PEER REVIEW OF THE DAM SAFETY PROGRAM OF THE MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

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April 19, 2006

Association of State Dam Safety Officials (ASDSO)

PEER REVIEW
OF THE
DAM SAFETY PROGRAM
OF THE
MICHIGAN DAM SAFETY PROGRAM

EXECUTIVE SUMMARY

1. Scope

This report documents the observations, findings, and recommendations made by the Peer Review Team of the Association of State Dam Safety Officials (ASDSO) on the Dam Safety Program of the State of Michigan Department of Environmental Quality. The peer review was conducted on 20 to 22 March 2006 in Lansing, Michigan. The object of the Peer Review Program is to provide professional guidance to dam safety agencies to improve management of their dam safety programs. The Peer Review Program seeks to raise the level of dam safety program practice by evaluating an agency's mission objectives, policies, and procedures, and examining its compliance with those policies and procedures. The Peer Review evaluates the scope of the agencies program relative to the generally accepted standards of dam safety practice.

2. Summary of Findings and Conclusions

Overall, we find that, prior to the unexpected elimination of the dam safety program in 2005, the Dam Safety Program was meeting its statutory obligations and was continuing to improve the compliance record of dam owners regarding dam inspection and Emergency Action Plans (EAPs). Following the return of the program after six months, the agency continues to maintain an effective dam safety program but is still recovering from the time lost and the loss of one dam safety engineer. It is recommended that the Michigan DEQ Dam Safety Program expand its public awareness efforts and be consistently proactive in delivering the message that effective dam safety saves lives, preserves the environment, and

protects the economy. This awareness should be delivered upward and outward throughout the DEQ, as well as to the stakeholders (dam owners). Efforts should include newsletters and, seminars and training for dam owners. Other government agencies, legislators, and the public should be included in this effort. The reader is referred to Section 4 of this report for the remaining specific recommendations offered by the Peer Review Team to help improve the Michigan Dam Safety program.

3. Overall Review of Program Effectiveness

From the staff interviews and review of documents provided by the Dam Safety Program office, we find that the Program staff is highly motivated and are experienced professional engineers. The procedures and policies of the Dam Safety Program are generally well developed. We attribute this to the organizational leadership of Byron Lane.

4. Acknowledgments

The Peer Review Team wishes to acknowledge the support of David Hamilton, Byron Lane and their technical staff in assembling the information for this effort. Special thanks are to Jodi Ege and Shirley Smith for their support in preparing this report.

1 INTRODUCTION

1.1 Scope

This report documents the observations, findings and recommendations made by the Peer Review Team of the Association of State Dam Safety Officials (ASDSO) on the dam safety program of the Michigan Department of Environmental Quality Dam Safety Program. The peer review was made on 20 to 22 March 2006 at the program offices in Lansing, Michigan.

This report is divided into five sections: (1) Introduction, (2) Michigan Dam Safety Program, (3) Observations and Findings, (4) Recommendations and (5) Certification. Each section is based on observations made by the Peer Review Team during interviews of staff members chosen by the agency, or those assisting the dam safety program of the agency.

1.2 Objective

The objective of the Peer Review Program is to provide professional guidance to dam safety agencies to improve the management of their dam safety programs. The Peer Review Program seeks to raise the level of dam safety program practice by evaluating an agency's mission, objectives, policies and procedures, and then examining its compliance with those policies and procedures. The Peer Review Team evaluates the competence of the agency's programs relative to generally accepted standards of practice of dam safety.

The Peer Review is limited in scope and cannot determine, ascertain or guarantee an agency program complies with all applicable state, federal or provincial regulations or standards of practice. A team of dam safety professionals performs the Peer Review. The Peer Review Team produces a technical opinion, not a legal opinion. The state attorney general, federal attorney, or other appropriate legal authority must render any legal opinions.

It is recognized that the success of any dam safety program depends upon adequate program funding, the quality of physical inspections, dedication and commitment of the regulatory agencies staff, and especially the due diligence of the dam owner or operator.

The Peer Review Team provides this written report, which documents findings and recommendations. However, the Team does not perform any follow-up, nor provide sanctions for not following recommendations. It is the responsibility of the reviewed dam safety agency and its state legislature, congress, or enabling body to implement any recommendations.

Further, the Peer Review Team does not inspect any dam as part of the Peer Review Program. The program does not, therefore, involve safety inspection of structures, or even the review of any specific inspection undertaken by the agency.

While an appropriate and well-managed dam safety program is vital to the interests of public health and safety, ultimately dam safety is contingent upon the commitment of the dam owner/operator.

1.3 Key Points

The key points to remember in interpreting this report are the following aspects of the ASDSO Peer Review Program:

A peer review is voluntary. The Michigan DEQ Water Management Section Chief requested this Peer Review. Access to certain materials and the documents reviewed by the Peer Review Team were given voluntarily by the agency. The documents reviewed may or may not be representative of the agency's practice. Likewise, certain individuals that were interviewed, whether they were suggested by the Engineer/Director or chosen by the Peer Review Team, may not be entirely representative of the agency, or fully responsive to the Peer Review Team. This Peer Review report is based on these limited views of the agency.

A peer review is confidential. The team will maintain confidentiality with respect to the sources of various observations that are reported here. The Peer Review Team informed the staff that all individual comments would be treated in a confidential manner. The Peer Review Team asks that the agency not probe beyond what is stated in the report concerning the sources of the comments or suggestions.

