LEGISLATIVE COMMITTEE TAPE PROJECT
Report of the Vermont State Archives
February 15, 2005

The Project: The 2004 session of the general assembly appropriated $50,000 to the state archives to convert analog (reel to reel and cassette) tape recordings of legislative committee hearings to digital form. As explained by the Legislative Council, the goals of the project are to preserve the recorded testimony and create consistency of storage by having all past and current testimony captured on CDs.

Importance of the Records: In general terms, the recorded testimony is a unique and valuable resource that should be preserved. Testimony is used to defend and interpret the legislature's intent in passing specific legislation. The recordings have an immediate administrative value in allowing committees to review testimony when marking up and reporting bills and a long term value in providing context for bill drafting. They also have unique historical value as documentation of important legislative deliberations such as civil unions, educational funding or health care reform.

Problem Addressed: The immediate problem is that the tapes are deteriorating and market forces are replacing analog technology (tapes and recording equipment) with digital recording hardware and software.[1] The Legislative Council stopped using analog tapes in 2001 in favor of digital recordings of committee testimony and, in the senate, floor debate. Testimony is now recorded on to CD-Rs. The Council stopped routinely transcribing tapes in 1985 so the analog tapes are the sole record.

These tapes are in need of preservation. Reel to reel tapes have traditionally been seen as an archival medium and, under proper storage conditions with regular management (rewinding and cleaning for example), could last an estimated 50 years. Manufacturing changes in the 1970s and 1980s shortened tape life, while cassettes, which have largely replaced reel to reel technology, have an even shorter life. Starting in the 1990s the Legislative Council began to use longer, but thinner, 120 minute cassette tapes. These tapes may last 15 years but are subject to "sticky shed,"[2] stretching, and other problems associated with storage conditions and use. As noted above, market forces are making analog tapes obsolescent. The State is down to its last couple of reel to reel players and there are only a couple of vendors left for that technology.

Scope of Project: The legacy tapes, which date back to at least 1985, include 2,270 reel to reel tapes (13,620 hours) and 16,179 cassettes (24,269 hours). This does not include tapes created by the Joint Fiscal Office for the Appropriations committees.[3] Transfer of

[1] For an example of the problem see the February 7, 2005 news article included as Appendix C.
[2] Associated with tapes manufactured in the 1980s sticky shed is a chemical reaction, often triggered by poor storage environments, that creates a sticky surface on the tape which can literally peel off the recorded information.
[3] The JFO's transfer sheets documenting what they sent to the Middlesex record center do not easily lend themselves to quantification, but there appear to be hundreds of tapes.

analog to digital recordings must occur in real time; it will take 40,000 hours to convert 40,000 hours of tape.[4]

Public Records estimated that it would cost them $757,770 to do the conversion. Based on the costs of similar projects at the Vermont Folklife Center and the Maine State Archives, other estimates ranged between $2 million and $4.6 million. These costs do not include the sustained funding needed to manage tens of thousands of CDs across changing generations of hardware and software.

Problem (Archives Perspective): From the Archives perspective the core problem is the lack of a sustainable plan for managing legislative records in general and legislative digital records in particular. Without a management plan the digital conversion project (and on-going digital recording of testimony) will simply recreate the situation that led to over 40,000 hours of testimony being at risk. Consequently whatever time and money are accorded the project will not ultimately achieve the goals of preservation or access and will entail even greater costs over time.

General Lack of Management: Currently legislative records are scattered among several entities. The Archives has received original acts since the 1780s and committee minutes, as kept by the legislative clerk, since 1917. Legislative Council records, since the early 1970s, are stored with Public Records (the record center). These includes minutes as kept by the Council's clerical staff, the recorded testimony, bill files (dating back to the 1940s), and Legislative Council studies (some studies are sent to the State Archives, though it is not clear what criteria is used in deciding what goes where). The Legislative Council maintains its own electronic files (bill tracking, drafting documents, etc). The Department of Libraries receives reports as submitted to the general assembly as well as bills as introduced.

