital format could be stored and queried in software designed to manage text databases. As new reports are written and published, there is potential to structure the text so that the traditional printed report would be produced as well as the text put in a format suitable for a text database. If properly done there would be no extra effort in structuring the text for the text database as the structuring of the text for typesetting is all that would be required.

Project Scheduling

The Minerals Database Program should be viewed in two time frames:

1. long term view over 6 years and
2. short term view over two years.

The long term view will be concerned with integration of all the minerals data sets, the creation and conversion to computerized format of minerals data sets, and the evolution the Minerals Database into a "Geographic Information System" with computer produced minerals maps. The benefit of setting long term goals is that it provides a context for all activities concerned with data collection, storage and delivery. One method to organize work

towards these goals is to define the role of each data set and its interrelationships to the other data sets. The staff working with a particular data set now have a context to work in and can modify their current database creation and maintenance work so that the present and future requirements for their data set are met. This process does not require large budgets to carry out but does require staff time and organization to carry through to completion. It is a worthwhile step, even if funds for hard copy conversion are unavailable, as it lays down the frame work for a successful integrated database from which users can be served.

The short term goals should be primarily concerned with providing users with improved access to existing data. Digital files exist describing the drill core in the Hibbing Drill Core Library. These files with some upgrading could be distributed to clients in an easy-to-use format within one year. This project would take from 1 to 2 man-years of effort plus the computer equipment for the staff.

A major requirement of users, that was voiced at the Minerals Database Forum, was the pressing need for an integrated digital index to all Minerals Data managed by the four agencies. This index project could be completed within two years. The effort required to complete this project is difficult to estimate without a good knowledge of the status of each data set. A digital data set would require minimal effort to add to the digital index but a hard copy data set would require conversion of the index data to digital format. An estimate of resources required for this project would be from 6 to 9 man-years plus computer equipment.

Recommendations

1. It is recommended that Minerals Database Subcommittee be responsible for coordinating the Minerals Database project.

A coordinating function is required for the Minerals Database project which could be carried out by the Minerals Database Subcommittee. The Subcommittee would be responsible for developing policy, planning proposals with both the short (1-2 years) and long term (6 years). A coordinator should be appointed who would be responsible on a day-to-day basis for the coordination of the Minerals Database project. This Coordinator would have to have a strong geological background with working knowledge of database management techniques. The task is to develop practical solutions that deliver minerals data to users.

2. It is recommended that the Minerals Division of Department of Natural Resources be the publisher of the Minerals Database.

Each agency would continue to manage the minerals data sets they currently manage. Users would be provided with a well defined source from which to obtain digital minerals data.

3. It is recommended that by the end of the first year of the Minerals Database project that the digital data set describing drill core from Hibbing Drill Core Library be published.

This is a highly practical project as a first project because it uses existing digital data that are of great interest to the exploration industry.

4. It is recommended that by the end of the second year of the Minerals Database project that a digital index be published that describes briefly all Minerals Data managed by the four agencies.

This digital index was proposed by users at the Minerals Database Forum. The index would greatly improve access to all the data sets managed by all four agencies, both digital as well as hard copy.

5. It is recommended that the ultimate goal of Minerals Database project be the creation of an integrated, geographically-based geoscience information system designed to meet the needs of end users.

Geographic location is the one attribute that all geologic data has. It is the main means by which all geoscience data can be integrated. A Geographic Information System (GIS) approach is essential to obtaining maximum long term benefit for users from the Minerals Database project.

6. It is recommended that, within the next year, a review be done of the existing data sets to determine what changes or additions must be made to each data set so that they can form an integrated Minerals Database with a unified locational component.

This review is an essential first step in the establishment of an integrated database. It provides the context within which work on each data set can be carried out. If work starts on building or revising a data set before this review is completed then this effort may be wasted as some or all of the work may have to be redone to conform to the requirements of an integrated Minerals Database.

Appendix B:

Summary Report from User Interviews During Preliminary Systems Analysis of Minnesota Minerals Integrated Database

by

Charles Hanselman

Systems Consultant
CAP Gemini America
Minneapolis, Minnesota

Appendix B

Synopsis

The Minnesota Minerals Coordinating Committee, created as part of the State of Minnesota Minerals Diversification Program, formed the Minerals Database Subcommittee. One of the functions of this subcommittee was to conduct a preliminary study for the design of a Minnesota Minerals Integrated Database. As part of that study, interviews were conducted at the following four state agencies:

Department of Natural Resources, Minerals Division *(St. Paul and Hibbing offices)*

Mineral Resources Research Center *(University of Minnesota, Minneapolis)*

Minnesota Geological Survey *(University of Minnesota, St. Paul)*

Natural Resources Research Institute, Minerals Division *(University of Minnesota, Duluth)*

This report is to inform the Minerals Database Subcommittee of responses to the User Interview Questionnaire used to document interviews conducted at the four state agencies. The questionnaire was divided into three parts: Business Environment, Current Databases and Required Information, and Expectations of a Future Minnesota Minerals Integrated Database System.

Part One: Business Environment

Categories of Interviewees

Within the four state agencies the following types of people were interviewed:

13 geological scientists
7 supervisors
4 engineers
3 directors
3 managers
2 analysts
2 geology professors
1 mineland reclamation specialist
1 geophysicist
1 geochemist
1 peat ecologist
1 hydrologist
1 planner
1 mineral economist
1 student worker

42 total interviewees

Functions of Organizations

All four agencies conduct the following:

- Geological research
- Mineral potential studies
- Consultation and publication to government, private industry, general public, and academic community
- Education: Formally through the University of Minnesota, informally through symposiums and workshops

The DNR Minerals Division has the following additional responsibilities:

- Mining engineering and operations supervision
- Leasing management
- Mineral exploration management
- Environmental impact studies
- Mineral land planning

Minerals Division of DNR and NRRI have the following duties in common:

- Geochemical analysis
- Geophysical analysis
- Economic development of mineral lands

MGS also publishes geological maps

MRRC also conducts mineral processing research and maintains a geological research library

History of Organizations

DNR (Department of Natural Resources)

1889	Minnesota State Auditor created original agency
1891	Leasing administration began
1903	Hibbing office opened
1931	Department of Conservation, Division of Lands and Minerals formed
1960's	Reclamation studies began

1966 Metallic mineral work began

1970's Department of Natural Resources organized Environmental studies began. Mineral potential work started with copper/nickel study. Geoscience section formed 1975 DNR Division of Minerals created

1980 Reclamation section added to DNR Minerals Division. Title work began

1982 Exploratory Boring Law passed

1983 Reclamation section expanded to Hibbing office

MGS (Minnesota Geological Survey)

1872 Created as part of University of Minnesota Geology Department

MRRC (Mineral Resources Research Center)

1911 Established by Minnesota State Legislature and University of Minnesota Board of Regents as Minerals Experiment Station

1970 Name changed to Mineral Resources Research Center

1978 Designated by Governor Perpich as the Minnesota Mining and Mineral Resources Research Institution in a federal program and became known internationally for development of the taconite process

NRRI (Natural Resources Research Institute)

1981 Created by Minnesota State Legislature

1985 Duluth building opened when minerals division was created

1987 Coleraine research laboratory obtained from U.S. Steel Corporation

1988 Greater Minnesota Corporation designated NRRI as their research center

Personal Responsibilities

DNR

Personal duties vary as follows:

- Administration and management of St. Paul and Hibbing offices
- Geological, geophysical, geochemical analyses
- Ore estimates
- Mapping
- Mineral potential studies conducted and published to government, industry, academic community, general public
- Core library maintenance and data dissemination
- Industrial minerals research and publication
- Peatland studies
- Mining operation supervision and mineral processing research
- Monitoring exploration activities
- Environmental impact studies
- Mineland reclamation control and supervision
- Economic related research
- Leasing issuance and management
- Mineral rights administration
- Computerization of data collected

MGS

Individual responsibilities include:

- Creation of geological maps for other state agencies, private industry, academic community, and general public
- Geological, geographical, geophysical, and geochemical studies
- Computerization of data collected

MRRC

Personal responsibilities are focused on the following activities:

- Education of general public and academic community regarding geological history research Minnesota
- Mineral processing research

NRRI

Individuals are involved in the following activities:

- Interfacing with University of Minnesota, state agencies, and primarily private industry for projects and funding
- Geochemical and geological research for private industry and government
- Mineral economic research studies and publication

