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MARYLAND GEOLOGICAL SURVEY
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COASTAL AND ESTUARINE GEOLOGY
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LONG-RANGE DATA PRESERVATION PLAN
FOR THE
MARYLAND GEOLOGICAL SURVEY

Year 1

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in response to the

National Geological and Geophysical Data Preservation Program

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A. OVERVIEW

This report recommends a plan for preserving the physical, as opposed to digital, geological data and collections held by the Maryland Geological Survey (MGS or the Survey). It briefly describes the variety of MGS's physical holdings, the threats to the long-term survival of these materials, and a plan for meeting those threats. The focus of the report is limited because MGS has only just begun to grapple with the long-term preservation of its holdings. It is the Survey's intent to revisit this plan annually. As part of the second year revision, MGS will address preservation of digital reports, maps, and other data.

1. DESCRIPTION OF ACTIVITIES AND REPOSITORY

a. The Maryland Geological Survey (MGS)

MGS is a state government agency within the Maryland Department of Natural Resources (DNR). It serves the citizenry of a relatively small, densely-populated, coastal state, with a land area of 9,844 square miles, a water area of 623 square miles, and an estimated population of 5.6 million people (MGS, 2007; U.S. Census Bureau, 2006). The State straddles six geologically diverse physiographic provinces - the Appalachian Plateau, the Ridge and Valley, the Blue Ridge, the Piedmont Plateau, the Coastal Plain, and the Atlantic Continental Shelf - and contains an extensive network of freshwater rivers, tidal streams, and bays, most notably, northern Chesapeake Bay. The Atlantic Ocean forms its eastern border.

i. History of MGS

Established in 1896, the Survey has been in continuous operation for more than a century (Reger, 1996). During the first half of its existence, MGS was closely affiliated with the Johns Hopkins University (JHU). Until 1963, the director of the Survey (and state geologist) held a joint appointment with the university's geology department. At length, the interests of MGS and JHU diverged, with geological research at the university becoming more theoretical and international in scope. MGS remained focused on practical geological applications in Maryland. In 1969, a reorganization within state government resulted in the creation of the Maryland Department of Natural Resources (DNR). The Survey was made a member agency of the new department, and the close working relationship with Hopkins' faculty effectively ended.

The mission and accomplishments of the Survey have changed over the course of its existence, in response to its shifting affiliation with JHU and state government – and the different needs of those two institutions; the vision and interests of its directors and the expertise and size of its staff; the occurrence of natural disasters and social upheavals; and funding opportunities.

During its early years, the Survey's two primary activities – education and a mix of basic and applied research in economic geology – reflected its close ties with an academic

institution. The director/professor and his students prepared topographic, geologic, and economic maps; collected and studied Maryland's minerals, rocks, and fossils; and investigated mineral resources (including road-building materials), soils, artesian wells, and water power. During this period, the Survey was also engaged in pursuits that today would be regarded as marginally geologic in nature, such as road construction, forestry, meteorology, and the survey of state boundaries.

From time to time, natural and social disasters altered the mission of the Survey, as reflected in the nature and number of its publications. For example, a severe drought in 1930 convinced the state that water resources were not inexhaustible. In response, the state legislature authorized the formation of a Water Resources Commission to assess Maryland's surface water and groundwater resources and to formulate a plan for their preservation, allocation, and regulation. This regulatory function was eventually transferred to MGS, and the Survey, at the behest of its director, commenced the geological and hydrological studies that continue to provide the basis for sound decision-making regarding water appropriations.

Similarly, the Chesapeake-Potomac Hurricane of August 1933, one of the severest storms ever to have occurred along the mid-Atlantic coast, galvanized the State's Water Front Commission, which had been established a few years previously to devise plans and policies for protecting Maryland's shorelines against erosion. Later, this Commission's functions were also transferred to MGS. The Survey subsequently embarked on the first of several quantitative studies of tidal shoreline change. The justification for such studies has broadened over time, from mitigating land loss to understanding the effects of global climate change and rising sea level on the state's low-lying coastline.

Likewise, MGS has been affected by the great historical events and economic trends of its time. During the Great Depression, student enrollment at JHU fell as personal resources were exhausted, and field work at the Survey was curtailed. World War II had a similar effect, this time due to the diversion of faculty and students to military service and the rationing of gasoline. More recently, the nation's poor economy has resulted in state budget cuts and hiring freezes, with a concomitant drop in the Survey's workforce. This last development has led the Survey to focus especially on research for which outside funding is available.

ii. Current MGS Activities

MGS presently consists of two research-oriented programs, the Hydrogeology & Hydrology Program and the Coastal & Environmental Geosciences Program. The mission of the Hydrogeology & Hydrology Program is to (1) explore for groundwater by means of hydrogeologic studies, geophysical surveys, and test drilling, (2) assess streams, springs, and aquifers and their interactions, (3) forecast potential effects of water demand and land use on stream flows, groundwater levels, water quality, salt-water intrusion, and land subsidence, and (4) maintain a statewide water-data network in cooperation with the Water Resources Division of the U.S. Geological Survey (USGS). Typical activities of the program include:

- Determining the effect of projected withdrawals from various aquifers on groundwater levels and recharge rates,
- Monitoring arsenic concentrations in groundwater from Maryland Coastal Plain aquifers,
- Determining the occurrence and distribution of radium in groundwater in particular aquifers underlying the upper Chesapeake Bay area,
- Documenting ambient groundwater quality in shallow aquifers throughout the State as a basis for monitoring future changes in water quality,
- Determining the influence of groundwater on the nitrate loads of particular streams, and
- Estimating the area contributing recharge to selected public-supply wells.

The mission of the Coastal & Environmental Geosciences Program is to investigate and determine the geologic framework of the State's geologic resources and provide information for wise stewardship – protection, preservation, and enhancement – of those natural resources. Typical activities of the program include:

- Measuring the physical and geochemical properties of bottom sediments collected from the Chesapeake Bay, its tributaries, Maryland's coastal bays, and the Atlantic Ocean,
- Monitoring the placement and behavior of dredged material in specially designed containment facilities and at overboard disposal sites,
- Assessing the volume and suitability of offshore sand resources for nourishment of Atlantic coast beaches,
- Measuring rates of change in shoreline position (erosion or accretion) for the State's tidal bodies of water,
- Mapping the bathymetry of Maryland's bays and reservoirs,
- Assessing the physical properties of prospective oyster restoration sites,
- Mapping Maryland's geology, mineralogic and energy resources, and geohazards (e.g., sinkholes), and
- Monitoring earthquake activity.

b. Description of Repository

i. Physical Facilities

MGS currently stores its data and collections in two separate places – its main office in Baltimore, Md., and a warehouse 40 miles away at a Maryland Department of Natural Resources facility in Matapeake, Md. These two facilities are described in detail in Section B.6.a (Physical Data – Preservation – Infrastructure).

ii. Holdings

In FY2008, the National Geological and Geophysical Data Preservation Program (NGGDPP) issued a request for proposals (Program Announcement No. 08HQPA0015) aimed specifically at assessing the current collection resources and data preservation needs of state geological surveys. In responding to that request, a small group of Survey geologists reviewed the examples of geoscience collections and data listed in an appendix of the report, "Implementation Plan for the National Geological and Geophysical Data

Preservation Program” (Data Preservation Working Group, 2006). The group identified the categories of data that apply to MGS, the specific collections held by MGS, and the program and/or person most knowledgeable about each collection. Results of this basic, initial inventory are presented in Appendix 1.

From the appendix, it is apparent that MGS possesses a wide array of holdings in a variety of formats. Of the derived or indirect geoscience data, paper-based collections, particularly maps and reports produced prior to the 1990s, are more common than digital ones. However, many of the Survey’s shorter, more popular publications, as well as many recent reports and maps, have been made available digitally through the MGS website (www.mgs.md.gov).

It is not uncommon for items in a single collection to exist in more than one format (e.g., both paper and digital, digitally in more than one format). For example, well logs, such as gamma and resistivity logs, originate as paper records. As Survey hydrogeologists request them, they are being scanned as raster images and then digitized as vectors.

Incidentally, many of the physical specimens collected early in the Survey’s history are no longer in its possession. Presumably, JHU inherited most of those artifacts and either retained or disposed of them as it saw fit. It is likely, for example, that JHU donated a set of Maryland’s type fossils, once held jointly with MGS, to the Smithsonian Institution (Conkwright, R., pers. comm.). Derived data, in the form of reports and maps, are the main legacy remaining from this period.

iii. Protocols

MGS is just beginning to grapple with the long-term preservation of its data and collections. No formal, systematic, Survey-wide protocol(s) have been adopted for collection documentation, cataloging, or preservation. Paper and/or digital catalogs exist for some holdings, and individual researchers, at their own discretion, have documented and preserved certain data sets. Overall, however, current preservation efforts at MGS are aptly described by a phrase in the NGGDPP Implementation Plan (USGS, 2006) - “inadequate, incomplete, and uncoordinated.”

2. PURPOSE AND JUSTIFICATION FOR REPOSITORY

a. Purpose and Justification

At MGS, geologic materials are usually collected to answer specific, narrowly focused questions. However, those same samples may be useful for other purposes – as additional questions arise, as new analytical techniques are developed, as knowledge of geologic processes evolves, or as the interpretation of the rock record changes. New analytical techniques, for instance, could be applied to existing rock cores or cuttings without the added expense of having to collect them. A real-life example, closer to home, involves the sediment cores that the Coastal & Environmental Geosciences Program has collected from the Atlantic Continental Shelf to identify sources of sand for

beach replenishment. Those cores are now of interest for marine habitat assessments and, with the possible advent of offshore wind farms, siting windmills.

Geologic materials are expensive or impossible to replace. With development proceeding at a rapid pace in the state, it may be impossible to retrieve cores, for example, from sites that MGS has already sampled. Retaining those cores may allow future scientists, educators, and decision-makers to make judgments or interpretations with more information than they might otherwise have had.

Finally, access to geologic materials may facilitate the assessment of natural resources or geologic hazards. The latter particularly may require quick answers, over a time frame that does not allow additional data collection.