Consequently anyone seeking to trace legislative history or locate specific information may have to travel to four different programs and two different towns. There is no centralized index providing an overview of where records are located or how different records are related (how a study relates to specific testimony or particular bills, for example).

Even within the entities holding legislative records there are inconsistencies that may complicate access. At Public Records legislative records received different designation and may be found under PRA (Public Record Acquisition) or LC (Legislative Council) without an easy way to link the related records. Within the Legislative Council the IT staff use a numeric code to identify specific committees, while the clerical staff uses an alpha code for committees, as does the Archives (this does not appear to be a problem at the moment, though may become a barrier if it is decided to created a unified database for all committee records).

[4] Obviously a plan of work could be devised to shorten the time. For example, multiple project staff could simultaneously convert several tapes at a time. The commitment of resources, however, would remain significant.

Lack of coordination also creates duplication of effort/costs. The Archives seeks to collect supporting material (written testimony, model laws, etc) from committee clerks, as does the Council.

There is no analysis of how different legislative records fit together or of their relative value in documenting legislative intent and action. For example, how does the material in the drafting staff's bill files relate to committee records; which provides the best evidence of intent?

Lack of Management of Analog Tapes: This is extremely important to consider since the analog tapes are the legislature's first experience with "machine-readable" records; that is records that cannot be created or "read" without the intervention of equipment (in this case recording/playback equipment; electronic records require software as well as hardware).

The general assembly began recording testimony in the 1970s, apparently because of the ease of capturing all testimony rather than relying on a clerk's notes (though we have not studied this in detail, it does appear that traditional clerk notes began to decline in content once recording became common).

It does not appear that thought was given to the costs and requirements of keeping these tapes accessible in accordance with the mandate that they be preserved permanently.

Without a management plan:
--no duplicate use copies were made from the original recording. If the original deteriorated, was damaged or lost, etc, then the information was lost. Since the tapes are routinely used in legislative history research the originals could be repeatedly copied or played, leading to degradation of the tape.
--the old reel to reel tapes were not migrated to cassettes when the legislature switched to cassette technology in the 1990s. The reel to reel tapes are rapidly becoming obsolescent and play back equipment is hard to find.
--the convenience of 120 minute cassettes, requiring less intervention by the clerk, outweighed preservation considerations (120 minute tapes are thinner and thus subject to breakage, bleed through, etc)
--there was no consideration of special storage environments that could help preserve the tapes. Temperature fluctuations, high heat or humidity, electro-magnetic fields, etc accelerate tape degradation. Some tapes are currently stored in the basement of the Statehouse.
--there was no management plan to periodically re-wind or test tapes.
--available technology to log tapes to identify when a particular bill was discussed or a particular person testified was not consistently used, requiring users to listen to hours of tape or to spot check by fast forwarding through the tapes (placing additional stress on the tapes).

Lack of Management of Digital Recordings: There does not appear to have been any cost/benefit or risk analysis when the decision was made to convert to digital recording

nor is there a formal plan for managing the recordings. As a result the same problems are being replicated: no master/use copies are made; storage environments were not considered; logging capabilities are not being used to identify separate testimony, again forcing users to listen to the entire disk or attempt to skip through it; there is no management plan for periodically refreshing the disks (copying them to a new CD) or for migrating them to emerging technologies (DVDs or whatever else will emerge), etc.

Consequently short term costs and convenience guide the use of digital recordings. The use of CDs is a case in point. The costs and risks of managing tens of thousands of CDs will be significant in the long term. Once the conversion is complete there will be approximately 44,000 CDs of older testimony as well as the 500 CDs currently being created each biennium. Each of these individual disks will have to managed, refreshed, migrated, etc at significant cost. A cost/benefit comparison of the long term costs of server-based storage versus the use of CDs does not appear to have been done.

Archives Recommendation: Given the projected costs of the conversion project and the likelihood that the overall goals of preservation and improved access will not be achieved without a management plan, the Archives recommends that a comprehensive, long term management plan, based on cost/benefit and risk analysis, be created for all legislative records, including digital recordings.