Dependencies upon Other Organizations

DNR

People interviewed in the Minerals Division indicated they used information obtained from the following:

-Other DNR divisions such as:
- Land Bureau
- Forestry
- Water and Wildlife
- Real Estate Management

-Other state agencies including:
- Secretary of State office
- Attorney General office
- Department of Revenue
- State Legislature especially LCMR (Legislative Committee on Mineral Resources)
- Department of Transportation
- Department of Labor
- Department of Health
- Pollution Control Agency
- Minerals Coordinating Committee
- MGS
- MRRC
- NRRI

-County and municipal governments

-Various outside government organizations
- US Department of Revenue
- US Pollution Control Agency
- US Geological Survey
- US Bureau of Mines
- US Department of Labor
- National Weather Service
- United Nations
- World Bank

-Private industry, in particular the six operating mining companies in Minnesota

-Academic community, usually University of Minnesota

MGS

The following list summarizes the sources of information:

- LMIC (Land Management Information Center)
- DNR (Department of Natural Resources)
- PCA (Pollution Control Agency)
- USGS (United States Geological Survey)
- DOE (Department of Energy)
- DOH (Department of Health)
- U of M (University of Minnesota)
- US Army Corps of Engineers
- City and county governments
- Private industry

MRRC

This agency obtains information primarily from:

- University of Minnesota Natural Research Council
- Department of Natural Resources
- Minerals Coordinating Committee

NRRI

This institute listed the following organizations as information sources:

- DNR
- U of M
- MGS
- USGS
- MRRC
- Minnesota Department of Health
- US Bureau of Mines
- City and county government
- Private industry and business such as Northwest Mines Association and Ontario Geological Survey

Responsibilities to Other Organizations

DNR

Information is being sent to the following:

-Other DNR divisions such as
Land Bureau
Forestry
Water and Wildlife

-Other state agencies including
Attorney General office
State Legislature especially LCMR
Pollution Control Agency
State Planning Agency
LMIC
MGS
NRRI

-School districts

-City and county government

-Private industry

-General public

MGS

Data is channeled to:

-Other state agencies such as:
DNR Minerals Division
Department of Health
Pollution Control Agencies

-Other governmental agencies include:
US department of Energy
US Geological Survey

-General public

-Private industry

-Academic community

MRRC

Organizations which benefit from this agency are mainly:

- DNR
- NRRI

NRRI

Research results are sent to the following:

-State agencies
DNR
MGS
MRRC
Department of Health

-Federal agencies
USGS
USBM

-Private industry

-Local government

-General public

Changes in the Four Participating Organizations

DNR

The Division of Minerals is becoming more aggressive in industrial and metallic mineral exploration research. Personnel and physical facilities are growing due to an increase in the volume and complexity of the data found. Techniques for handling and analyzing this data are being upgraded especially through the use of personal computer software. There is a trend from geophysical to geochemical analyses as more exploratory data is obtained from industry. As mineral programs become increasingly integrated and the leasing program accelerates to clarify title work, the Division of Minerals is playing a larger role in the state economy and becoming more visible to the general public.

MGS

The primary change in this agency is growth due to an increase in the volume of data.

MRRC

This state organization is also growing as indicated by its budget. Funding for the center is being restored to the level of the 1960,s. Financial resources are now about 40% of that amount.

NRRI

Projects for the Institute are becoming more environmentally related and over longer periods, usually several years. The work is more detailed and product-oriented than in the last few years. To analyze the data in a more intricate manner, research is involving more

and better computerization. The results of the research projects are becoming more exposed to the general public.

Change in the Duties of the Staff

DNR

The activities are becoming more innovative, better designed, and more detailed through the use of personal computers. The projects are more short term with better communication to private industry. There is a trend from mining supervision to land management.

MGS

The work in this agency is becoming more project, less program oriented with a demand for better subsurface data. As research information increases, volume of data to analyze also increases.

MRRC

The primary emphasis on work from the Resource Center is aimed at educating the University of Minnesota administration as to the importance and history of its organization.

NRRI

As the work level increases, there is more economic related geological research done. Also an increased involvement with private industry and government is noticeable.

Part Two: Current Databases and Required Information

Types of Data Used

DNR

Maps and reports of geographical, geological, geophysical, and geochemical data are widely used. Exploration surveys, especially peat and studies of environmental and economical nature are being kept both manually and on personal computers. The drill core library in Hibbing is a growing major source of data. Research publications are also stored throughout the organization. The leasing program is becoming a more vital part of the Minerals Division. Leasing data is kept on title maps, reports and correspondence of land ownerships, minerals rights, royalties, lease terminations and exploratory borings.

MGS

Databases, manual and computerized primarily contain data of the following nature: gravity and aeromagnetic surveys, maps of outcrops and bedrock, drill hole locations, and logs, as well as geochemical and water well studies.

MRRC

Scientific literature comprises the bulk of data kept in this agency.

NRRI

Geological, geochemical, and geographical data are of utmost importance to the Institute. Also economical studies and scientific literature impact their projects. Historical and current mining sites and data are of benefit to the agency as well.

Media for Data Handling and Storage

DNR

Data is kept as much as possible on personal computers but mainframes and manual files are also used. PC software used includes SuperCalc 4, Marcon, Info, Q & A, Condor, and SPSS. Mainframes used are the University of Minnesota Cybers, and a Prime Computer at LMIC. Manual libraries include the Hibbing drill core library, St. Paul leasing files, microfiche, and personal file cabinets and shelves throughout the agency.

MGS

Personal computers, mainframes, and manual methods are utilized to maintain data at the society. PC software includes Lotus 1-2-3 and dBase 3. Mainframes used are the Cyber at the University of Minnesota and one at the National Geophysical Data Center in Boulder, Colorado. Manual file cabinets are also prevalent throughout the agency.

MRRC

The Research Center uses about sixty personal computers, two manual libraries, and one mainframe to manipulate and store information. The mainframe is an IBM with twenty terminals on dedicated lines. The libraries are located at MRRC and the University of Minnesota, Minneapolis campus.

NRRI

The Research Institute uses both personal computers and manual storage for its data handling activities. PC software includes Lotus, Autocad, Paradox 2, WordPerfect, ArcInfo, and dBase. Microfiche as well as files and shelves are also used to store data.

Data Priorities

DNR

The priorities as a whole fall into the following categories:

1) Geographical
   - maps
   - land survey records
   - airborne survey
   - climatic data

2) Geological
   - drill hole locations and data
   - types of survey
   - elements found

3) Geochemical analyses

4) Geophysical studies

5) Others
   - Peat Inventory Database
   - Industrial Minerals Database
   - DNR LEA Database (lease tracking for metallic minerals)
   - Heritage Database (at Wildlife Division)
   - Precious metals research
   - Water quality analyses
   - Soil analyses
   - Vegetative characteristics

MGS

Priorities at this agency fall into three categories:

1) Geographical
   - maps
   - reports
   - correspondence

2) Geological
   - aeromagnetic surveys
   - gravity surveys
   - water well data
   - drill hole information

3) Geophysical studies

MRRC

Current data is more useful than historical. Site specific geological data is also of primary importance.

NRRI

Current data is much more needed than historical in the following categories:

Geographical, Geophysical
Geochemical, Economic, and
Geological

Part Three: Expectations of a Future Minnesota Minerals Database System

Access and Maintenance of an Integrated System

All four agencies (DNR Minerals, MRRC, MGS, NRRI, Minerals) agreed upon authority to access and responsibility to maintain an integrated database system.

Access should and can only be to open file data. The general public, private industry, other governmental agencies, and the academic community would need access.

Maintenance (inputting, updating, archiving, and purging) of data should be limited to the four agencies with each agency responsible for its own data integrity using a centralized index to each database.

Type of Integrated Input Data

The four agencies visualize the following categories of input data:

- Georeferenced geological data especially from drill holes and airborne surveys
- Geophysical
- Geochemical
- Current lease information
- Research text data including economic and environmental information

Type of Integrated Output Data

All four participating agencies need access to output data by various media such as floppy disks, magnetic tapes, hard copy maps and reports, and PC graphics. Other information regarding output of an integrated system is listed by each agency.