MGS has varied and extensive geoscience holdings, collected over decades by dozens of researchers in the course of satisfying the requirements of countless projects. The Survey currently acts as a repository for all such material that researchers have chosen to donate or retain. However, not all of the material is stored in an orderly way, and the larger geoscience community is, for the most part, unaware of its existence. At present, the data and collections, with certain exceptions, are available primarily to Survey staff. The exceptions are aerial photography, maps, and reports, available for in-house use by the walk-in public, and maps, reports, and data posted to the MGS website. The vision for the MGS repository, then, is twofold: (a) to retain those materials deemed permanent based on the criteria presented in this report, organizing, describing, cataloguing, and storing them in such a way as to ensure their long-term preservation and (b) to advertise their availability and increase their accessibility to the larger geoscience community.

As a repository of geoscience materials and data collected mainly from Maryland, MGS, through the NCGDPP, will participate in a national network of such repositories and, to the extent feasible, adopt the standards, procedures, and metadata protocols recommended by that Program in the day-to-day operations of the facility.

For MGS, developing and implementing a preservation plan is a matter of some urgency. Over the last several decades, periodic, long-lived hiring freezes at the state level have reduced the size of the Survey's staff. Further staff reductions in response to budget cuts are conceivable. Belt-tightening measures have produced a gap in age and experience between the newly hired and the nearly retired. The scientific/technical staff at MGS presently consists of 19 people, 75% of whom are older than 50. Many have spent their entire careers at the Survey. MGS would be wise to tap their collective memories before they retire. Participating in a national preservation effort affords an ideal opportunity to do just that.

A major impetus for the National Catalog came from agencies and organizations engaged in mineral and petroleum research, exploration, and extraction and interested in preserving subsurface geologic data (NAS, 2002). Scientific investigations undertaken by MGS more commonly relate to other, locally important issues (e.g., the consequences of climate change for a coastal state, the quality and quantity of groundwater available for

a growing population, the success of efforts to limit or reverse environmental degradation in the Chesapeake Bay, the co-location of sinkholes and highway rights-of-way). The results of some of these studies, acquired at great effort and expense, will be of value to future generations of researchers, long after the working lifetimes of the geologists who produced them. But only if they are preserved.

b. A Cautionary Tale

The modern Survey was preceded by an earlier, short-lived state geological survey that existed for eight years, between 1834 and 1842 (Reger, 1996). Perhaps the greatest achievement of the topographical engineer and the geologist who comprised the early Survey's two-member staff was the production of a statewide topographic and geologic map. The 1840 map was one of the first to use contour lines instead of hachures to depict topography. It included geologic boundaries and the locations of a variety of mineral products.

The fate of this map makes a compelling case for the development and implementation of a long-term preservation plan for the modern Survey's current holdings. The map was never published, though at least two manuscript copies were known to exist. (Lesson 1 – Publish what you want to preserve.) A tracing of the map, made at the beginning of the Civil War under the orders of a military commander, eventually found its way into the U.S. Army archives. (Lesson 2 – Information collected originally for one purpose may later be useful for other purposes.) Presumably, the modern Survey once had photos of the traced map in its possession, but these have since been lost. (Lesson 3 – Intentionally preserve valuable data and collections.) So, the whereabouts of an important historical document – the first topographic and geologic map of Maryland – is unknown to the very agency whose reason for being is to understand the geology of the state.

3. GOALS FOR REPOSITORY

a. Goals and Objectives

The Maryland Geological Survey (MGS) shares the concerns of other agencies and organizations engaged in geological research -- that geoscience collections and data are valuable in their own right, beyond the lifetime of the projects during which they are collected or acquired, and that special efforts are required to preserve them.

Listed below are the actions – goals and associated objectives – that must be taken to turn the MGS repository into an expandable, well-organized, accessible set of data and collections, available to the larger geoscience community, now and in the future. The main goals for the MGS repository are similar to those listed in the NGGDPP Implementation Plan (USGS, 2006) for managing geoscience data and collections nationally; the objectives are unique to MGS.

i. Goal 1

Identify, evaluate, and broadly describe geologic materials and data held by MGS and develop protocols to evaluate which of these are kept, acquired, assimilated, or discarded.

Objectives

1-1: Finalize MGS's Long-Range Data Preservation Plan and revisit it annually.

Once this draft of the plan has been completed, it will be circulated among the MGS staff members who met in Spring 2008 to discuss the 2008/2009 NGGDPP proposal (i.e., Jeff Halka, Bob Conkwright, Dave Bolton, Jim Reger, and John Wilson), as well as other interested staff. Even though the plan looks out five years, MGS will revisit it annually and revise it as necessary, based on the previous year's activities.

1-2: Appoint a curator, whose functions are to oversee implementation of the *Long-Range Data Preservation Plan*; apply for funding for the repository; keep abreast of and adhere to national standards for archiving geoscience materials; serve as a contact for accessing collections in the repository; update information about permanent collections in MGS's internal database and the National Catalog (see Section 3.c – Strategy to Meet Goals, below).

1-3: Raise awareness at MGS about the need for collection/data preservation and standardized procedures/protocols for curation and documentation.

Ultimately, such awareness should lead to changes in the thoroughness of collection documentation, in the acquisition of funding to support the archives, and in the orderly transfer of project materials to the archives.

1-4: Establish an Ad Hoc Data Preservation Advisory Panel.

MGS has witnessed first-hand the inadvisability of leaving decisions about the fate of collections in the hands of a few people. Several years ago, the Survey faced the prospect of having to abandon its present quarters, split into two groups, and relocate into considerably less office space in Baltimore and Annapolis. Downsizing was, it seemed, mandatory. Based on the judgment of a few people, innumerable reports and journals from the library and the Publications Inventory were discarded. Staff members surreptitiously retrieved many of them from the dumpster.

The Advisory Panel, composed primarily of local geoscience experts outside of MGS, will assist MGS in (a) evaluating the disposition of the Survey's holdings, (b) prioritizing the order in which they will be documented, organized, and preserved, and (c) improving access to curated collections. One other advantage of establishing an Advisory Panel is that, in the unhappy event of the Survey's demise, MGS's holdings are more likely to find other homes and survive intact.

Prospective members of the Advisory Panel will be identified during the collections inventory (2008-2009 NGGDPP grant). One of the questions on MGS's in-house *Geological Collection Inventory Form* is:

Please list the names and/or titles of people outside of MGS who might be familiar enough with the items in this collection or data set to be included on a Data Preservation Advisory Panel. The Panel will advise the Survey on the disposition of its collections. Include the agency or organization with which each person is affiliated, as well as other contact information.

MGS will contact the individuals named in response to that question and ask if they are willing to serve on the Panel.

After an initial meeting of all Panel members, the composition of subsequent meetings may vary, depending on the nature of the collection under consideration. For example, the State Archivist or the DNR librarian might be consulted in the disposition of reports and maps. But in decisions pertaining to fossil collections, a staff member of the Smithsonian Institute or a local professor of paleontology would be a more appropriate choice. Similarly, the Panel members consulted by the Hydrogeology & Hydrology Program will probably differ from those consulted by the Coastal & Environmental Geosciences Program.

If MGS staff members are unanimous in their decision to retain a collection, the panel would not necessarily be consulted. Only when the MGS staff is unable to reach a decision internally would a panel meeting be convened.

Ideally, MGS's five-member Board of Commissioners, legally mandated and appointed by the governor, would serve this function. At present, however, all commissions have expired; the Board exists in name only. Alternatively, an initial list of potential panel members is presented in Appendix 2. MGS will contact each prospective member and ask if he or she is willing to serve in an advisory capacity when it comes time to decide the fate of a particular collection or data set.

1-5: Establish the criteria and associated protocols to be used in (a) evaluating the disposition of the Survey's holdings, (b) prioritizing the order in which they will be documented, organized, and preserved, (c) accepting new acquisitions. For collections that MGS decides not to retain, develop possible alternatives to outright disposal (e.g., contact members of the Advisory Panel and Board of Commissioners and inquire about possible outside interest in the collections).

For outside collections acquired by MGS, develop a memorandum of understanding (MOU) or other formal agreement for transferring and housing each collection. Clauses in the MOU should specify: (a) the length of time for which the collection is to be held, (b) any environmental conditions necessary to preserve the collection, and (c) the name of a contact at the partner agency (confirmed or updated periodically).

1-6: Inventory data and collections held by MGS, decide which are permanent, and enter information about the latter into NCGDPP's Collections Inventory of the National Catalog.

MGS will meet this objective as part of its 2008/2009 NNGDPP grant. All MGS staff will be apprised of the terms of the grant and encouraged to participate with the two staff members assigned to the project. Each member of the scientific staff will be interviewed about the holdings with which he or she is familiar.

MGS will develop an internal database that mirrors the National Catalog, but contains additional information (e.g., the location of the collection/data within MGS; the program or person responsible for its maintenance) for both permanent and semi-permanent collections.

Information about the permanent collections will be added to the Collections Inventory of the National Catalog.

ii. Goal 2

Establish a system to organize the physical collections, physical and digital data, and metadata.

Objectives

2-1: Rank the permanent collections in the order in which they are to be preserved, based on such considerations as their condition (i.e., need for rescue), the availability of staff familiar with the collections, the usefulness or perceived demand for access to the collections, and funding opportunities.

2-2: Develop specific plans for curating each of the permanent collections.

This will entail a number of unique solutions, depending on the nature of the collection (e.g. scanning publications and posting them on the MGS website; converting well logs to digital (raster) format and then to vector format; acquiring proper storage containers for fossils, labeling them, and entering them into a collection database). To the extent that it is feasible, MGS will follow NNGDPP recommendations for handling particular types of collections.

2-3: Itemize and archive permanent collections, based on their rank ordering.

Develop and populate an internal database for each collection, with one record per item in the collection. Develop a process by which metadata will be generated and submitted to the internal database, including quality assurance processes used to check the data. Develop a plan for producing a file format that will import into the National Digital Catalog.

Decide how to identify items (e.g., by bar codes).

Acquire the necessary storage containers, cabinets, etc. for proper curation of the items in the collection.

2-4: Develop protocols for adding to collections, including converting individually-held collections (or other agency held collections) to permanent archiving at MGS. Begin

incorporating individual collections, particularly those in the possession of near retirees, into MGS's permanent collections.

Develop a plan, integrated into MGS's business process for the long-term maintenance and update of catalog records in both the internal database and the National Catalog. For each collection, determine a planned update period and specify the update process, that is, how new or modified records in the database/catalog will be identified and updated. Develop upload mechanisms for transferring information from the internal database to the National Catalog.