The management plan should be prospective, addressing legislative records and digital recordings from this point forward. Once it is approved it can also be applied, in stages, to the retrospective conversion.

Specific recommendations include:
--assign a legislator or legislators to work with the Archives and Legislative Council in developing a plan.
--identify all the record series that make up “legislative records” as well as how they are currently managed.
--appraise the series to determine their respective legal, administrative and archival values.
--develop up-dated, comprehensive record schedules for the orderly disposition of legislative records. Disposition includes identifying all archival records and planning for there regular deposit with the Archives under the appropriate access mandates (bill files, for example, are exempt from the Public Records Act).
--do a comparative cost/benefit analysis of CD versus server-based storage (such as a Storage Area Network) to guide prospective recording and retrospective conversion.
--develop best practices for managing digital records/recordings to take full advantage of access capabilities, provide for migration, etc.
--provide sustained training for Council staff and committee clerks on the management plan.
--determine what funding and staffing is needed to sustain the plan over time.

WORKED PERFORMED TO DATE

In March 2004 the state archives began to meet with members of the Legislative Council to plan implementation of the conversion. The archives communicated with public and private sources and professional groups to gain a better understanding of the work entailed. The archives contracted with the Vermont Folklife Center, which is converting its analog tapes to digital form, for advice.[5]

A group consisting of Christie Carter, Bill Dalton and Gregory Sanford of the Secretary of State's Office and Shirley Adams, Al Boright, Michael Chernick and Duncan Goss worked on the project from March to December.

Secretary of State Deborah Markowitz and Bill Russell of the Legislative Council attended the June 15th meeting. The need for an evaluation of the value of legislative tapes, the possibility of creating fewer, but better records, and the need for a prospective plan for managing records before starting with the conversion was discussed. Gregory Sanford's June 14, 2005 memo that was discussed at the meeting is included as Appendix A since it provides the initial analysis of the scope of the project.

As initial step toward evaluating legislative records, solely within the context of documenting legislative intent, the State Archives began to review Vermont case law in which legislative records were cited. A draft of the report on that on-going review is available upon request.

On September 30, 2004 the group met with Andy Kolovos of the Vermont Folklife Center who gave an overview of archival considerations in converting analog to digital form as well as insights from the Folklife Center's on-going conversion project. Specifically the discussion centered on the technical architecture and standards needed to preserve digital records over time. Mr. Kolovos strongly recommended the server-based storage of the testimony, though Duncan Goss expressed concern over the costs of providing server space both retroactively and prospectively.

On November 10th the group met at the Folklife Center to test the conversion of a committee tape into different digital formats. Based on that practical experience the group looked at ways to do the conversion that might not entail the costs of a full archival approach, but which would provide a useful product.

The Archives experimented with the digitized testimony to suggest a possible future direction through which original acts, recorded testimony, and committee minutes could

[5] In addition to reading archival material on digital recordings, the archives' staff talked with Bill Russell, Al Boright, Shirley Adams, Michael Chernick and Duncan Goss of the Legislative Council; Ken Atherton (who set up digital recording system for the senate); Mark Reaves and Terry Lamos of Public Records; Ginny Catone of the Joint Fiscal Office; Sam Sanders of Vermont Public Radio (who converted some VPR tapes to digital form); and Bill Schubart of Resolution of South Burlington (who has experience with analog to digital conversion). In addition the archives talked with other state archives, including those of Maine, Massachusetts, Minnesota, Oregon, Rhode Island, and South Carolina. We thank them for their assistance.

be associated through the Legislative Council's bill tracking system. The result can be viewed at http://vermont-archives.org/apa/mockup/legintent.html. Scroll to the bottom of the page to see added links. To get to the recorded testimony, click on Committee Hearings where H. 780 was discussed and then scroll down to the tape list for January 13, 1996 and click on cassette #960032.

In December the group decided to implement and test some limited management steps for the on-going digital recording. See Appendix B.

PROJECT FUNDS:
Since the initial appropriation was to digitize the analog tapes the Archives limited use of the project funds until the legislature had a chance to review the proposal to first develop a prospective management plan. To date the only money spent to date is $602.50 on the contracted work with the Vermont Folklife Center.