DNR

An index of what data is available and where it is kept is the primary benefit to an integrated minerals database. Maps showing surficial and subsurface geology such as peatland and core profile is required. Drill hole data should be statistically and graphically displayed and printed. Reports should include land surveys and descriptions, leasing and exploration activities, research by industry, government, and academic community. These reports need to indicate economic feasibility, environmental and economic impact, as well as geological information and fixed assets. Spreadsheet capability is also needed.

MGS

This agency also expressed specific desired outputs from the system. Graphics such as maps, charts, and diagrams both on computer screens and hard copies are expected. Digitized logs of drill hole data with text interpretation would be very useful. Reports giving information needed to produce maps or describe geographical regions along with a bibliography of geological reports is also needed.

MRRC

Reports, maps, graphs, charts, spreadsheets, diagrams and flowcharts are wanted from an integrated database.

NRRI

Expected output include maps, charts, computer graphics, and word processor capabilities. Site specific data geologically and geochemically is needed. Also mentioned as useful output was references to completed studies and projects.

Types of Reference to Integrated Data

The following lists summarize the responses to this question by agency in the order most frequently mentioned:

DNR

- UTM (Universal Transit Mercator)
- Public Land Survey System (Township Range Section)
- Lat/Long (Latitude/Longitude)
- Subject, Title, Author, Date of publication
- Type of commodity, type of survey terrain
- Lease date of issuance and name of lease
- County
- Sample number of drill core data

MGS

- UTM
- Public Land Survey System (Township Range Section)
- Lat/Long
- Type of commodity and geographical area

MRRC

- Subject, author, title, location, type of commodity

NRRI

- UTM
- Public Land Survey System (Township Range Section)
- Lat/Long
- Subject, title, author, date of publication

Detail Level of Integrated Data

All four agencies agreed the output could only be as detailed as the input allowed but further responses are noted below.

DNR

- Public land survey units
- County and school districts
- USGS quadrangles (2000 ft/inch)
- Drill hole site within 10 or 20 meters

MGS

- Site specific for industry, 40 acre for others
- Scales could be 1:24,000 as well as 1:250,000 and 1:500,000

MRRC

- By geographical region

NRRI

- STR
- Drill hole location
- Nearest meter if possible

Advantages of a Minnesota Minerals Integrated Database

Each agency agreed an obvious advantage would be faster and more accurate access to the data by having a centralized index to all available data. Other responses are listed by agency.

DNR

- Cross referencing of land surveys
- Better coordination of data
- More complete output
- Elimination of duplicated efforts
- Better interface between agencies
- Easier and more timely management of projects
- Easier data updating
- Special relationships of drill hole data made easier
- Information about processing from ore to product

MGS

- Easier reference to literature
- Better dissemination and coordination of data saving man-hours of research

NRRI

- improved analytical capabilities
- Savings of man-hours of research
- Faster response to requests by private industry

Part Four:
Other Potential Interviewees

Names and Title of Others to Interview

DNR

- Arlo Knoll, Manager Mineland Reclamation, DNR Minerals, Hibbing
- Tim Pastika, Natural Resource Specialist, Geoscience Section, DNR Minerals, Hibbing
- Kim Lapakko, Senior Engineer,Impact Mitigation, Mineland Reclamation, DNR Minerals, St. Paul
- Cindy Buttleman, Mineland Reclamation Specialist, DNR Minerals, St. Paul
- Memos Katsoulis, Principal Engineer, Mineland Reclamation, DNR Minerals, St. Paul

NRRI

- John Gephardt, Scientist, Forestry Division NRRI, Duluth

Other organizations

- LMIC (Land Management Information Center)
- Warren Plasden, Aggregate Engineer, Office Materials Handling, Room 130, MN Dept. of Transportation St. Paul
- John Green, Professor at UMD Duluth
- Dick Ojakangas, Professor at UMD Duluth

Appendix C:

Recommendations For Future Development of The Minnesota Minerals Integrated Database System

By:

Charles Hanselman

Systems Consultant
Cap Gemini America
Minneapolis, Minnesota

Appendix C

1. Coordination of Development

The Minnesota Minerals Coordinating Committee created the Minerals Database Subcommittee to initiate the design of a Minnesota Minerals Integrated Database System. Therefore, the Subcommittee should coordinate all future activities for its purpose. In turn, greater usefulness of the system will result.

2. User Involvement

Throughout the entire development and implementation of the database system, a representative group of end users should be consulted on a regular basis. The logistics of how this is done can be an activity of the Database Subcommittee. Careful consideration must be given to insure successful results of the database development.

3. System Standards

Standards must be developed to insure all required data sets, both current and future, are successfully incorporated into an integrated system. Since the data sets are varied as to their content and format, a coordinated effort between the agencies must be made. The Database Subcommittee could manage this effort with support and contributions by personnel from the four agencies. Also, appropriate selection of hardware and software must be made in order to benefit all of the user communities.

4. Database Publisher

The Division of Minerals, Minnesota DNR should be the publisher. The integrity and management of the individual data sets must be maintained by the agencies. In order to facilitate distribution, the Division of Minerals should be the centralized publisher of the information the individual agencies manage.

5. Publications of Hibbing Drill Core Library

Due to the volume of this library and its intrinsic value to the user communities, this should be one of the first projects toward the development process. Rick Ruhanen should be the primary consultant for this activity.

6. Index of Existing Databases

One of the primary requests at the Database Forum was a method of determining where information is currently kept. Databases, both manual and computerized, must be locatable by users through a meaningful index. This should also be one of the first accomplishments toward the development of an integrated database system.

7. Inter-Relationships Between Data Sets

There are numerous inter-relationships between the data sets managed by the four state agencies. A diagram of these relationships would be a valuable aid to both end users and developers of the integrated database system.

8. Publication of Critical Databases

The publication of these databases involves management of an integrated system through selection of the data sets which are critical to the users. The Database Subcommittee should direct this effort with input from the user communities as mentioned in item 2.

9. Definition of Data Elements and Formats

This is a tedious, lengthy process which involves cooperation by the user communities. System standards must be accomplished prior to this task as mentioned in item 3.

10. Development of GIS Capabilities

Once the prior steps have been adequately and appropriately taken, the foundation has been laid for a truly integrated database system with GIS capabilities. The level of sophistication may be simple at first, due to restrictions of budget, personnel, and user defined needs. However, the capability to enhance the system in the future must be made possible from the beginning of the integration process.

11. Development of an Integrated Database Publishing System

Distribution of the information of the integrated minerals database is the key to its usefulness. Levels of detail of the data must be coordinated through a centralized process which facilitates the appropriate information getting to the appropriate users on a timely basis.

12. Deliverable Products

Tangible results should be delivered to both the Minnesota Minerals Coordinating Committee and the user communities on a regular basis, perhaps every 6 months. The MMCC must be able to determine the direction and progress of the entire integration process. This will insure continued support from them and enable them to secure funding as needed. The user community must be involved in the decision making process and see periodic benefits from the system to insure their continued interest and support.

Appendix D:

Information Systems Descriptions

By:

Charles Hanselman

Systems Consultant
Cap Gemini America
Minneapolis, Minnesota

Division of Minerals, Hibbing Office

System Name:
Terminated Lease Files

Contact/Phone:
Rick Ruhanen or Jacki Jiran
218-262-6767

Description:

Purpose: *Preservation and use of geologic data from expired mineral leases in Minnesota*

Files: *Paper files divided into state and non-state mineral lease groups*

Data Categories: *Lithologic logs, geochemical data, geophysical data, location maps, legal description*

Data Processing Steps: *Major step is organizing pertinent data and transferring when it switches from an active lease to a terminated lease.*

System Name:
Overburden Geochemistry Database

Contact/Phone:
Rick Ruhanen or Jacki Jiran
218-262-6767

Description:

Purpose: *Database containing information from Reports 252, 262, and 263*

Sample information includes: *sample number, T-R-S, sample interval, chemical analyses, and other laboratory information.*

System Name:
Core Repository Geochemistry Database

Contact/Phone:
Rick Ruhanen/Jacki Jiran
218-262-6767

Description:

Purpose: *Database of sample information from Reports 255, 255-1, 265, 266*

Sample information includes: *sample number, T-R-S, sample interval, and chemical analyses*

System Name:
Geodrilling Database

Contact/Phone:
Rick Ruhanen or Barry A. Frey
218-262-6767

Description:

Purpose: *Database of geochemical analysis results from Project 264*

System Name:
Drill Core List

Contact/Phone:
Rick Ruhanen or Jacki Jiran
218-262-6767

Description:

Purpose: *Catalog of contents of drill core library at Hibbing DNR Minerals facility*

Information for each drill hole includes: *location, lease number, lessee, footages available, angle/azimuth, types of analysis performed, whether a log of the core is available*

Files: *Computer file DRILLIST.WAT*

Update Frequency: *As needed when drill core becomes public domain information (usually published once a year)*

Processing Steps: *Data sorted by: county, township, range, section, lessee*

System Name:
7.5. Quad Map File

Contact/Phone:
Rick Ruhanen or Jacki Jiran
218-262-6767

Description:

Contains 1:24000 topographic maps of Minnesota in alphabetical order. These are used as references and base maps for various projects and are updated as needed when supplies are exhausted. There are usually 2 to 4 copies of each map on file

System Name:
DNR Thin Section Heel Collection

Contact/Phone:
Barry A. Frey
218-262-6767

Description:

Paper file contains: thin section number, drawer number, and slot number in drawer

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System Name:
Reference Library

Contact/Phone:
Mike Mckenna
218-262-6767

Description:

Purpose: *To set up a professional library retrieval system*

Files: *Bibliography; thesis, textbooks, agency publications, periodicals, excerpts from various professional publications and periodicals, major date categories, author(s), subject, source, date, page numbers (total or range), brief description of contents, broad geographic location, library location, library of congress number*

Update Frequency: *Upon receipt of new material (weekly)*

Major processing steps: *Enter data from existing card index and possibly examine item for brief description of content and geographic location*

System Name:
Project 123

Contact/Phone:
Rick Ruhanen
218-262-6767

Note: Some information contained in these files is proprietary to the mineral lessee.

Description:

Purpose: *To keep a record of sampling of drill core stored in Hibbing core library and to record results of sampling (i.e. geochemistry) from labs.*

Files: *Files sorted by year sampled and company/person doing the sampling; updated as samples and results come in*

Processing steps: *Sampler fills out request form with: core #, footage, sample #, and date sampled; when results return from lab, a copy of the analysis is attached to a request form and placed in the Project 123 data file.*

System Name:
DNR Thin Section Collection

Contact/Phone:
Barry A. Frey
218-262-6767

Description:

Purpose: *Create relational computer data base to organize thin and polished thin section collection catalog type of data fields:*

1. Drawer name (a,b,c, etc)
2. Tray numbers
3. Slot numbers
4. Thin section number (Same as sample log book unique number)
5. S-T-R
6. Forty
7. Geologic formation
8. Geologic age
9. Mineralogic name
10. Significant features
11. Type of thin section - regular or polished
12. Slot in drawer

System Name:
Sample Log Book

Contact/Phone:
Barry A. Frey
218-262-6767

Description:

Purpose: *Relational organization of DNR sample numbers*;

Types of data:

1. Sample number
2. Sample number prescript
3. Sample number postscript
4. Sampler
5. Date
6. Sample type
7. DDH
8. S-T-R
9. Forty

10. County
11. Project number
12. Project name
13. Rock type
14. Geologic age

System Name:
Polished Section Collection

Contact/Phone:
Barry A. Frey

Description:

Purpose: *Organize the polished section collection into a relational database*

Type of data: *Polished section number, sample type, company (if applicable), DDH, footage, S-T-R, forty, rock type, geologic age, mineral mode, county, drawer number*

System Name:
Reference Collection

Contact/Phone:
Henk Dalhberg
218-262-6767

Description:

Reference rock study collection to compare and contrast barren and mineralized rocks from sites in Minnesota with those from mining camps (not in Minnesota) with a similar geological setting. Two files exist: Vol. I, *Precambrian rocks,* and Vol. II, *Mineralized rocks from Canada and the U.S.*

Update: *As frequently as field trips to mining camps are organized.*

Processing steps:
1. numbering of rock samples
2. locating sample # (s) on topographic or geologic maps
3. preparing sample list
4. storing samples in designated drawers

System Name:
Voidest. Calc

Contact/Phone:
Jim Sellner or Fred Fawkes
218-262-6767

Description:

The purpose of this software is to calculate ore-reserves mined from state and privately owned iron-ore properties

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System Name:
Inventory

Contact/Phone:
Jim Sellner
218-262-6767

Description:

Inventory of iron-ore related drilling records primarily consisting of drill core and cuttings stored at the west end of the core-library. The inventory is udated yearly.

System Name:
Roy Calc

Contact/Phone:
Jim Sellner
218-262-6767

Description:

Mine feasibility accounting package

System Name:
Drill Hole Proposals

Contact/Phone:
Lee Warren
218-262-6767

Description:

Purpose: *To record the location of drill holes as required by Chapter 156A, Water Well and Exploratory Boring Law.*

Files: *One record for each section in which a hole or holes is proposed*

Data Categories: *There are 10 data items for each record:*

1) lessee
2) county

3) lease numbers
4) S-T-R
5) Forty
6) proposal date
7) number of holes
8) year received
9) fiscal year received
10) month received

Update Frequency: *This file is updated as proposals are received. The following list indicates the number of records added on an annual basis:*

1979 - 14	1982 - 34	1985 - 35	1988 - 64 (to date)
1980 - 34	1983 - 49	1986 - 35	
1981 - 40	1984 - 36	1987 - 48	

As of September 28, 1988 there are 408 records in this file. Any one proposal letter contains multiple proposed drill hole locations. Multiple holes for a specific forty acre parcel, as well as multiple parcels, may also exist. Therefore, one proposal letter may establish one or several records.

System Name:
Geophysical Grid Proposals

Contact/Phone:
Lee Warren
218-262-6767

Note: Information contained in this file is proprietary to the mineral lessee

Description:

Purpose: *To record the location of geophysical, geological, or geochemical grids as required by the State's Mineral base and farther defined in the checklist*

Files: *One Record for each section or part there of in which a grid is proposed*

Data Categories: *There are eight data items for each record:*
1) lessee
2) county
3) lease number
4) S-T-R
5) date proposed
6) year proposed
7) fiscal year proposed

8) month proposed

Update Frequency: *This file is updated as grid proposals are received. The following list indicates the number of records added on an annual basis:*

1983 -	1985 - 123	1987 - 51
1984 -	1986 - 16	1988 - 24 (to date)

As of October, a grid location may be confined to one section, or one grid may cover several sections. Grids vary greatly in size. This file indicates the number of leases involved in geophysical grids.

System Name:
Abandonments

Contact/Phone:
Lee Warren
218-262-6767

Description:

Purpose: *To record the locations of completed drill holes for statistical information and administrative purposes*

Files: *One record for each hole completed*

Data Categories: *There are fourteen items for each record:*

1) lessee
2) county
3) lease number
4) S-T-R
5) forty
6) permanent abandonments data
7) permanent-month received
8) temporary-month received
9) temporary abandonment (date)
10) drill hole number
11) permanent record number
12) temporary record number
13) year received
14) temporary year received

Update Frequency: *This file is updated as abandonments reports are received*

System Name:
Lease Status

Contact/Phone::
Lee Warren
218-262-6767

Description:

Purpose: *To keep track of active and terminated lease status.*

Files: *This system consists of four individual files: leases.stat, party, documents, and document types. (the last 3 files can be related to the main leases .stat file)*

Data Categories: *The main file, leases.stat, has eight items for each record:*

1) mining unit #
2) lease no.
3) lease I.D.
4) lease date
5) lease term
6) termination date
7) document flag
8) old mining unit

Update Frequency: *This file is updated as leases are issued and terminated; the frequency is variable. There were 1095 records as of 10-19-88*

System Name:
Trenching Proposals

Contact/Phone:
Lee Warren
218-262-6767

Note: Information contained in this file is proprietary to the mineral lessee

Description:

Purpose: *To record the location of proposed trenching or stripping as required by Chapter 156A "The Water Well and Exploration Boring Law " and as further stated in the checklist.*

Files: *One record for each section in which trenching or stripping is proposed.*

Data Categories: *There are ten data items for each record:*

1) lessee
2) county
3) lease number
4) S-T-R

5) number of forty acre parcels
6) proposal date
7) number of trenches
8) year of proposal
9) fiscal year of proposal
10) month received

Update Frequency: *This file is updated as proposals are received. The following list indicates the number of records added on an annual basis:*

1983 - 1 1984 - 1 1985 - 3 1986 - 7 1987 - 12 1988 - 7 (to date)

As of October 11, 1988, there are 31 records in this file. Any one proposal letter may contain multiple proposed trenching activities (locations) and multiple trenches for a specific forty acre parcel, as well as multiple parcels per letter. Therefore, one letter proposal may establish one or more records.