2-5: Develop a digital method for tracking the whereabouts of items (i.e., a database that lists items in collections, the name and affiliation of borrowers, and location while on loan). Be more proactive about returning items to the locations where they are permanently stored; adopt the maxim "a place for everything and everything in its place."

iii. Goal 3

Provide appropriate repositories for these materials.

Objectives

3-1: Improve existing infrastructure and reorganize collections.

The storage facility at Matapeake is unsatisfactory for that purpose, due primarily to periodic flooding, but also to lack of climate control and infrequent cleaning. Those deficiencies should be addressed, or the material stored there moved elsewhere.

Although the main office in Baltimore is structurally sound, collections are scattered throughout building. Collections stored here should be reorganized in such a way that space is devoted entirely or primarily to the collections and their use. To the extent possible, archival data and collections should be stored separately from field equipment, extra copies of publications, cleaning supplies, etc.

iv. Goal 4

Make users aware of these geoscience data and collections and provide access to them.

Objectives

4-1: When a permanent collection is archived, make its presence known via the MGS website. Better yet, if feasible and possible, make a digital version of the collection web accessible. This will entail either arranging for assistance in web design and implementation (e.g., from Towson University's Center for GIS) or providing training internally.

4-2: Provide training in the use of the archived material, if necessary and feasible.

4.3: Develop procedures and policies for distributing archived materials to outside users. If MGS decides to make certain collections available to outside users (e.g., for sample analysis beyond MGS's capabilities), then the Survey needs to develop procedures for

handling user requests (e.g., reviewing and granting or denying requests, limiting the numbers or types of samples released, paying for shipping) and policies stipulating user responsibilities (e.g., crediting MGS for providing samples, providing MGS with reports based on analysis of the samples). (See, for example, Lamont-Doherty Earth Observatory Deep-Sea Sample Repository's *Policy and Procedures for Distribution of Samples and Sample Information*)

v. Goal 5

Ensure that samples and data continue to be useful and reliable.

Objectives

5-1: Investigate possible partnerships with other entities in the state (e.g., universities – UM system, including UMCES; other state agencies – MD State Archives, MDE) for joint data storage and access.

5-2: Periodically (every 1-3 years) inventory the items in the collection to ensure that they are properly preserved. Replace missing, broken, or damaged items, if possible.

5-3: Assess the number of users of each of the permanent collections (e.g., as part of the tracking function of the database developed for Goal 2, Objective 2-5). Invite users to suggest improvements to the collections themselves, the helpfulness of staff, etc.

5-4: As technology changes, convert (digital) items to new data formats, storage media, etc.

vi. Goal 6

Pursue outside funding to support the MGS repository.

Objectives

6-1: Apply for annual NGGDPP grants. Over the past three years, the NGGDPP, as part of its mission to foster the preservation of geoscience materials nationwide, has issued requests for proposals from state geological surveys. For each of the past two funding cycles, MGS has submitted a proposal and been awarded a NGGDPP grant, first, to broadly inventory its collections and, second, to provide detailed information about the items in its sediment core collections. MGS will continue to apply for NGGDPP grants as appropriate, remaining aware that that Program is very particular in terms of the activities that it funds each year.

6-2: Encourage MGS staff to include support for the repository in proposals other than those submitted to the NGGDPP.

6-3: Include potential sources of outside funding in the individualized long-term preservation plans developed for each MGS collection.

6-4: Discuss possible sources of outside funding with the Data Preservation Advisory Panel.

6-5: Determine which of the funding sources listed in Section B-8 (Physical Data - Funding Model) might apply to a state agency.

b. Milestones

The following are the major milestones, in approximately chronological order, to be achieved in establishing MGS as a complying member of the nation system of geoscience repositories:

- Develop and ratify a *Long-Range Data Preservation Plan*.
- Name a curator for the MGS repository.
- Establish a Data Preservation Advisory Panel.
- Establish protocols or criteria for (a) determining disposition of a collection (i.e., retain, relinquish, or discard), (b) ranking collections in the order in which they are to be preserved, and (c) accepting new acquisitions.
- Inventory the data and collections held by MGS.
- Enter information about existing permanent collections into the National Catalog.
- Develop preservation plans for each permanently-held collection.
- Prioritize the order in which data and collections are to be rescued or preserved and, one by one, archive them.
- Reorganize the collections in terms of the physical space they occupy and make necessary repairs to infrastructure.
- Develop and implement plans for facilitating access to MGS holdings.
- Actively pursue funding for the repository (e.g., apply for NCGDPP grants annually; include line items in other grants, as appropriate, to fund preservation).
- Pursue partnerships with other agencies interested in preserving geoscience materials.

c. Strategy to Meet Goals

MGS employees generally believe in the value of their work and support the idea of data preservation. After all, preservation extends the usefulness of results obtained over a lifetime of work – their lifetime and their legacy. To varying degrees, individual researchers already make efforts to preserve specimens and data collected during the projects to which they are assigned. However, obtaining supplementary funding for salaries and meeting project deadlines, not preserving data, are the driving concerns of most Survey researchers. Instilling an archiving mentality in MGS staff – so that they (a) look beyond collecting data for a particular project to the long-term preservation of that data and (b) willingly observe new protocols for handling collections and making them available to the larger geoscience community – will require a deliberate shift in their thinking about the value of preservation.

The likely reasons to be offered in opposition to systematic data preservation are: (a) it requires too much time and effort, and staff are already spread thin by budget cuts and hiring freezes, (b) it is unnecessary in accomplishing project goals and is certainly less interesting than answering geology-related questions or advancing geological

understanding, (c) it has never been a priority before, (d) it raises the possibility of having to release data to the larger geoscience community before the researcher is satisfied that he or she has no further use for it, one of the worst cases being that outside agencies will request early access to data or collections and then fail to credit MGS's contribution.

To meet the goals outlined in this plan, MGS must address two partially related obstacles to success: the possible reluctance of staff to participate and inadequate funding, time, and/or personnel. The Survey can take a number of steps to overcome these:

- Request that the director, who ultimately sets priorities for Survey staff, (a) announce that data preservation will become a way of doing business at MGS and (b) follow up on that announcement as necessary. For example, as part of the 2008/2009 NNGDPP grant, the director issued the invitation and introduced a presentation on the objectives of that project and the importance of data preservation generally.
- To foster Survey-wide compliance, involve the staff in devising data preservation protocols, particularly decisions about the timing of data release to the larger geoscience community.
- To ease the burden of implementation on Survey researchers, name a curator to deal with preservation issues. The job functions of the curator will include (a) overseeing implementation and (annual) revision of the long-range plan, (b) keeping abreast of and adhering to national preservation standards, (c) tracking funding opportunities, including NNGDPP's spending priorities, and applying for funding to support data preservation activities, (d) working closely with MGS staff members to identify and conserve items that belong in permanent collections, (e) convening meetings of the Advisory Panel as needed, (f) updating the internal and the National Catalogs as needed, (g) serving as a contact for accessing collections in MGS's repository, (h) arranging for training in the use of permanent collections, as needed, and (i) engaging in active outreach as time allows. In grants requiring a 1:1 match, the curator's salary will serve as the MGS match.
- Make it clear to those who access MGS's holdings that they are expected to give credit to MGS as a condition of using the collections. In some instances, MGS may suggest working collaboratively with outside agencies rather than merely supplying items in a collection for their use.
- To fund preservation:
 - Apply for NNGDPP funding each year that that Program issues a request for proposals.
 - From the planning/proposal-writing stage forward, include data preservation in future Survey projects, with funds earmarked specifically for that purpose.
 - Establish collaborative relationships with other agencies in or near Maryland, such as the Maryland State Archives, to share certain data preservation responsibilities.
- As a guiding principle and in the interest of time, adhere to national standards and best practices (e.g., for preservation, curation, access to holdings) whenever feasible.

4. FIVE-YEAR TIMEFRAME

Table 1 matches the goals and objectives listed above to a five-year timeframe, beginning in Spring 2009.

Table 1: Five-year timeframe for implementing MGS's initial data preservation goals and objectives.		
Year	Goal - Objective	Action
1	1-1	Develop <i>Long-Range Data Preservation Plan</i>
	1-2	Appoint a curator for the MGS repository
	1-3	Raise awareness about the need for data preservation among MGS staff
	1-4	Establish a Data Preservation Advisory Panel
	1-5	Establish protocols/criteria for disposition of current holdings, prioritizing preservation needs, and accepting new acquisitions
	1-6	Inventory MGS's holdings and enter information about them into the NGGDPP's National Catalog
	2-1	Rank the permanent collections in the order in which they are to be preserved
	6-1	Apply for NGGDPP grant, if appropriate
	6-2	Encourage MGS staff to include support for repository in non-NGGDPP proposals
	6-4	Discuss possible outside funding sources with Data Preservation Advisory Panel
	6-5	Determine which of the funding sources listed in Section B-8 might apply to a state agency
2	1-1	Revise <i>Long-Range Data Preservation Plan</i> on basis of previous year's activities; expand the <i>Plan</i> to include digital data
	1-2	Arrange for curator to attend Data Preservation Techniques Workshop, July 2009
	3-1	Improve existing infrastructure and begin reorganizing collections
	2-2 6-3	Develop specific plans for curating each of the permanent collections, including potential sources of outside funding
	2-4	Develop protocols for transferring collections held by individual researches (or other agencies) to permanent archiving at MGS
	2-3 2-4	Itemize and archive permanent collections, including individually-held collections
	2-5	Develop a digital method for tracking the whereabouts of items
	5-1	Investigate possible partnerships with other entities in the state