APPENDIX A
June 14, 2004 Overview
By Gregory Sanford

June 14, 2004

TO: Legislative Committee Tape Project Committee

FROM: Gregory Sanford

RE: Research to date; project options

Since our March 29th meeting I have been trying to gather information that can help us proceed.[6] I see some significant underlying management issues concerning the analog and current digital recordings. I outline these issues below, as well as a range of options on how to proceed. To provide some context for discussion I start by sketching out the scope of the work.

Scope of work (general):
--Exclusive of Joint Fiscal Office (Appropriations Committees) tapes, there are approximately 38,000 hours of taped testimony.[7]
--Public Records breaks their total down to 2,270 reel to reel tapes (13,620 hours) and 16,179 cassettes (24,269 hours). Reel to reels are recorded at different speeds, which may affect transfer. Cassettes are primarily 120 minute tapes, with some 90 minute tapes.
--Analog to digital transfer must be in real time; that is it will take 38,000 hours.
--Public Records estimated (1/31/04) that it would cost $757,770 for them to do the transfer. Estimates based on the rates of a vendor who does archival quality transfers of oral history tapes could be as high as $4.6 million.
--At Public Records estimate of $20 an hour, it would take 63 weeks to spend the $50,000 (that does not include hard/software purchases).
--If the transfer is done, as envisioned, to CDs, a typical CD can capture 80 minutes of testimony. The 38,000 hours of tape would require approximately 44,000 CDs.[8] This

[6] In addition to reading archival material I have talked with Michael Chernick, Shirley Adams and Duncan Goss of the Council; Andy Kolovos (analog to digital tape project, Vermont Folklife Center); Ken Atherton (set up digital recording for senate); Mark Reaves and Terry Lamos of Public Records (who explored the possibility of digitizing the tapes a few years ago); Ginny Catone of the JFO; Sam Sanders of VPR (who converted some of VPR's analog tapes to digital form; and Bill Schubart of Resolutions (who has experience/knowledge of analog to digital conversion).
[7] The Archives counted, for 1989-2001, approximately 35,000 hours of tape. Public Records, which holds the tapes, provided an estimate of 38,000 hours from 1985-2001. The 2001 *Legislative Council Report on the Administrative Rule-Making Process* included an estimate from Public Records, as of June 26, 2000 of 20,997 hours (I do not know why there is such a discrepancy). I have some of the JFO's tape transfer lists but they are difficult to quantify; it appears to include several hundred more tapes (the JFO has not transcribed tapes since 1973).
[8] Figuring 2 CDs for each of the 16,179 120 minute cassettes and 5 CDs for each of the 2,270 6 hour reel to reel tapes.

number is exclusive of the CDs currently being created. At 38 cents a CD the cost would be $16,720, twice that is a master and a use copy are made.

Scope of work (future):
--Using Public Records estimate of $757,770, at $50,000 a year (assuming sustained legislative support) it would take 15 years to complete the project
--As a rule of thumb, migration plans should follow five year cycles in order to keep up with changing hardware and software (we will not have the "luxury" of ignoring the recordings for 15 to 20 years, as happened with the analog tapes)[9].
--if CDs are used, a management plan needs to be in place for regular refreshing or migrating of the CDs (digital to digital transfer can be done at high speed, but even allowing only 3 minutes per transfer, plus labeling, it would take 55 weeks to transfer 44,000 CDs if done all at once.

Approaches:
Given the limited funds, in each of the approaches it is essential to establish priorities for tape conversion.

1. Contract with Public Records to do the conversion. Public Records does not currently have all the necessary hardware and software but has explored what is needed.
2. Contract with a private vendor. There are vendors who do analog to digital conversion but their costs are higher than those projected by Public Records.
3. Do the conversion in-house. An immediate question is who would do the conversion (Legislative Council, Archives or?) Andy Kovolos and Bill Schubart offered suggestions on what equipment would be needed to do the work in-house. These include analog playback equipment (reel to reel and cassette), an external analog to digital converter; an audio PCI card; a personal computer; and Audio Editing software. Depending on what the State already possesses, the equipment would probably be less than $5,000. Additional costs would dependent on whether a dedicated server, CDs, or some other storage medium is used.