System Name:
Drill Record

Contact/Phone::
Lee Warren
218-262-6767

Description:

Purpose: *This file contains geologically relevant data about drill holes as reported from abandonment reports*

Information includes: *Completion data, location, sample, intervals, hole depth, angle/azimuth, etc...*

Files: *There are 24 items for each record:*
1) lessee
2) lease number
3) county
4) termination date
5) core delivery
6) delivery date
7) drill hole number
8) completion date
9) year drilled
10) S-T-R
11) core footage

12) overburden footage
13) total footage
14) termination date
15) fiscal year drilled
16) remarks
17) forty
18) cuttings interval
19) core interval
20) total cuttings footage
21) angle/azimuth
22) unit number
23) permanent abandonment records number
24) temporary abandonment record number.

Update Frequency: *This file is updated as abandonment reports are received. The file contained 444 records as of 10-19-88*

System Name:
Reclamation Research Program

Contact/Phone:
Steve Dewar or Anne Jagunich
218-262-6767

Description:

Content: *Completion of summaries of DNR Minerals reclamation research as of February 1980.*

A. Taconite
1. Summary of taconite mining impact and mitigation (includes bibliography)
2. Current and proposed studies on taconite mining impact and mitigation

B. Non Ferrous
1. Summary of research on non ferrous metal mining impact and mitigation (includes bibliography)
2. Current and proposed studies on non ferrous metallic mining impact and mitigation

C. Peat
1. Summary of research on peat mining impact and mitigation (includes bibliography)
2. Current and proposed studies on peat mining impact and mitigation

System Name:
Mesabi Range Air Photos

Contact/Phone:
Steve Dewar
218-262-6767

Description:

Black and white aerial photos of the Mesabi Range, taken June 1980, 9 X 9 Stereoscopic 1:15840 (1 in = 1/4 mi. scale)

System Name:
Reclamation Rules

Contact/Phone:
Steve Dewar or Julie Jordan
218-262-6767

Description:

Contains two sets of rules - the *Department of Natural Resources Rules Relating to Mineland Reclamation* (taconite mining) and *Peatland Reclamation General Provisions;* the above were enacted to implement a legislative statute in order to control possible adverse environmental efforts of mining, while at the same time promoting the orderly development of mining and encouraging good mining practices; this may be amended with approval by the legislature.

System Name:
Reclamation Permit Applications

Contact/Phone:
Steve Dewar or Anne Jagunich
218-262-6767

Description:

Contains information submitted by each taconite or peat mining company when applying for a mineland reclamation permit as required by the mineland reclamation rules. This information consists of maps and narratives explaining and describing the organizational data of the company, the geologic setting, extent of the peat or ore body, underground and surface characteristics of the mine setting, surface and severed ownership, an environmental setting analysis, and copies of any environmental reports prepared relative to the mining operation. Maps and narratives also depict (by intervals): the mining of the ore body, the amounts, placement, and methods of waste materials, and sequence and schedules (for the life of the mine) of reclamation applied to meet the requirement of the mineland reclamation rules.

System Name:
Annual Mining Reports

Contact/Phone:
Steve Dewar or Anne Jagunich
218-262-6767

Description:

Permitted peat and taconite operators are required to submit an annual report describing:

(1) annual financial and income statements for the proceeding fiscal year
(2) actual rate of mining and remaining minable reserves
(3) actual mining activities
(4) actual reclamation activities
(5) map(s) depicting information described above in 3 and 4

The DNR then processes the information about actual reclamation activities into computer files. They are updated when annual reports come in (Jan-March) and after the results of annual inspections (Sept-Oct) are received.

System Name:
Mine Operating Plans

Contact/Phone:
Steve Dewar or Anne Jagunich
218-262-6767

Description:

Permitted peat and taconite companies are required to submit an operating plan covering a forthcoming period (usually 1 year). This plan includes:

1. Any changes in the rate of mining or minable reserves
2. Anticipated mining activities
3. Anticipated reclamation activities
4. Map(s) depicting the status of mining, construction, reclamation, and watershed modifications.

System Name:
Reclamation Library

Contact/Phone:
Steve Dewar or Anne Jagunich
218-262-6767

Description:

An informal collection of reclamation and related literature including: reference books, journals (i.e. from the Soil Science Society of America), reclamation revegetation research (out of print), journals about environmental quality, journals about soil and water conservation, research papers, and publications

Division of Minerals, St.Paul Office

System name:
Land Exchanges and Sales

Contact/Phone:
Otto Christensen
612-296-4807

Description:

A cataloging system of lands being considered for exchange or sale. System developed for:

1. Creating review forms for commercial peat, industrial minerals, and metallic minerals, to be completed by Minerals Division staff.
2. Creating a catalogue (including the reviewers' comments and the ultimate decision made by the Bureau of Lands) of all the land exchanges and sales .

System Name:
East Range

Contact/Phone:
Perry Canton
612-296-9563

Description:

The East Range Area lies at the eastern end of the Mesabi Iron Range, between the cities of Babbitt and Hoyt Lakes. An East Range Minerals Land-use Committee was formed to consider long-range land use conflicts; the committee is staffed with represetatives from mining companies, exploration companies, cities, U.S. Fish and Wildlife, U.S. Forest Service, Lake County, St. Louis County, and the Minnesota Department of Natural Resources. Data from the IRIS and MINESITE systems were merged with needed information from the participants. The output was then overlaid to show land-use conflicts and potential environmental impacts. The information in the East Range study is essential to a systematic planning process and the resolution of land-use conflicts.

System Name:
Heavy Metals

Contact/Phone:
Kim Lapakko
612-296-1358

Description:

Water quality and flow data for the Kennecott site (1977 to present) from the Erie Mining Company water quality and flow data.

System Name:
IRIS (Iron Range Information System)

Contact/Phone:
Perry Canton
612-296-9563

Description:

IRIS was developed to aid the division in fulfilling its planning and reclamation responsibilities. As a compilation of natural resource information from governmental and private sources, IRIS will constitute a comprehensive, detailed inventory of natural resources on the Mesabi Iron Range. This system will provide data and analysis capabilities for future land use planning, mineland reclamation permit evaluations, and criteria for comprehensive resource management. Data was encoded at a 100 meter grid cell size for the following variables:

1. PLS (T/R/S/Forties/Government Lots)
2. Bedrock Geology
3. Soil Association
4. Watersheds, Surface Hydrology
6. Vegetation
7. Elevation
8. Wildlife
9. Mining land use
10. Ultimate Mine Pit limits
11. Urban and Rural Development
12. Water Appropriation and Discharge
13. Roads
14. Utilities
15. Public Land Ownerships

System Name:
Ore Estimation

Contact/Phone:
Perry Canton
612-296-9563

Description:

A set of Fortran programs, interfacing with the SURFACE program, that use taconite drilling data to calculate ore reserves, resources, and waste material tonnages.

System Name:
Peat Monitoring

Contact/Phone:
Erv Bergland
612-297-4947

Description:

System keeps track of data samples taken from about 15 sites on DNR peatlands. Each sample contains 45 items including: date and time information, location, and any relative heavy metal and chemical compounds found in the peat.

System Name:
Peat Inventory Site Descriptions

Contact/Phone:
Dave Olson
612-296-4807

Description:

A referencing and cataloging system of the Peat Inventory Project's site descriptions. Each site is described using the following items:

1. Location
2. Access
3. Ownership
4. Surface characteristics
5. Who described the site and when the profile was described.

Some sites were also sampled for later laboratory analysis to identify the physical and chemical characteristic of the peat.

System Name:
Peat Inventory-County Maps

Contact/Phone:
Dave Olson
612-296-4807

Description:

A computerized version of the County Peat Resource maps produced by the Peat Inventory Project. These maps provide reconnaissance-level information on peat type and depth. (The mapping scale for the manually produced Peat Resource maps is 1/2" = 1 mile)

System Name:
Peatland Development Potential Model-1985

Contact/Phone:
Dave Olson
612-296-4807

Description:

A project to identify the development potential, particularly for energy use, of the state's peatlands. The model combined the following factors: resource characteristic, ownerships, transportation-access to a peatland, proximity to potential markets, and management constraints.