Table 1: Five-year timeframe for implementing MGS's initial data preservation goals and objectives.		
Year	Goal - Objective	Action
	6-1	Apply for NNGDPP grant, if appropriate
	6-2	Encourage MGS staff to include support for repository in non-NNGDPP proposals
3	1-1	Revise <i>Long-Range Data Preservation Plan</i> on basis of previous year's activities
	2-2	Develop specific plans for curating each of the permanent collections, including potential sources of outside funding
	6-3	
	2-3	Itemize and archive permanent collections, including individually-held collections
	2-4	
	4-1	When a permanent collection is archived, make its presence known via the MGS website.
	4-3	Develop procedures and policies for distributing archived materials to outside users.
	5-1	Investigate possible partnerships with other entities in the state
6-1	Apply for NNGDPP grant, if appropriate	
	6-2	Encourage MGS staff to include support for repository in non-NNGDPP proposals
4	1-1	Revise <i>Long-Range Data Preservation Plan</i> on basis of previous year's activities
	2-3	Itemize and archive permanent collections, including individually-held collections
	2-4	
	4-1	When a permanent collection is archived, make its presence known via the MGS website.
	4-2	Provide training in the use of the archived material
	4-3	Develop procedures and policies for distributing archived materials to outside users.
	5-2	Inventory the items in the collections to ensure that they are properly preserved
	6-1	Apply for NNGDPP grant, if appropriate
	6-2	Encourage MGS staff to include support for repository in non-NNGDPP proposals
5	1-1	Revise <i>Long-Range Data Preservation Plan</i> on basis of previous year's activities
	2-3	Itemize and archive permanent collections, including individually-held collections
	2-4	
	4-1	When a permanent collection is archived, make its presence known via the MGS website.
	4-2	Provide training in the use of the archived material
	4-3	Develop procedures and policies for distributing archived materials to outside users.
	5-3	Assess the number of users of each of the permanent

Table 1: Five-year timeframe for implementing MGS’s initial data preservation goals and objectives.		
Year	Goal - Objective	Action
		collections; solicit their suggestions for improving the repository
	5-4	As technology changes, convert (digital) items to new data formats, storage media, etc.
	6-1	Apply for NNGDPP grant, if appropriate
	6-2	Encourage MGS staff to include support for repository in non-NNGDPP proposals

B. PHYSICAL DATA

1. PURPOSE/JUSTIFICATION

See Section A.2.a (Overview – Purpose and Justification for Repository – Purpose and Justification).

2. GOALS FOR PRESERVING PHYSICAL COLLECTIONS

The general goals for preserving MGS’s physical collections are included among the goals for the repository listed in Section A. As permanent collections are identified and described, appropriate goals will be developed for the preservation of each one.

a. Milestones and Measurable Results

See Section A.3.b (Overview – Goals for Repository – Milestones).

b. Strategy to Meet Goals

See Section A.3.c (Overview – Goals for Repository – Strategy to Meet Goals).

3. PRIORITY SETTING

a. Setting Priorities for Preserving Physical Data

In setting priorities for preserving physical data, one approach is to choose a single guiding principle and adhere to it strictly: the activity that benefits the greatest number of collections (e.g., infrastructure improvements), or the collection most threatened by loss, or the collection that is used most often, or, more pragmatically, the collection for which funding is available - has highest priority. Each of these has merit. However, MGS, constrained by a tight budget and facing a multitude of data preservation challenges, is

probably better served by a more flexible approach. At any moment, any one of these principles might take precedence over the others. If, for example, funding is available for a particular collection – not necessarily the collection most in need of rescue or the one that is most frequently used – then, MGS must take advantage of the funding opportunity. (Because funding is so critical to data preservation efforts at MGS and because NCGDPP grants, in particular, are targeted to specific activities, MGS must consider NCGDPP objectives in ordering its own priorities.) So, to summarize, MGS will set data preservation priorities by weighing a number of factors. Once set, the list will not be immutable; priorities may change depending on unanticipated circumstances.

All else being equal, MGS’s collections will be rank-ordered primarily on the basis of threat of loss, with those most in need of rescue highest on the list. The impending loss of a collection may be associated with one or more of the following: poor storage areas and/or conditions; inadequate documentation, particularly coupled with the imminent retirement or departure of employees who are most familiar with the collection; lack of staff/time/funding to properly care for the collection. (Other factors, such as failure to recognize a collection’s importance or lack of formal procedures to ensure its long-term survival, are presumably not issues for an agency that has acknowledged the need for data preservation and has implemented a plan to achieve it.)

Table 2 summarizes the criteria that MGS will apply in rank ordering preservation activities associated with its physical collections.

Table 2: Criteria for prioritizing the archiving of a physical collection, based largely on responses to the corresponding <i>Geological Collection Inventory Form</i>
<p><u>Storage condition</u></p> <p>Is the collection stored in less than ideal conditions? If so, can these conditions be improved? Will improving these conditions benefit more than one collection? (Consider the answers to Questions 4-7, Section B, on the associated Geological Collection Inventory Form.)</p> <p>Examples of poor storage conditions: storage area is subject to flooding or otherwise exposed to the elements; storage area lacks climate (temperature and humidity) control; storage area is not secure from theft, vandalism, or vermin; storage area is also used to store field equipment, cleaning supplies, etc., which may pose a threat to the collection; items comprising the collection are scattered and/or disorganized; the boxes, shelves, or drawers in which the items are stored are inadequate (e.g., moldy cardboard boxes, fading or peeling labels, collapsing shelves, broken sample bottles)</p> <p><u>Specimen condition</u></p> <p>Are the specimens that comprise the collection deteriorating? Will the deterioration likely worsen with time? Can the deterioration be halted?</p> <p>Examples of deterioration: maps, reports, photos, etc. tearing or crumbling due to age</p>

Table 2: Criteria for prioritizing the archiving of a physical collection, based largely on responses to the corresponding *Geological Collection Inventory Form*

Metadata

Is the collection adequately catalogued and documented? Are the whereabouts of the metadata known to the curator? If not, are contributors to the collection available for consultation? (Consider the answers to Questions 16-17, Section B, on the associated Geological Collection Inventory Form and the current age of the person(s) who completed the form.)

In general, if metadata are inadequate, collections associated with staff members closest to retirement have higher priority.

Use

Is there an urgent research or societal need that can be more easily met by rescue or proper archiving of the collection? Is the collection used or accessed often by MGS staff? By outside users? Will the frequency of access likely increase as a result of entering information about the collection into the National Catalog? (Consider the answers to Questions 8, 10, 12, and 13, Section B, on the associated Geological Collection Inventory Form.)

Funding/staff/time

Are funding and staff available to effect a rescue? Is additional funding available from other sources to hasten the rescue? In particular, is the preservation activity in alignment with current NCGDPP objectives?

b. The Priorities

After the initial collections inventory, to be completed by Summer 2009, MGS will be in a position to prioritize activities associated with the preservation of its physical holdings. The curator, with input from other MGS employees and the Data Preservation Advisory Panel, will review the Geological Collection Inventory Forms completed for each of the collections and, using the criteria in Table 2 above, develop a list of data preservation priorities.

One of the issues will involve prioritizing not just the preservation of physical specimens themselves, but the conversion of such specimens, especially paper-based items, to their digital equivalents.

4. ACQUISITION AND DISPOSAL

a. Deciding What to Accept, Keep, or Discard

For MGS, deciding what to accept, keep, or discard is one of the most difficult data preservation issues to resolve. At present, no Survey-wide policies exist to guide such decision-making. Individual researchers differ radically in their propensity to keep or toss geoscience materials, as is readily apparent from the appearance of their offices. For some, publication of a report, including extensive data appendices, is enough to warrant discarding the materials collected in support of the study. Others keep everything.

To help make consistent decisions about the fate of geological artifacts, MGS, relying heavily on guidelines developed by the National Academy of Sciences (NAS, 2002), compiled the following list of questions and considerations in Table 3 to guide its future deliberations.

Table 3: Guidelines for deciding which geological materials to accept, keep, or discard
<p><u>Question 1: Mandated?</u></p> <p>Is archiving of the collection or data set mandated (e.g., by law, by the terms of a grant or agreement)?</p> <p>A legal or contractual mandate to archive a collection or data set automatically dictates that it be kept. Specify the length of time the collection is to be kept and ensure that it is well documented, including the name of a contact at each partnering agency.</p>
<p><u>Question 2: Irreplaceable?</u></p> <p>Is the collection/data set unique or irreplaceable? Is it impossible or highly unlikely to collect a similar sample, for example, due to inaccessibility of the site or because re-collection is too costly or time-consuming?</p> <p><u>Question 2a: Adequately documented?</u></p> <p>Is the irreplaceable collection/data set adequately documented, that is, documented at least well enough to know that it is unique (e.g., through field notebooks)?</p>
<p><u>Question 3: Well documented?</u></p> <p>Is the collection well documented or can it be easily documented (e.g., from a known report, from the collector)?</p> <p>Unless a collection is well documented, further assessment of its utility and future is</p>

Table 3: Guidelines for deciding which geological materials to accept, keep, or discard

difficult or impossible. “Documentation” refers to the information stored in the

National Catalog, such as age, location, depth, collector or author, date acquired, and associated material. (Unless information for all “required” fields is supplied, metadata cannot be uploaded to the National Catalog.)

Question 4: Potential applications?

Does a science advisory board comprised of members of the user community foresee that the data set might be of value in potential future applications (e.g., applied or basic research, education, exploration and development of natural resources, protection of the environment, mitigation of natural disasters)?

Question 5: Accurate?

Is accuracy a factor for this particular data set/collection?

Accuracy is not necessarily a factor for some types of data and collections. For example, maps, notes, and other unpublished materials may be highly inaccurate, but their historical context could be valuable in understanding how someone was led astray. Or, for geophysical information, the accuracy might be very poor, but some valid information could nevertheless be extracted from it mathematically.

Question 5a: Accuracy adequate?

Given the considerations above, is the accuracy of this data set/collection adequate?

Question 6: Quality/completeness?

Is the quality or completeness of the data set adequate for legal vs. research vs. teaching purposes?

Question 7: Non-replicative?

Does the collection/data set duplicate another set?

For physical specimens, particularly derived data (e.g., well completion reports, seismic lines, reports, maps), does the data collection already exist in a digital format? If so, is it necessary or desirable to retain the original specimens? If not, is it necessary or desirable to convert the original specimens to digital format? Once the conversion is effected, should the originals be discarded?

Question 7a: Replication desirable?

If the answer to Question 7 is “Yes,” is replication of the data set/collection desirable?

Replication is not always a negative factor in the retention of data

Table 3: Guidelines for deciding which geological materials to accept, keep, or discard

sets/collections. For example, replicate information for engineering collections, such as multiple drill stem tests from the same well or from nearby wells, can be useful in assembling the history of reservoir development and exploitation.

Multiple specimens of the same fossil taxon allow evaluation of population information, such as variability. If a mine is opened and part or all of a deposit is mined, mine cores may be the only remaining record of the mined material. Sediment cores have an inherent fragility and sensitivity to storage conditions that make replicates a wise insurance policy against loss.