In terms of labor, a staff member would have to be available to turn the tapes, do indexing, labeling of CDs, some spot quality controls, etc. While there is the possibility that the person would only have to change the tapes every 45 to 60 minutes for the 120 cassettes, the regular interruption plus associated work would make it difficult for him or her to be engaged in other large work activities.

Bill Schubart suggested using a homebound disabled person to do the work. Another possibility would be contracting with one of Vermont's regional tech centers. Quality controls, labor costs, etc would remain an issue.

Alternative Approaches:
1. Do an analog to analog migration. I have not done a cost estimate, but the State already possesses the equipment, at least for cassette to cassette copying[10]. This would

[9] The progression from 8" to 5.25" to 3.5" floppies to CD-ROMs and soon DVDs is but one example.
[10] If reel to reel tapes were the focus, additional reel to reel play back equipment could be purchased through E-bay.

add a level of security (again only a single copy exists for each tape) and would allow a greater number of tapes to be duplicated. This, however, simply pushes the overall problem (the eventual disappearance of analog tapes and playback equipment) into the future, while retaining some of the access barriers (having to listen to analog tapes in real time).

2. Transcribe selected testimony or committees. This would create a searchable electronic text. Based on conversations with Shirley, for $50,000 it might be possible to transcribe 800 hours of testimony (about 2% of the backlog). It also would require some framework to determine which committees or testimony to transcribe.

Tentative Recommendation:

The Council and Archives purchase the hardware and software for the conversion and test a process. Key to any process is establishing indexing and metadata standards and addressing access issues (at a minimum establish tracks at regular intervals so a user does not have to listen in real time to find what specific testimony).

Once a process is established either continue the work in-house, using a temporary employee, or contract with Public Records or an outside vendor. An advantage to in-house conversion is that, in response to future requests for copies of a tape, that tape could be converted to digital form.

General Management Issues:

The most important issues we must address are management issues, not just for the converted legacy tapes, but for the on-going digital recording of testimony now in place. Without sustain risk management and cost/benefit analyses we will simply replicate the current problems. The range of issues to consider include:

--review nature of legislative intent research to determine where the best quality information can be captured (rather than simply recording everything) and whether new procedures, such as requiring written testimony from agencies, would be beneficial.

--understand user needs, including potential users.

--utilizing the enhanced access opportunities of digital recordings

--whether some server environment (RAID, for example) is more cost effective in the long run than trying to manage tens of thousands of off-line storage media, such as CDs or DVDs.

--indexing systems

--costs of a migration and refreshing plan.

APPENDIX B
Test Management Steps for the 2005 Session

On 17 Dec 2004 at 9:56, @LIST1D88.PML wrote:

From:	Gregory Sanford <gsanford@sec.state.vt.us>
To:	@LIST1D88.PML
Subject:	**meeting last Wednesday**
Date sent:	Fri, 17 Dec 2004 09:56:34 -0500

Thanks for meeting with me on Wednesday. We discussed what, if any, basic steps we could begin to take to better manage the digital recordings of committees. Much of the discussion weighed recordkeeping best practices against staffing and resource realities. To develop some baseline information, back-ups will be made of the CDs from House Government Operations and the proposed Health Care Committee. Duncan will look into what additional burners might be needed to allow for quickly making copies at the end of each day. Given concerns about whether staff and/or legislators would label the CDs within the clear center space on each CD, Duncan is looking at a CD printer that could add the identifying information in the center space.

Left aside as a possible long term step was creating a single unique identifier for each committee (currently Duncan uses a numeric identifier for his databases and Shirley uses and alpha identifier based on committee name; House Government Operations=hgo).

Also set aside for the time is automatically putting in tracks every five minutes when responding to a request for a copy of a CD (the idea would to enhance ability to search tape). It was unclear whether such software was available to automatically add tracks.