System Name:
Peat Monitoring-Hydrology

Contact/Phone:
Erv Bergland
612-297-4947

Description:

Hourly measurements of water tables, groundwater, and humidity. The data is used to analyze how the hydrological environment affects the DNR Peatlands where these measurements are taken.

System Name:
MINESITE

Contact/Phone:
Perry Canton
612-296-9563

Description:

The MINESITE data storage system contains 32 data inventory variables and over 100 model variables encoded at a 2.5 acre cell size over a 560 square mile area in Northeastern Minnesota. The MINESITE study developed a systematic interdisciplinary approach to mineral resource management and development related to copper-nickel exploration in the 1970's. Models for mineral resources, recreation, wildlife habitat, timber, environmental sensitivity, etc. were developed from the 32 data inventory variables and compared to mining facility site alternatives. For information on the data variables, models, or their utilization, please contact the Division of Minerals.

System Name:
Mineland Reclamation Maps & Information

Contact/Phone:
Perry Canton
612-296-9563

Description:

Mine plans for taconite companies were digitized into the ARC/INFO system at LMIC. Information on mining pits, stockpiles, tailings basins, water management facilities, past mining, transportation, disturbed areas, and surrounding landscape is encoded by polygon numbers associated to an INFO file for each mine plan submitted by the companies as required by the rules and regulations for reclamation.

System Name:
Lake Sediment Mapping

Contact/Phone:
Perry Canton
612-296-9563

Description:

Lake sediment samples are analyzed for base and precious metals. The ARC/INFO digitizing system is used to input lakes, Township/Range/County boundaries, and geology. An INFO database containing sample site numbers, location coordinates, and analysis is interfaced to the digitized maps producing a separate mineral potential map for each metal in the data base.

System Name:
Mineral Occurrence Mapping System

Contact/Phone:
Perry Canton
612-296-9563

Description:

All drill holes, test pits, outcrops, and floats associated with mineral exploration (over 5,000 sample points) have been encoded into an INFO data base. County boundaries, Township-Range boundaries, Section boundaries, lakes, and roads were created with ARC/INFO digitizing system. Information in the INFO data base can now be plotted on a state-wide, County or Township-Range basis. Information within the data base includes: location, occurrence type, company, lease number, drill hole number, core storage location, and the type of occurrences found.

System Name:
UBIS (Unit Book Information System)

Contact/Phone:
Mark Kotz
612-296-4807

Description:

A state land records data base that uses INFO and FORTRAN programming to produce a unit book for a mineral lease sale. (A unit book is a list of all the parcels being offered for metallic minerals leasing). Minerals Division staff select the area to be leased, and these areas vary from one sale to the next.

System Name:
Metallic Minerals Lease Tracking System

Contact/Phone:
Mark Kotz
612-296-4807

Description:

Identifies all metallic minerals leases issued by the state since 1966. Data files are broken down into current leases and terminated leases. Information includes: legal descriptions, dates of issue and termination, royalty bid rate, and documents affecting leases. System includes a query menu allowing searches for information based upon variables contained in data base.

System Name:
Severed Mineral Rights

Contact/Phone:
Mark Kotz
612-296-4807

Description:

Identifies severed mineral interests that have forfeited to the state for nonpayment of taxes, tax forfeited severed minerals of record in various counties, and private mineral rights ownership of record in various counties. Data files are sorted by county. Data input includes: legal descriptions, fractional ownership, owners of private minerals, and recording information. System includes a query menu allowing searches for information based upon variables contained in data based. Some information is not automated due to the complexity of the title.

System Name:
Industrial Minerals Inventory

Contact/Phone:
Dave Olson
612-296-4807

Description:

A data base of industrial mineral mining activity in Minnesota. The information includes both past and current activities, excluding sand and gravel operations. Each entry will contain data pertaining to location, company, geology, and commodity.

System Name:
County Aggregate Studies

Contact/Phone:
Dave Olson
612-296-4807

Description:

Digital data of Wright County geology and aggregate reserves.

Minnesota Geological Survey

System Name:
ATES

Contact/Phone:
Splettstoesser, John
612-627-4780

Description:

Aquifer thermal energy storage system. Data related to ATES project-pumping test data, bedrock core, core descriptions, and modal analyses.

System Name:
Clay Mineral Analyses

Contact/Phone:
Mossler, John
612-627-4780

Description:

Analyses of clay minerals in rock samples; includes age and formation name of samples.

System Name:
Inventory Of Bedrock Analyses

Contact/Phone:
Mossler, John
612-627-4780

Description:

Compilation of engineering data for bedrock units in the 7-county metro area.

System Name:
Borehole Geophysics

Contact/Phone:
Setterholm, Dale
612-627-4780

Description:

Bore hole geophysical logs including: gamma, SP, caliper, casing location, some bedrock density, and miscellaneous other logs. Data coverage is scattered state-wide.

System Name:
Cuttings Index

Contact/Phone:
Setterholm, Dale
612-627-4780

Description:

Location and stratigraphy of drill hole cuttings stored at MGS.

System Name:
Cretaceous Geochemistry

Contact/Phone:
Setterholm, Dale
612-627-4780

Description:

Trace element analyses and whole rock analyses of cretaceous drill hole samples.

System Name:
Bibliography of MN Geology 1986-Present

Contact/Phone:
Swanson, Lynn
612-627-4780

Description:

A bibliography of references on Minnesota geology released from 1986 to date; highly structured (formatted) according to earlier designated style. Published every five years.

System Name:
Glacial Drift Textures

Contact/Phone:
Meyer, Gary
612-627-4780

Description:

Textural data from Central Minnesota and Hennepin County

System Name:
Significant Deep Drill Holes

Contact/Phone:
Mossler, John
612-627-4780

Description:

Includes location, year drilled, depth, elevation, analytical data available, sample availability of deep phanerozoic drill holes and holes cutting.

System Name:
Glacial Drift 1-2mm Sand Counts

Contact/Phone:
Meyer, Gary
612-627-4780

Description:

Sand count data from Central Minnesota and Hennipen County. Compositions of sand fraction from sample locations in Central Minnesota and Hennepin County.

System Name:
Field Data

Contact/Phone:
Jirsa, Mark
612-627-4780

Description:

Itasca and Koochiching counties field data, including: rock descriptions, structural data, and whole rock geochemistry.

System Name:
Graphite

Contact/Phone:
McSwiggen, Peter
612-627-4780

Description:

Whole rock analyses, x-ray data, sulfide fraction data and carbon fraction data (N,H,O,H2O,C) of graphite samples.

System Name:
Quaternary Textures

Contact/Phone:
Hobbs, Howard
612-627-4780

Description:

Textural analyses of Quaternary samples

System Name:
Quaternary Samples

Contact/Phone:
Hobbs, Howard
612-627-4780

Description:

Quaternary sample location and exposure description information, included are: color, texture, carbonate content, height of exposure, description of contacts, elevation, and location of exposure (T-R-S).

System Name:
Quaternary Grain Counts

Contact/Phone:
Hobbs, Howard
612-627-4780

Description:

Classification of the 1-2mm size grain fraction in quaternary samples, grains are first grouped by age: Precambrian, paleozoic or cretaceous, and then subdivided by rock type. Data is abundant in a few counties, but sparse or nonexistent in most.

System Name:
Well Cuttings

Contact/Phone:
Mossler, John
612-627-4780

Description:

Listing of well cuttings at the MGS, including names, locations, depth and bottom formation in well.

System Name:
Aeromag

Contact/Phone:
Chandler, Val
612-627-4780

Description:

Aeromagnetic data grid, 213m interval covering northeastern, east-central, central, northwest, southwest, and west-central Minnesota

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System Name:
Gravity

Contact/Phone:
Chandler, Val
612-627-4780

Description:

Gravity data base, statewide coverage at average interval of 1-3 miles.

System Name:
Rock Properties File

Contact/Phone:
Chandler, Val
612-627-4780

Description:

Rock property measurements; density, magnetic susceptibility, and scintillometer count; 900 entries; all data located.

System Name:
WELLOG

Contact/Phone:
Bloomgren, Bruce
612-627-5780

Description:

Detailed information from well-drillers logs including unique number, location, construction details, stratigraphy, geologic interpretations.