Question 8: Multiple formats?

For physical specimens, particularly derived data (e.g., well completion reports, seismic lines, reports, maps), does the data collection already exist in a digital format? If so, is it necessary or desirable to retain the original specimens? If not, is it necessary or desirable to convert the original specimens to digital format? Once the conversion is effected, should the originals be discarded?

Question 9: Cost and space?

Is there adequate space to store the data? If not, is there adequate funding to pay another repository to store the data?

Question 10: Use?

Is the data set or collection used a lot?

Use may be a poor criterion for assessing importance or future relevance for two reasons. First, use commonly is a function of how well known a collection is. A particular collection may be unused if its whereabouts is unknown. Second, immediate use is not necessarily an indicator of future use.

Question 11: Author/collector still employed by MGS?

Is the author or collector still employed by MGS? If so, does he or she believe the data/collection should be discarded?

Strictly on the basis of employee morale, carefully consider discarding reports/data collected during the lifetime of an employee still working for MGS. It is discouraging/demoralizing to see your life's work chucked into the dumpster.

Question 12: Physical specimens altered?

For physical specimens, is it likely that sample storage has altered the physical or chemical properties of the original samples so as to make their future value problematic (e.g., sediment or water samples stored in an environment radically different from in situ conditions, for example, bay bottom sediment samples stored at ambient temperature and humidity at Matapeake)?

Table 3: Guidelines for deciding which geological materials to accept, keep, or discard

b. Updating Collection Data

Collections and data will continue to accrue mainly as Survey researchers carry on their mission-driven investigations. Certain newly acquired specimens and data may remain in the possession of the collector or creator until he or she completes the associated project or leaves the Survey. Occasionally, MGS's partners may request that the Survey act as a repository for certain jointly collected items. The primary difference between the past and anticipated future growth of collections will be the development and use of standardized protocols for transferring or otherwise adding new items, both from within and outside the Survey.

c. Finding and Rescuing Collections

MGS has been awarded a one-year grant from the National Geological and Geophysical Data Preservation Program (NGGDPP), which began in September 2008. As part of that grant, MGS will inventory its data and collections by (1) interviewing staff to learn of the existence and whereabouts of MGS's holdings, (2) locating and assessing their condition, and (3) setting priorities for rescue. Fortunately, many of MGS's staff members have worked at the Survey for decades and, among them, have a good idea of where data and collections are located. Furthermore, all of the Survey's holdings are housed in two buildings, so finding and inventorying them will be relatively straightforward.

Once MGS has broadly identified its data and collections, determined their condition, and decided which are to be permanently held, each MGS program will rank its holdings in the order in which they are to be rescued. "Rescue" will mean different things for different collections, depending on the nature of the collection and its current condition. On the one hand, it may merely entail entering information about the items that comprise a well-maintained collection into a database. On the other hand, it may involve researching the items, properly curating and/or digitizing them, as well as entering information about them into a database.

5. DOCUMENTATION/METADATA

a. Metadata Requirements

MGS holds a wide variety of data and collections, and, over time, different groups of people contribute to them. As of the date of this plan, MGS has no formal metadata requirements that apply to all of its holdings. However, Survey researchers usually write project reports, which include a great deal of information that can be construed as metadata. The challenge for the curator will be matching the reports to the individual items in the data/collections.

b. MGS's vs. National Catalog Requirements

As part of its 2008-2009 NGGDPP grant, MGS will inventory its data and collections and, for those deemed permanent, submit records to the Collections Inventory of the National Catalog. The Survey also intends to develop an internal database that mirrors the National Catalog, but contains additional information (e.g., the location of the collection/data within MGS; the program or person responsible for its maintenance) for both permanent and semi-permanent collections.

In 2009, MGS was awarded a second NGGDPP grant (2009-2010) to begin itemizing its sediment core collection, supplying the associated metadata to the National Catalog. Again, metadata stored in the Survey's internal database will include any and all information required by the National Catalog.

6. PRESERVATION

a. Infrastructure

i. Current Infrastructure

As mentioned above, MGS currently stores its physical data and collections in two separate buildings – its main office in Baltimore, Md., and a storage building in Matapeake, Md. (Fig. 1).

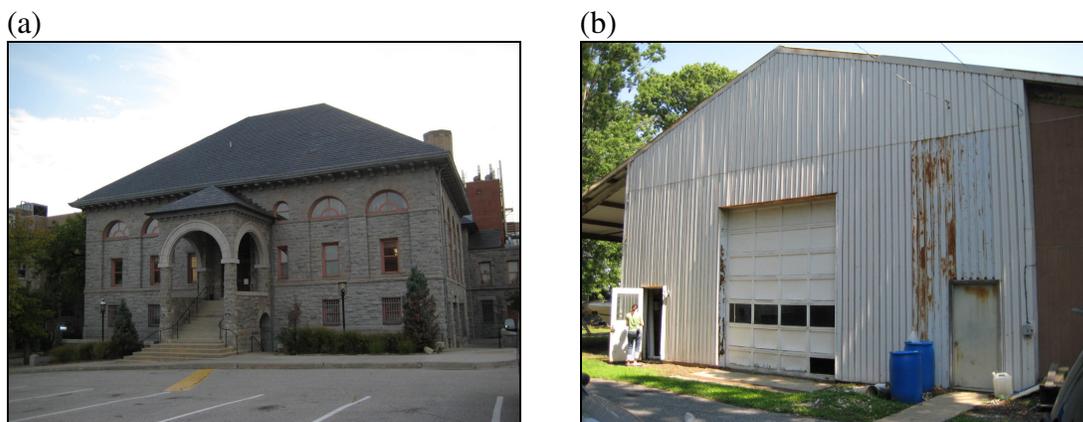


Figure 1: MGS's geoscience holdings are stored in (a) its main office building in Baltimore, Md., and (b) a storage building in Matapeake, Md.

Baltimore

MGS's main office is located in a renovated, climate-controlled, stone edifice built in 1888 as a college gymnasium. The four-story building, 33,000 ft² in size, consists of two

wings – the main building and the annex – connected by a bridge that spans the alleyway separating them. Its function as a repository for most of MGS’s data and collections is secondary to its use as office space. It contains staff offices, conference rooms, a publication sales office, libraries, laboratories, and storage areas. One small room, in which original MGS publications are stored, is protected by a halogen system.

A variety of data and collections are scattered throughout the building – in individuals’ offices, in a number common rooms (e.g., library, lobby, storage rooms), and on stairway landings. Appendix 3 contains the floor plans of the main building and shows the contents of common rooms, other than occupied offices, known to contain data or collections.

Data and collections stored in common rooms may share space with field equipment, extra copies of reports (the Publications Office inventory), obsolete computer equipment, cleaning supplies, etc. (Fig. 2).

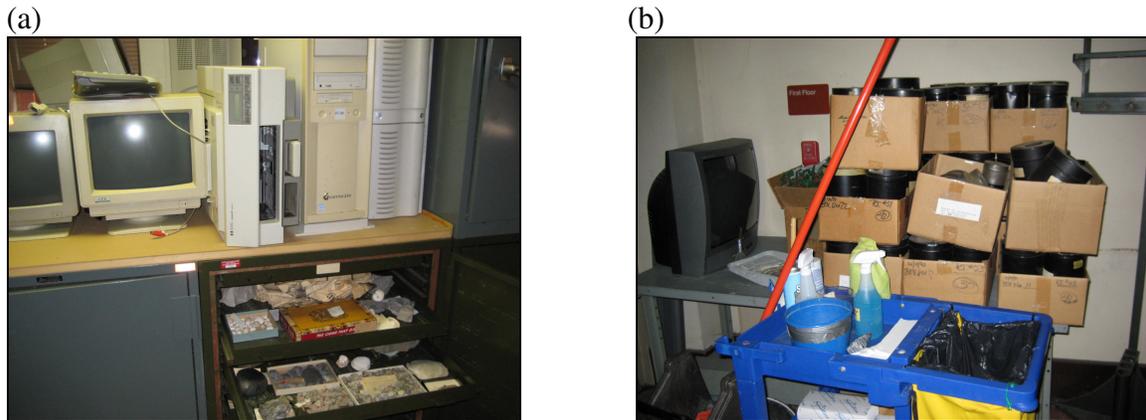


Figure 2: At the main office building, MGS’s collections commonly share space with (a) obsolete computer equipment and (b) cleaning supplies.

Matapeake

MGS’s storage facility at Matapeake consists of a single room, 1,100 ft² in area, partitioned from the interior of a larger, corrugated metal building. Entry is through either a single house door or a garage door, both located on one side of the building. The building is insulated and wired for electric lights, but temperature and humidity cannot be regulated, except by opening or closing the doors.

The collections housed at Matapeake consist almost entirely of marine and estuarine sediment cores, sediment grab samples, and sand splits remaining from the analysis of sediment grain size. Many of the items in these collections have been in storage at Matapeake for over 30 years. MGS does not advertise their existence, and they are seldom accessed.

As is the case at the main office, the facility at Matapeake is used to store both collections and field equipment (Fig. 3). The site is conveniently located for field work on

Maryland's Eastern Shore. So, it is a handy place to store equipment, particularly the Survey's 17-foot Boston Whaler. However, joint storage of field equipment and physical collections has been a problem. Several years ago, a driver, backing the boat into the "garage" at Matapeake, accidentally hit a rack of shelves and ruined a number of the samples stored there.



Figure 3: At the Matapeake facility, MGS's collections (sediment grab samples stored in glass jars in cardboard boxes) share space with field equipment.

ii. Existing Issues with Current Infrastructure

Baltimore

- For the most part, the main office building is well maintained, secure, and regularly cleaned. Temperature and humidity are controlled. The primary structural deficit is a tendency for the basement to flood during heavy rainstorms and external water main breaks (Fig. 4).
- The dispersal of data and collections throughout the building complicates their management.
- At present, no area except the library is designated specifically for the examination of collections (i.e., reports, maps, and aerial photos) by outsider users.

Matapeake

- Inadequate storm drainage around the Matapeake facility sometimes leads to severe flooding inside the building; water stands several inches deep after heavy rainstorms. The resulting dampness has encouraged the growth of mold in the insulation and on interior walls.