Otherwise we will continue past practice, while recognizing that it may not be ideal (such as writing on disk itself). A long tern goal is to identify the steps--and costs--of a management plan that recognizes legal/archival value of the recordings and avoids the problems that led to the backlog of decaying tapes. Gregory

APPENDIX C
NEWS REPORT ON ANALOG TAPE SHORTAGE

Agencies prepare for Digital Age

Shortage of magnetic tape forces feds to look for other storage media

BY Aliya Sternstein <mailto:asternstein@fcw.com>
Published on Feb. 7, 2005

A shortage of professional-grade tape is prompting government agencies such as the National Archives and Records Administration, the Library of Congress and NASA to switch to digital media.

Quantegy, one of the last U.S. suppliers of analog tapes, filed for Chapter 11 bankruptcy protection in January and closed its only U.S. plant. Quantegy was the primary supplier of tapes to federal agencies, but now that supply line is in jeopardy. Agencies must either modernize, a costly and risky process of switching to digital storage media, or look overseas for a source of high-quality analog tapes.

But audiotape is not outdated. NARA officials will reluctantly switch from Quantegy tape to WAV files saved to digital media, such as CDs. "Audiotapes are not becoming old-fashioned," said Les Waffen, an audiovisual archivist in NARA's special media division. "They're just not going to be available anymore."

NARA officials have begun saving audio recordings, such as the CIA's radio monitoring of POWs and MIAs during the Vietnam War and oral arguments before the Supreme Court, as analog recordings and WAV files. NARA officials anticipate that their audiotape supplies will be depleted in three to four months.

"The beauty of analog is it's simple and it works," Waffen said. But NARA is being forced into the Digital Age, he said. NARA officials will stop using audiotape unless they can find new sources, perhaps in Europe, Japan or India.

Waffen said the quality of those tapes is unknown. But he has other concerns about the cost, longevity and reliability of digital media, especially under fluorescent lighting conditions. NARA's storage costs have tripled since the agency started saving WAV files on a server, and digital storage requires a support staff of information technology professionals.

Gene DeAnna, acting head of the recorded sound section at the Library of Congress, does not share those reservations about digital preservation. "The largest use of audiotapes has been to reformat fragile sound recordings to tape," DeAnna said. "We are not using audiotapes to reformat anymore, and it's a good thing."

In the past year, library officials have purchased nine digital audio workstations for creating WAV files, at a cost of less than $10,000 per workstation.

Digital has a higher resolution than tape, DeAnna said. But he acknowledges

the copyright and storage issues that accompany digital media use. The infrastructure to safely store and retrieve vast quantities of WAV files has to be flawless, he said.

Another problem for the library is potential copyright violations. Researchers in the library's reading rooms can easily break copyright law by saving the files to a CD or e-mailing the files to themselves. Protecting copyrights is "doable, but it's expensive and requires new equipment," DeAnna said.

The library has not stopped using or acquiring audiotapes, but the tapes are stored in boxes that are deteriorating. Quantegy used to supply archival containers, DeAnna said, but now library officials must look elsewhere.

NASA also relies on high-quality tapes. The agency's contractor, United Space Alliance, was awaiting confirmation last month for its order of 20 Quantegy tape reels for future space shuttle missions.

NASA officials use tape reels to store temperature and pressure information from sensors embedded throughout the vehicle and inside its wings, tail and skin. They have used tape reels on space shuttle missions since the start of the program.

"It's kind of like a rearview mirror - we look at it after the flight," said Kyle Herring, a NASA spokesman. The 20 reels on order are supposed to last through the projected length of the space shuttle program, to about 2010, he said.

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Tips on tapes

Magnetic tape has the virtue of simplicity without the added cost, longevity and reliability concerns that some archivists associate with digital media.

Here are tips from Quantegy for preserving magnetic tapes:

* Store tapes in dust-proof containers.
* Store tapes vertically, never stacked.
* Never place tapes on top of computer equipment.
* For long-term storage, make sure the room is 65 degrees and has 40 percent relative humidity.
* Clean entire tape path often using lint-free cloth and appropriate solvent.

Source: Quantegy