System Name:
Cuyuna

Contact/Phone:
Wahl, Tim
612-627-4780

Description:

Logs and geochemical analyses. Logs for Cuyuna exploration drill holes, including assay data. Approximately 5300 logs computerized of original 12,000 compiled by USBM. Additional locations and assay available in paper files.

System Name:
MGS Geosys

Contact/Phone:
Wahl, Tim
612-627-4780

Description:

Locations of outcrops, structures, drill holes, and geochemical samples. Digitize, store in computerized form, and produce computer generated data plots of geologic data including locations of outcrops, structures, drill holes and geochemical samples in the Duluth Complex, locations of exploration drill holes in the Cuyuna District, and water well and test boring locations statewide. Five different data structures are defined based on five categories or data types:

1. Point
2. 2-D linear
3. 3-D linear
4. Planar
5. Polygonals.

Digitization of water well locations is on going. Major processing steps include digitization and verification (archival-retrieval is a separate process as needed).

System Name:
County Well Index

Contact/Phone:
Bloomgren, Bruce
612-627-4780

Description:

Summary data base containing water well construction, geologic conditions and aquifer characteristics in wells. It can also house water quality information and static water level data.

System Name:
MN/DOT Gravel Pits

Contact/Phone:
Meyer, Gary
612-627-4780

Description:

Location of gravel pits in the 7-county Metro area and location of selected test borings in each pit. In addition to boring logs, textural data and quality of test data are included.

System Name:
Mgs Core Listing

Contact/Phone:
Mossler, John
612-627-4780

Description:

Index of core-stored at the MGS, including name, location, depth and bottom formation.

System Name:
Geologic Map Index of Minnesota

Contact/Phone:
Wahl, Tim
612-627-4780

Description:

Bibliography of geologic mapping in Minnesota. The primary file is a bibliographic listing, and the associated file contains digitized outlines of mapped areas. Bibliography entries are categorized as bedrock, surficial or others, and they are also categorized by scale. Associated software permits selection by category and generates computer maps displaying map locations. The file is updated at 2-4 year intervals.

Mineral Resources Research Center

System name:
MRRC Progress Reports (1962-1974)

Contact/Phone:
Rod Lipp
612-625-5048

Description:

Quarterly Progress Reports for the period 1962-1974 summarizing iron ore/taconite, manganiferous iron ore, copper-nickel, and other materials research conducted at the Mines Experiment Station/MRRC over this period.

System Name:
Minnesota Mining Directory

Contact/Phone:
Rod Lipp
612-625-5048

Description:

Directory was first published in 1920 and is issued annually. The directory is divided into seven parts:

1) A maps section showing location of the iron ore mines
2) Listings of iron ore properties and exhausted mines
3) Ownership interests
4) Iron ore statistics
5) Listings of copper-nickel interests

And taconite plants of information such as

6) Location tonnages shipped by years
7) A brief history of its years in operation.

System Name:
MN Industrial Minerals Directory

Contact/Phone:
Rod Lipp
612-625-5048

Description:

Directory was first published in 1980 and issued annually. It contains a listing of the names, addresses, and telephone numbers of the producers of natural abrasives, clays and scale, peat, construction sand and gravel, industrial sand, crushed and broken stone, and dimension stone.

System Name:
Index to Ore Samples by Company

Contact/Phone:
Rod Lipp
612-625-5048

Description:

Content/each sample:

1. Ore number
2. Engineer in charge
3. Date received
4. Project number
5. Company
6. Description
7. Covering communication
8. Tentative test plan
9. Preliminary mining laboratory examinations completed
10. Remarks
11. Reports submitted

General description: Index initiated in 1911 (the date when the Mines EXperiment station, the forerunner to the MRRC, was mandated by the MN State Legislature to be the "State Ore Testing Facility" located at the School of Mines). Each individual ore submitted to MEX/MRRC is assigned a unique ore number and is entered, along with other descriptive information (see list above), alphabetically by company and sequentially by ore number.

System Name:
Index to Ore Samples by Company

Contact/Phone:
Rod Lipp

Description:

Content:

1. Company name
2. Ore number
3. Description of sample
4. Location
5. Nature of test
6. Reported

General description: Index initiated in 1911 (the date when the Mines EXperiment station, the forerunner to the MRRC, was mandated by the MN State Legislature to be the "State Ore Testing Facility" located at the School of Mines). Each individual ore submitted to MEX/MRRC is assigned a unique ore number and is entered, along with other descriptive information (see list above), alphabetically by company and sequentially by ore number.

Natural Resources Research Institute

System Name:
Airborne Spectral Radiometry Survey

Contact/Phone:
Steve Hauck
218-720-4273

Description:

Purpose: *Compile ground truth botanical and biogeochemical, soil geochemical and geological data to be merged with the airborne spectral radiometry data.*

Files:
Drawing
Flight path graphics
Geologic maps
Lotus soil.wk1

Data: *Grid point #, North UTM, East UTM, township, range, section, 1/4, 1/16, quad, location, sample depth, slope, topography, drainage, vegetation, boulders, horizon, soil types, glacial type, color, water table, stream flow, change width, channel depth, sorting, angularity, Ag, Au, As, Pb, Zn, Fe.*

Update: *Under development*

Processing: *Manual data input*

System Name:
Partridge River Intrusion
Geochemistry

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Summary of all known geochemistry (published) for the Partridge River Intrusion*

Files: *There are currently two Lotus files*

Categories: *Sample #, Drill hole #, location, sample type, rock type, interval (from, to), reference and list of analyzed elements.*

Update frequency: *Once a year*

System Name:
Duluth Complex-Water Hen Drill Holes

Contact/Phone:
Mark Severson or Steve Hauck
218-720-4239

Description:

Purpose: *Lithologic drill holes for Water Hen Fe-Ti-Cu-Ni prospect*

Files: *One file per drill hole*

Update frequency: *None*

System Name
Partridge River Intrusion-
Structure Data

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Drill hole databases for Partridge River Intrusion*

Files:
Minnamax/Babbitt area
Dunka Road area
Wetlegs areas
Longnose Longyear Intrusions
Wyman Creek Area
Allen Area
Skibo Area

Categories: *Drill Hole #, collar elevation, hole angle, T.D. Base of Complex, top of Fe Fm, top of Pokegama, top of Giants Range, thickness of Virg. Fm., Thickness of Fe Fm.*

Update frequency: *Once a year*

System Name:
Filson Creek

Contact/Phone:
Steve Hauck
218-720-4273

Description:

Purpose: *Compilation of graphic drill hole and analytical data pertaining to the South Filson Creek prospect.*

Files: Drawing
Maturi.DWG - Regional map of geology, gravity, magnetics and drill holes in S. Kawishiwi Intrusion
Drill logs (paper)-drill hole #, from, to, rock type description, est. modal mineral percentages

Lotus files: Drill hole, drill hole #, interval (from, to), sample #, analytical lab, rock type, Cu, Ni, Co, S, Pb, Pt, Au, Ag, Rh, As, Sb, Bi, Se, Te, Pb, Zn, Fe203, Fe0, Cr, Ti, V, Al, Ca, Mg, Na, K, C, F, Sn, B, Mo, W, P, Cd, Ba, Mn, Be, Sr, Cu/Ni, Cu/Cu + Ni, Pt/Pt + Pd, Cu/S, Ni/S, Pt + Pd/100S, Ag/S

Update: *As data and input operator become available,.*

Processing: *Manual input of data*

System Name:
Partridge River Intrusion-Map Database

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Drill hole locations, contours, structural data, geologic maps, sample location maps for the Partridge River Intrusion*

Files:		
	Wetarea	= Geology of wetlegs area
	Wet A	= Wetlegs area cross-section AA'
	Wet B	= Wetlegs area cross-section BB'
	Wet C	= Wetlegs area cross-section CC'
	Dips	= Basal contact dips, dip of top of Biwabik I.F.
	DNRBasF2	= Drill hole location map
		= Structure contour map-basal Duluth Complex contact.
		= Structure contour map-top of Biwabik I.F.
		= Isopach map of Virginia Fm
	Wetlegs	= Partridge River Intrusion-Duluth complex, log & correlation of drill holes (on mylar)
		= Geologic map of study area with sample locations

Freq. update: *3 times a year*

System Name:
Tax Study Drawings

Contact/Phone:
Lawrence M. Zanko
218-720-4274

Description:

Purpose: *Drawings developed for tax drawing report to illustrate the results of the comparative economic analysis.*

Files: *Fig1.dwg through Fig9.dwg*

Categories of data: *Layer names*

Update frequency: *Completed*

Major processing steps: *None*

System Name:
Partridge River Intrusion-
Microprobe Database

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *List of microprobe data to be collected for: olivine, pyroxene, plagioclase, ilmenite, magnetite, sulfides.*

Files: *File yet to be made*

System Name:
Particle Size

Contact/Phone:
John J. Heine
218-720-4231

Description:

This information system contains the particle size distribution information for samples collected for the LCMR clay project during 1987-1988. It consists of one file - Partsize. data

Categories are:

1. Sample number
2. Sample type
3. Size range percentages by weight.

Location data for samples will be located in a file not yet created

System Name:
Partridge River Intrusion-Geochemistry

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Rock geochemistry of the Partridge River Intrusion (Duluth complex), currently consists of one file containing: samples number, drill hole number, assay data, analytical lab., sample type, direction, angle, interval, rock type, unit, county, location (AMS), quad, quarter-S-T-R, and a list of analyzed elements.*

Update frequency: *Just starting this file*

System Name:
Partridge River Intrusion-Skibo
Drill Holes

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Lithologic logs of Skibo Fe-Ti prospect*

Files: *One file per drill hole*

Update frequency: *None*

System Name:
Partridge River Intrusion-Minnamax/
Babbitt

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Lithologic drill holes for Minnamax prospect*

Files: *Sequential order-all surface drill holes*

Categories: *By drill hole number*

Update frequency: *None*

System Name:
Partridge River Intrusion-Dunka Road
Drill Hole

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Lithologic logs of all drill holes for U.S.X.'s Dunka Road Cu-Ni prospect*

Files: *One file for each drill hole-arranged sequentially*

Update frequency: *As each drill hole is relogged.*

System Name:
Partridge River Intrusion-Drill logs
for Wetlegs Deposit

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Lithologic drill holes for Wetlegs Cu-Ni prospect*

Files: *One file per drill hole-arranged sequentially*

Update frequency: *As each drill hole is relogged.*

System Name:
Partridge River Intrusion-Wyman Creek
Drill Holes

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Lithologic drill holes at USX's Wyman Creek Cu-Ni prospect*

Files: *One file per drill hole-arranged sequentially*

Update frequency: *As each drill hole is relogged.*

System Name:
Partridge River Intrusion-Longyear Drill Hole

Contact/Phone:
Mark Severson
218-720-4239

Description:

Purpose: *Lithologic drill holes of Longnose and Longyear Fe-Ti prospect*

Files: *One file per drill hole*

Update frequency: *As each drill hole is relogged.*

System Name:
Clay Map Database

Contact/Phone:
Jayne Reichhoff
218-720-4232

Description:

Purpose: *A collection of maps associated with the LCMR clay project.*

Files: *Sample88.dwg, Munprop.dwg, Severson.dwg, Munsel.dwg, Base.dwg., Seselbakr.dwg, Mortreg.dwg, Redloca.dwg, Barreg.dwg, Nova.dwg, Ochsmort.dwg, Nwsredf.dwg, Sprfld.dwg, etc.*

Data: *Each drawing is composed of layers of data layer content differs from drawing to drawing, based on available information.* Typical example layers are:

1. Topographic contours
2. Sample locations
3. Roads
4. Streams
5. Buildings
6. Geology
7. RR Tracks
8. Scale, N Arrow, etc.
9. Title, name, etc.

Update frequency: *Currently being revised for reports due to be done July, 1989*

System Name:
Platinum Map Database

Contact/Phone:
Jayne Reichhoff
218-720-4232

Description:

Purpose: *All platinum related drawings*

Files: *All drawings from 1987 Platinum Report by P. Morton & S. Hauck.*

In addition: Maturl.dwg & FilsonA(B,C).dwg

Data: *Each drawing consists of layers of data typical layers including:*

1. Title, name, etc.
2. Scale, narrow, etc.
3. Roads
4. Streams
5. Geology
6. Drill holes
7. Grids, etc.

Some are geologic maps or cross sections

System Name:
ITASCA Map Database

Contact/Phone:
Jayne Reichhoff
218-720-4232

Description:

Purpose: *Maps to accompany ITASCA geochemistry project (joint with MGS)*

Files:
1. Loc map.dwg
2. Stratcol.dwg
3. Map2.dwg
4. Jensen.dwg
5. Mgprime.dwg
6. Jenall.dwg

Data: *Maps are composed of various layers which vary from map to map*

Update frequency: *Project is currently being worked on - update approximately twice a year*

System Name:
Carbonate Map Database

Contact/Phone:
Jayne Reichhoff
218-720-4232

Description:

Purpose: *Maps to accompany carbonate project by P. Niles, NRRI*

Files: *Base.dwg*

Data: *Layers such as topography, roads, streams, RR tracks, scale, etc.*

Current project

System Name:
Historic Clay Database

Contact/Phone:
Jayne Reichhoff
218-720-4232

Description:

Purpose: *This database was developed to document all "historic" occurrences of clay in the state, including old pits and workings, and sample locations by other people. Designed for the current clay project.*

Files: *In the process of reorganization into a separate worksheet for each county then cohesion into 1 Paradox database*

Data: *County, brickyard, occurrence, quad map name, type of occurrence, city, location comments, quarter, S, T, R, type, age, geologic formation, clay color, thickness, contaminants, comments, chemistry (whole rock, etc.) physical characteristics brick characteristics (color etc.), source of data.*

Update frequency: *As data and operator are available.*

System Name:
ITASCA Geochemistry Database

Contact/Phone:
Jayne Reichhoff
218-720-4232

Description:

Purpose: *Geochemistry values for the Archean Geochemistry Project by M. Jirsa, MGS, NRRI*

Files: *Newita4.wk1 (current version)*

Data: *Sample #, drill hole #, assay data, analytical lab, sample type, rock type, location and geochemical values for: whole rock, trace, REE's, precious, and base metals*

Update frequency: *2-3 times a year*

System Name:
Platinum Geochemistry

Contact/Phone:
Jayne Reichhoff
218-7204232

Description:

Purpose: *This database contains all the geochemical data for the platinum related projects by Penny Morton and Steve Hauck.*

Files: *Main file - Newplat.wk1*

Data: *Includes sample #, assay date, analytical lab, sample type, rock type, location, whole rock, trace and rare earth element geochemistry values, and precious and base metals.*

Update frequency: *Varies - new data is entered 2-3 times a year*

System Name:
NW States Portland Cement Co.
Drill Hole Logs

Contact/Phone:
John Heine
218-720-4231

Description:

The purpose of the logs is to preserve information about drill holes donated to the NRRI by Northwestern States Portland Cement for use in the LCMR Clay Project. Major categories include: location data, footage and rock or clay type, and comments. There are no updates to the information planned, unless more core is donated in the future.

System Name:
Wrenshall Firing Data

Contact/Phone:
John Heine
218-720-4231

Description:

The purpose of this file is to contain data concerning the firing of bricks made from Wrenshall clays.

Data categories:

1. Clay type
2. Additives
3. Dry and fired weights
4. Amount of water added for brick making
5. Dry and fired dimension measurements

This file was completed from a report in process, and will not be updated.

System Name:
Clay Geochemistry

Contact/Phone:
Steve Hauck
218-720-4273

Description:

Purpose: *Compilation of all major element geochemistry on clays in Minnesota*

Files:
Clays.wk1 - current LCMR project
ClayUSBM.wk1 - USBM Department Investigation 9116
Clayset.wk1 - MGS open-file report 87-1

Major Categories: *Sample number, analytical lab, sample type, deposit name, rock type, sample station number, rock unit, thickness, county, AMS sheet, quadrangle name, quarter, section, township, range, UTM northing, UTM easting, reference, SIO2, Al203 TFe203, FeO, FeO, MgO, CaO, MnO, K2O, Na2O, P2O5, LOI, CO2, S, H2O, B, total organic carbon, total, K2O + Na2O, FeO/Fe2O3, molecular proportions (Ca, Na, K, Si, Fe, Mg) chemical weathering indices (5 different indices)*

Update frequency: *As input operator is available for processing manual and floppy data*