- The warehouse itself is poorly maintained. The exterior siding near the single door is coming unscrewed. Many of the overhead lights work erratically, flickering off and on, or not at all. A bottom panel is missing from the garage door. The opening allows entry to local cats. The storage room smells of urine, and animal feces are drying on the floor.
- The place is in dire need of cleaning. A light bulb lies shattered on the floor. A trashcan is overflowing. Field equipment is disorganized.
- Over time, variability in temperature and humidity has weakened the integrity of the cardboard boxes in which many of the collected items are stored.
- Given the amount of space allotted for the boat and its trailer, there is little or no additional storage space at Matapeake.



Figure 4: In Baltimore, building engineer Keith Andrews vacuums water from basement storage area (Room 009) following a heavy rainfall.

iii. Infrastructure Needs

At present, MGS has adequate storage space for its data and collections. Maintenance, including diverting local drainage, and cleaning of the Matapeake warehouse are the primary infrastructure needs.

b. Collections Needs

i. Storage (e.g., cabinetry, specimen containers)

The several collections and data held by MGS are scattered throughout the main office building or are stored at the Matapeake facility. The storage situation varies depending

on the collection. For example, in common areas of the main office building, fossils are labeled and displayed in glass display cabinets. Elsewhere, fossils are kept in labeled cigar boxes in cabinets located in a locked basement office subject to flooding (Fig. B-5). Individual researchers also have collections of their own, which may or not become part of MGS's permanent collection. These are stored according to the collectors' whims. No catalog, paper or digital, exists, listing MGS's fossil holdings.

Not until the initial inventory of collections and data is complete can this question be satisfactorily answered.

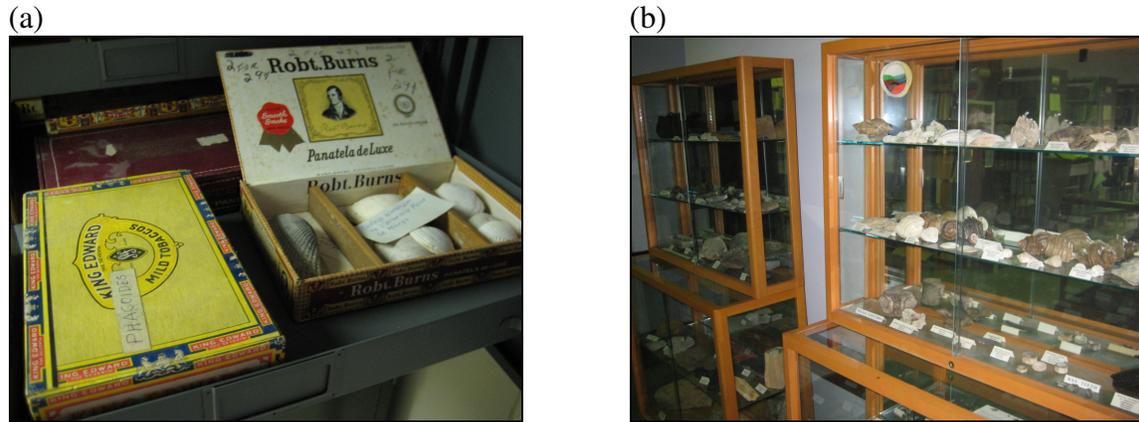


Figure 5: Storage of MGS's fossil collection in (a) cigar boxes in cabinet drawers and (b) display cabinets in public areas.

ii. Current Storage Situation

Until MGS completes its initial inventory of data and collections, identifying the current storage situation in detail is difficult. Again, the situation varies depending on the storage facility (Baltimore vs. Matapeake) and the types of data/collections stored in each.

iii. Issues with Current Storage Situation

Until MGS completes its initial inventory of data and collections, identifying all issues with storage needs is difficult.

iv. Storage Needs

Until MGS completes its initial inventory of data and collections, identifying storage needs is difficult.

7. ACCESS AND USE

a. User Community

Because MGS is a state agency, virtually any person, agency, or organization is a potential user of the Survey's data and collections. In reality, few people outside of MGS use any of our holdings, in large part because few know of their existence.

Again, outside usage varies by collection. The types and numbers of users who currently access the Survey's holdings will be known once the initial inventory of collections and data sets has been completed.

b. Outreach Plan

In addition to entering information about its permanent collections in the National Catalog, MGS currently has two other mechanisms at its disposal to publicize their existence: the Publications Office and the MGS website. In 2007, about 300 people visited the Publications Office and/or the MGS library. In sharp contrast, about 750,000 visitors access the Survey's website each year. Once a collection has been catalogued and readied for public use, its availability may be made known through one or both of these avenues.

Survey visitors may be prompted to inquire about MGS collections through signs displayed in the Publications Office, pages inserted into the annually-updated Publications Catalog, and a free brochure describing Survey collections. Those brochures may also be distributed by MGS's public affairs officer, who is regularly engaged in public outreach activities.

Compared to the number of walk-in customers, MGS reaches a considerably larger audience through the Internet. A digital version of the Collections brochure will be available from the Publications section of the website. MGS will create a Collections category on its website, which will contain descriptions of each collection, as well as information about how to use and access it. To the extent that it is feasible, MGS will strive to make its collections web-accessible.

However, because of limited staff, MGS will have to be judicious as to which collections it actively advertises as available for outside users.

c. Accessibility

Although, at present, MGS does not actively publicize the existence of its collections and their availability to the larger user community, when a prospective user requests access to particular collection, he or she can generally schedule an appointment with the staff member most familiar with the collection to view or otherwise utilize items in the collection. But, as with so much else in this report, much depends on the particular collection and the nature of the request.

Depending on the collection, MGS may develop (a) procedures for outside users to follow, for example, in requesting access to items in the collection, and (b) policies

explaining the users' obligations to the Survey, for example, by giving MGS credit for having provided the items.

d. Advisory or User Committee

Initially, the same Data Preservation Advisory Panel established to assist MGS in deciding the fate of its collections will serve as a user committee. As such, it will assist in the development of procedures and protocols appropriate for MGS and consistent with national standards. The plan to create the Advisory Panel is found in Section A.3.a.i (Goals for Repository – Goals and Objectives – Goal 1 (Objective 1-4)).

8. FUNDING MODEL

MGS has not actively pursued funding for data preservation, other than through NGGDPP. To fully develop a funding model will require input from other members of the Survey, the Data Preservation Advisory Panel, and, perhaps, a state financial advisor.

a. Requirements and Constraints

The biggest constraint on funding for data preservation is the disastrous state of the state's budget and of the country's economy generally. A "hard" hiring freeze precludes hiring a curator. Data preservation will have to be done on a shoestring budget, with the current staff. Consequently, it will probably proceed more slowly than might be desired.

b. User Fees

With its present limited user base, MGS does not charge user fees, except for its publications. As a state agency, the Survey is limited in its ability to collect fees of any sort.

c. Investment Plans

As a state agency, MGS does not participate in investment plans.

d. Endowments

MGS currently has no endowments and, as a state agency, may or may not qualify for any. The Survey certainly does not actively pursue endowments.

e. Base Funding

State government owns and maintains the two buildings that house MGS's geologic data repositories. Likewise, the state pays the author's salary.

f. Cost Sharing

MGS has not explored the possibility of cost sharing, other than suggesting that employees begin including archiving costs in future proposals. This matter may also be discussed with the Data Preservation Advisory Panel.

9. PARTNERSHIPS

To date, MGS has been awarded two year-long grants from NCGDPP to populate the National Catalog. Under the terms of the 2008-2009 grant, MGS will inventory and broadly describe its data and collections. The 2009-2010 grant will entail entering metadata about the particular items comprising the Survey's sediment core collection (both terrestrial and marine/estuarine cores) into the National Catalog.

Except for NCGDPP, MGS has no active partnerships with other agencies or institutions to fund or otherwise collaborate on data preservation. Sometimes, a particular collaborative project will be designed in such a way that samples collected during the course of the project are intentionally saved for some period of time afterwards. Thus, sediment cores collected from the Atlantic continental shelf, with partial funding from the Minerals Management Service, are being stored indefinitely in the Survey's Matapeake facility. In general, however, partnerships are established for purposes other than data preservation and may or may not include data preservation as one of their objectives.

That being said, as a state agency MGS has access, and sometimes an obligation, to the Maryland State Archives (MSA), at least in terms of preserving reports and data acquired through an expenditure of state funds. The Survey will contact a representative of MSA to explore how the two agencies might work together more productively. MGS will make similar overtures to the DNR librarian.

C. DIGITAL DATA

This section of the report will be addressed in the next annual revision.

D. REFERENCES

Data Preservation Working Group of the National Cooperative Geologic Mapping Program Federal Advisory Committee, 2006, Implementation plan for the National Geological and Geophysical Data Preservation Program: U.S. Geological Survey, 26 p.

- Lamont-Doherty Earth Observatory Deep-Sea Sample Repository, 2003, Policy and procedures for distribution of samples and sample information, http://www.ldeo.columbia.edu/res/fac/CORE_REPOSITORY/RHP1.html, [6/11/2009]
- Maryland Geological Survey (MGS), 2007, Fact Sheet 2: Land areas, inland-water areas, and length of shorelines of Maryland's counties, <http://www.mgs.md.gov/esic/fs/fs2.html>, [3/31/2008].
- Maryland Geological Survey (MGS), 2008, Inventory of geological data and collections at the Maryland Geological Survey: NGGDPP proposal submitted in response to Program Announcement No. 08HQPA0015 for FY2008: Md. Geological Survey, Baltimore, Md., 15 p.
- National Academy of Sciences (NAS), 2002, National resources in peril: The National Academies Press, Washington, D.C., 107 p.
- Reger, J.P., 1996, A history of the Maryland Geological Survey, *in* Brezinski, D.K., and Reger, J.P. (eds.), Studies in Maryland Geology – In Commemoration of the Centennial of the Maryland Geological Survey: Md. Geological Survey Special Publication No. 3, Baltimore, Md., p. 3-43.
- U.S. Census Bureau, 2006, 2006 population estimates, United States – states; and Puerto Rico, <http://factfinder.census.gov/>, [3/31/2008].

APPENDIX 1

Preliminary List of Geoscience Collections and Data, Maryland Geological Survey March 2008

Type of collection or data	MGS holding	Responsible program/individual
Physical geoscience collections		
Auger samples		Hydrogeology & Hydrology (H&H)
Geochemical samples	Sediment core samples	Coastal & Environmental Geology (C&EG) - Hill
Hand samples	Rock & mineral samples	C&EG - Reger
	Sediment grab samples	C&EG - Wells
Paleontological samples	Micro (foram collection; pollen spores, microfossil slides)	C&EG - Shelton H&H
	Macro (library/lobby exhibits; individual collections from cores, etc.)	C&EG - Shelton H&H
Rock cores	From non-coastal plain regions of the State, and from wells that penetrated basement on the Coastal Plain	H&H C&EG - Shelton
Rock cuttings	Offshore gas/oil?	C&EG - Shelton
	From gas wells in Garrett Co.	
	From non-coastal plain sections of the State, and from wells that penetrated basement on the Coastal Plain	H&H
Sediment cores	MMS cores (from 1985-present)	C&EG - Conkwright
	Other cores inventoried & stored at Matapeake	C&EG - Wells
Rotary Cores	Rock and sediment	H&H
Sidewall cores	Sediment only	H&H
Split-spoon cores (samples)	Sediment only	H&H
Thin sections/polished sections	In individual office collections and basement	C&EG - Brezinski
	From rock cores	H&H
Type stratigraphic sections?	“Type well sections”, i.e. cuttings used to erect the Piney Point Fm. A unit that only occurs in the subsurface. Also,	H&H

Type of collection or data	MGS holding	Responsible program/individual
	possibly same for the Waste Gate Fm.	
Derived & indirect geoscience data		
Drilling/completion reports	Well permits - from non-coastal plain sections and from wells that penetrated basement on the Coastal Plain.	H&H
	Well completion reports	Primarily MDE and the counties; also MGS (H&H)
	Well completion reports	C&EG - Conkwright
	MMS vibracores	C&EG - Conkwright
	Completion reports for deep gas wells	MDE
Drill stem & other tests	Pump tests	H&H
Water-level data	Synoptic and occasional water-level measurements	H&H
Field notes	Dating back to the founding of the modern Survey in 1896	C&EG – Reger; H&H
Geochemical data	Chesapeake Bay Earth Science Study (CBESS) – bay bottom pore water geochemistry; dredged-sediment disposal monitoring (Hart-Miller Is.; Poplar Is.)	C&EG - Hill
Isotope data (C ¹⁴ , Pb ²¹⁰ , Ce, etc.)	Core samples from continental shelf, reservoirs, Chesapeake Bay, coastal bays	C&EG
Paleontological, palynological data	Core samples from continental shelf	C&EG
Physical data (textural, bulk density, etc.)		C&EG
Geophysical data (e.g., magnetic, gravity)	Geophysical logs (gamma, resistivity, sonic, etc.) logs	H&H
Lithology logs (including mud and gas logs)	Geologists' descriptions of cores and well cuttings.	H&H
Maps	Hydrologic atlases	H&H
	Library/network CD and DVD ROM	C&EG - Quinn
	Paper copies, microfiche, blue line (mylars)	
Paper reports	Library/network CD and DVD	C&EG - Shelton

Type of collection or data	MGS holding	Responsible program/individual
	ROM	
	Reports of Investigations, Open-file reports, etc.,	C&EG, H&H
Photographs	Library/network CD and DVD ROM	
	Individual collections of cores in the field, outcrops, drilling operations, etc.	H&H
	Film (& negatives), photographs, radiographs, slides, digital images	
Potential fields		
Production history		
Routine analysis data	e.g., lab sheets for grain size	
Seismic data	Seismographs (digital or paper) from MGS seismic station (not to be confused with subbottom acoustic surveys)	Lamont-Doherty; C&EG - Conkwright
Special analysis data	e.g., sediment oxygen demand (SOD) data	C&EG
Stratigraphic horizons (e.g., cross sections)		
Surface & airborne data	LIDAR	MD DNR
	Elevation surveys for subsidence of well fields	H&H
	Aeromagnetic and gravity surveys (published maps)	H&H
	Sinkhole surveys	C&EG – Brezinski
	Bathymetric surveys	C&EG – Ortt, Wells
2-D seismic reflection	Coastal Plain	H&H
	Gas/oil well samples (rolls in basement)	
	Paper copies of seismic surveys (Chesapeake Bay and coastal bays)	C&EG
	Paper copies of side-scan surveys (continental shelf)	C&EG
Profile survey data	Ocean City beach profiles; Calvert Cliffs; Hart-Miller Is., CBESS nearshore data	C&EG
Synthetic seismograms derived from sonic logs	Coastal Plain	H&H
Well logs (paper, fiche, digital)		H&H
Derived fluid	Pore water extracted from bay bottom sediments (CBESS)	C&EG - Hill

Type of collection or data	MGS holding	Responsible program/individual
	Well water quality (including Hart-Miller Is. well monitoring)	H&H; C&EG
(Predictive) groundwater flow models		H&H

APPENDIX 2

Prospective Members of MGS's Data Preservation Advisory Panel

Ms. Laura Bowne

GIS Lead
Land Acquisition & Planning
Maryland Dept. of Natural Resources
Tawes State Office Bldg.
580 Taylor Ave. E4
Annapolis, MD 21401
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E-mail: lbowne@dnr.state.md.us
Collections: GIS data, digital and paper
(geologic) maps

Stephen Curtin

USGS
MD-DE-DC District
5522 Research Park Dr.
Baltimore, MD 21228
Phone: 443-498-5539
E-mail:
Collections: Well logs, auger samples

James Gerhart

USGS
Phone: 443-498-5501
Collections: Aquifer (pump) tests, well
permits & completion reports

John Grace

MD Dept. of the Environment
Source Protection & Appropriations Div.
Water Supply Program
1800 Washington Blvd.
Baltimore, MD 21230
Phone: 410-537-3714
E-mail: jgrace@mde.state.md.us
Collections: MD groundwater quality
data, aquifer (pump) tests, well permits
& completion reports

Harry J. Hansen

(former Chief, MGS's Hydrogeology &
Hydrology Program)
3501 St. Paul St.
Apt. 518
Baltimore, MD 21218
Phone: 410-235-6212
Collections: Well logs, 2-D seismic
reflection profiles, well permits &
completion reports, paleontological &
palynological data from water wells,
geological (lithological) descriptions of
Coastal Plain cores and wells

Jordan Loran

MD Dept. of Natural Resources
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580 Taylor Ave.
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continental shelf

Catherine McCall

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E-mail: cmccall@dnr.state.md.us
Collections: Photographs – Chesapeake
Bay shoreline

Ms. Kim Mereno

Director, Appraisal and Description
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Annapolis, MD 21401
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E-mail: kimm@mdsa.net
Collections: reports, maps

Cherie Miller

USGS
Phone: 443-498-5554
E-mail: cvmiller@usgs.gov
Collections: MD groundwater quality data

Tucker Moorshead

Earth Data, Inc.
Collections: Aquifer (pump) tests

David Powars

USGS
Collections: Rock cores, rock cuttings

Daniel C. Sain

MD State Highway Admin.
Plats and Surveys Div.
211 E. Madison St.
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Collections: Elevation surveys

James Snyder

US Army Corps of Engineers
Baltimore District
Collections: Sediment cores, MD continental shelf

Ms. Jennifer Stott

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David Vanko

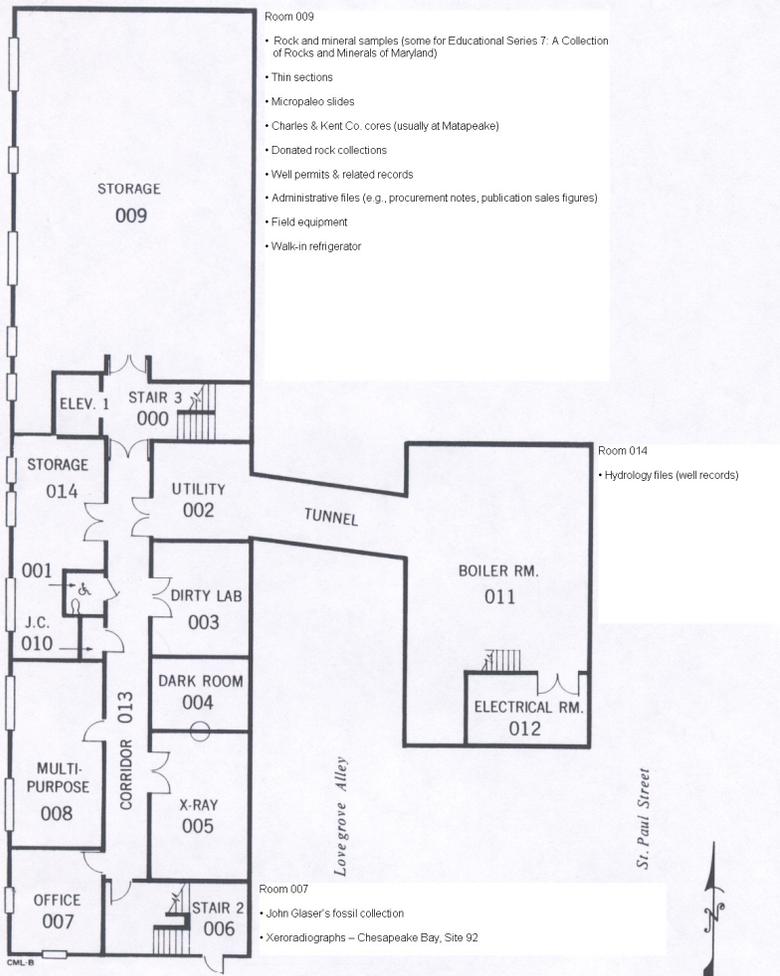
Towson Univ.
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Ms. Ann Wheeler

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Collections: reports, maps

APPENDIX 3

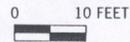
Floor Plan of MGS's Main Office Building with Notes about Collections Found There

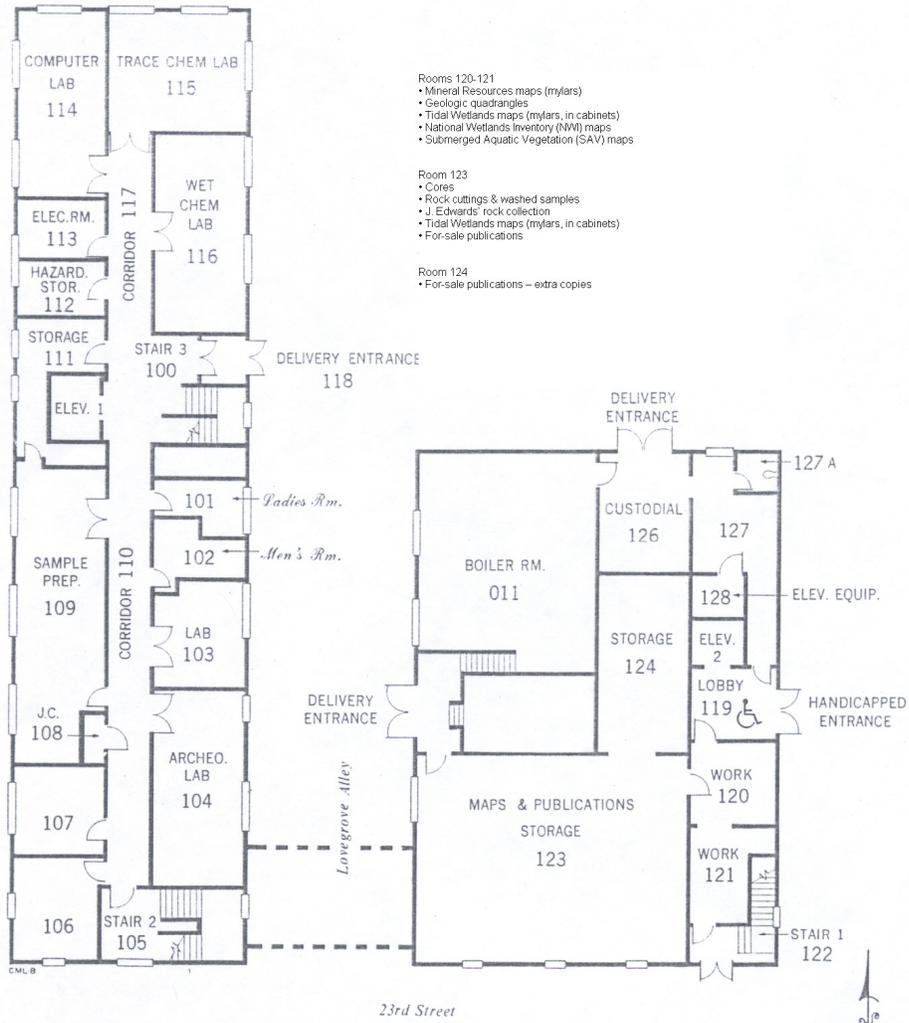


BASEMENT

23rd Street

**MARYLAND GEOLOGICAL SURVEY
BUILDING COMPLEX**





- Rooms 120-121
- Mineral Resources maps (mylars)
 - Geologic quadrangles
 - Tidal Wetlands maps (mylars, in cabinets)
 - National Wetlands Inventory (NWI) maps
 - Submerged Aquatic Vegetation (SAV) maps
- Room 123
- Cores
 - Rock cuttings & washed samples
 - J. Edwards' rock collection
 - Tidal Wetlands maps (mylars, in cabinets)
 - For-sale publications
- Room 124
- For-sale publications - extra copies

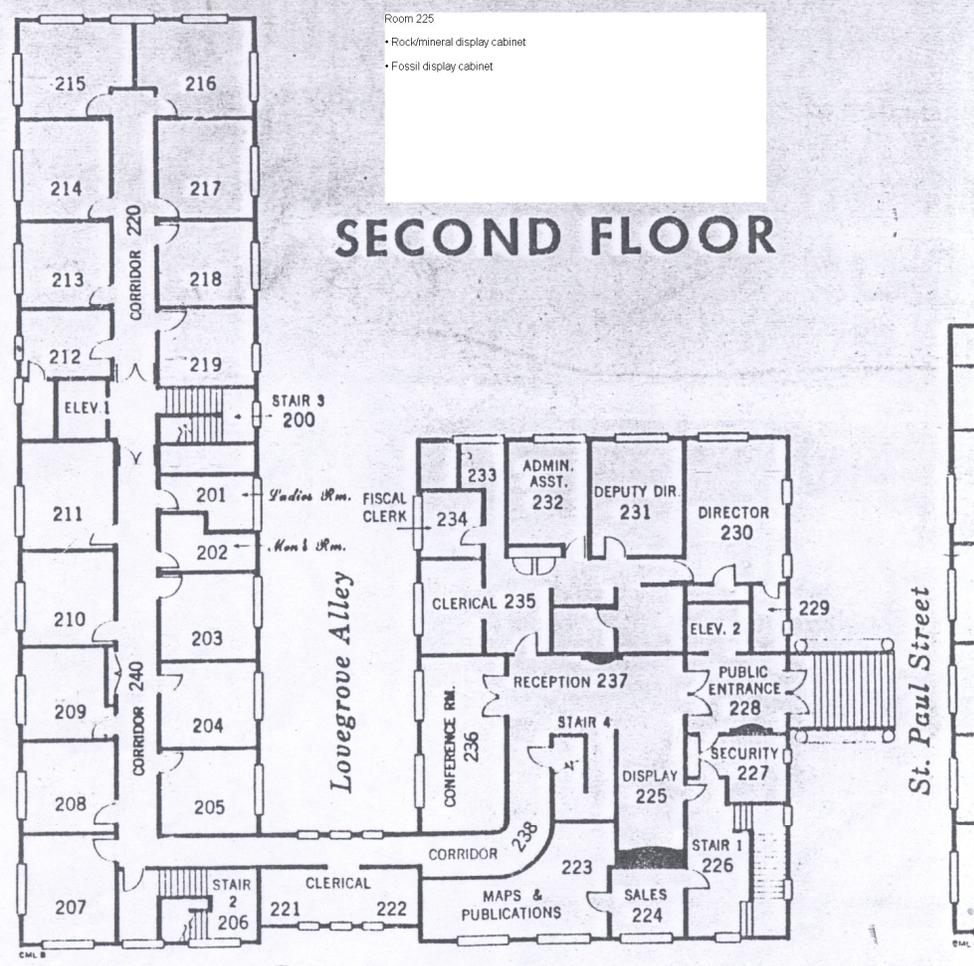
FIRST FLOOR

**MARYLAND GEOLOGICAL SURVEY
BUILDING COMPLEX**





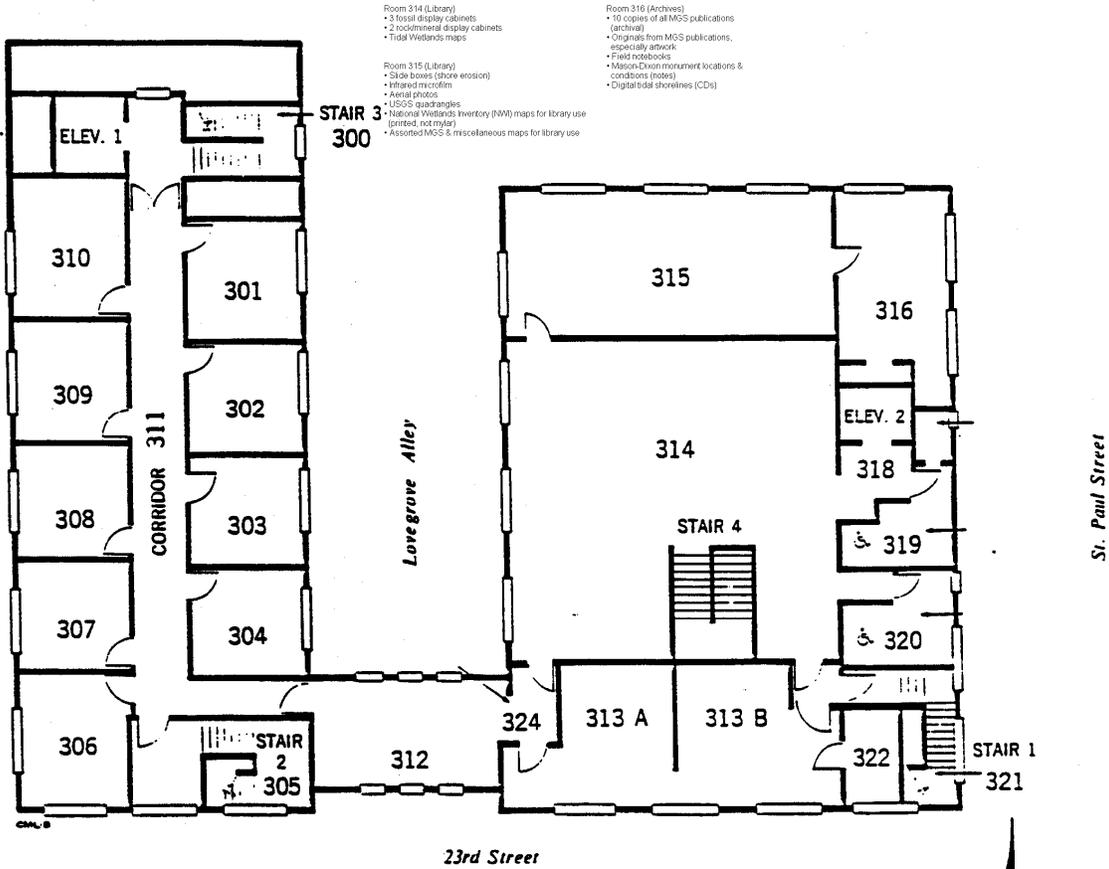
23rd Street



Room 225
 • Rock/mineral display cabinet
 • Fossil display cabinet

SECOND FLOOR

23rd Street



- Room 314 (Library)
 - 3 fossil display cabinets
 - 2 rock/mineral display cabinets
 - Tidal Wetlands maps

- Room 315 (Library)
 - Slide boxes (shore erosion)
 - Infrared microfilm
 - Aerial photos
 - USGS quadrangles
 - National Wetlands Inventory (NWI) maps for library use (printed, not mylar)
 - Assorted MGS & miscellaneous maps for library use

- Room 316 (Archives)
 - 10 copies of all MGS publications (archival)
 - Originals from MGS publications, especially atlases
 - Field notebooks
 - Mason-Dixon monument locations & conditions (notes)
 - Digital tidal shorelines (CDs)

THIRD FLOOR
**MARYLAND GEOLOGICAL SURVEY
 BUILDING COMPLEX**