A peer review is to evaluate practices and procedures. It is believed that a healthy agency must have definite policies in the seven areas of practice that the Peer Review program identified. These seven areas are: (1) Organizational Management, (2) Management, (3) Emergency Management Procedures, (4) Technical Practice and Procedures, (5) Human Resources Management, (6) Financial Management, and (7) Public Relations Practices. The Peer Review Team tried to cover all seven of these areas adequately. However, in the review of the agencies, not all technical aspects of the agencies approach to the Michigan Dam Safety Program have been examined. Similarly, the documents that were furnished were reviewed only from the standpoint of apparent conformance with the policies of the agency as to work planning, production, and adherence to their quality control/quality assurance policies.

1.4 Procedures

The interviews and procedures followed by the Peer Review Team followed the manual, "Peer Review for Dam Safety Agencies," issued by the Association of State Dam Safety Officials (ASDSO) in September 2000. This document was also made available to Michigan Dam Safety Program prior to the peer review. Documents that were needed for review prior to the peer review were submitted by the agency to the members of the Peer Review Team in advance. Confidential interviews were held with personnel involved with dam safety. A tour of the office and cursory review of several dam safety files and Inventory of Dams were also made.

1.5 Confidentiality

Because each member of the Peer Review Team would have access to confidential information, each member submitted to the Michigan Dam Safety Program and ASDSO prior to the formal process of the peer review, a signed "Peer Reviewer Statement of Nondisclosure" in order to preserve the confidentiality of the responses of the staff members of the agency. The statement of nondisclosure states in part that the signatory will " . . . neither copy nor disclose such information in whole or in part to anyone other than members of the review team, the ASDSO Peer Review Committee and the ASDSO Peer Review Program Administrator without the prior consent of the. "Agency". It is not intended that this report and documentation of the findings and recommendations in any way violate the statement of nondisclosure or reveal matters that would be considered confidential by the agency. Further, both the agencies representative and the Peer Review Team reviewed this document for consistency and appropriateness

1.6 Members of Peer Review Team

The Peer Review Team that visited the Michigan Dam Safety Program was composed of the following members:

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Short biographical sketches on the members of the Peer Review Team are included in Appendix C.

2 MICHIGAN DAM SAFETY PROGRAM

2.1 History

The history of the Michigan Dam Safety Program is summarized as follows:

Many of the dams that presently exist in Michigan were constructed in the late 1800s and early 1900s. These dams were constructed primarily to power sawmills and gristmills and for the purpose of producing hydroelectric power. As long as these dams were used for their intended purpose, their owners kept them in good repair. As the dams outlived their original purpose and usefulness for power generation, local units of government and private interests purchased them to retain their recreational benefits. Most of the changes in ownership, particularly those dams owned by power companies, took place during the 1950s and 60s. Some 30-35 years later, many of these dams had fallen into a poor state of repair because, in some cases, even routine maintenance had not been performed. Some of those dams were in danger of failure and posed a threat to life, downstream property, the environment, and/or natural resources.

Since 1981, at least 60 incidents of dam failures or near failures had occurred. Failure of these dams has caused property damage, damage to downstream roads, damage to the environment and natural resources, and losses in property values. During the period of the US Army Corps of Engineers Phase I national dam safety inspection program from 1979 through 1982, an average of one out of four dams inspected were found to be unsafe. New legislation was needed to provide for a vigorous inspection and follow-up program to assure the safety of existing dams and to protect the public safety, property, and natural resources.

Dam failures and incidents resulting from the lack of maintenance and/or misoperation of dams can result in significant resource damage. The 1984 Pigeon River Dam disaster, which resulted in severe damage to the Pigeon River for some 24 miles in Cheboygan and Otsego Counties, pointed out the need for closer scrutiny over the operation and maintenance of dams.

During the "Great Flood" of September 1986, 14 dams failed, some 20 others were severely threatened, and approximately 1,500 people were evacuated downstream of

dams. Many road crossings were destroyed, including a bridge on US-31, and a number of homes and businesses were flooded. This event confirmed with stark reality the threat that dam failures can pose to public safety and environmental resources and highlighted the need for Michigan to develop a comprehensive Dam Safety Program. A dam safety statute was enacted in1989 and became effective on 1 June 1990. The Dam Safety Program rules became effective in July 1993. The dam safety statute was consolidated with all other environmental acts in 1994 with the passage of Part 315, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Part 315 provides the Michigan Department of Environmental Quality (DEQ) with the authority to regulate 813 of the largest dams in the State, and conduct a number of essential functions to help protect Michigan's citizens from the consequences of dam failures. Specifically, the DEQ has the legal authority to:

1. Order the remediation of unsafe dams.
2. Provide assistance to emergency officials during dam safety emergencies.
3. Ensure that inspections are done, by taking compliance action as needed.
4. Follow up on dam inspections to ensure needed repairs and modifications are completed.
5. Ensure emergency action plans are developed and kept current.
6. Review and approve dam design, repair, or removal.
7. Determine the hazard potential of dams and which dams are regulated.
8. Maintain a central dam database for use in emergency operations, homeland security planning, and natural resource planning.
9. Inspect state and municipally owned dams.
10. Provide dam safety-related training to dam owners, consultants, and emergency management officials.

All dams are assigned a risk factor, or "hazard potential rating", depending on the size of the dam and what is located downstream of the dam. The hazard potential rating does not imply any likelihood of dam failure. It only indicates the potential incremental damage if the dam were to fail for any reason. High and significant hazard potential dams have the potential to threaten human life, residences, major roads, and critical infrastructure. Because of the greater potential risk, these dams are required to develop Emergency Action Plans and coordinate with local emergency managers, and to have their dams inspected more frequently (every three or four years respectively), than low hazard potential dams, which must be inspected every five years.

Michigan has seen a remarkable reduction in the number of dam failures since the Dam Safety act was passed. Michigan experienced 17 dam failures in the decade following enactment of Part 315, compared with 52 and 74 in the two preceding

Decades. (Appendix B)

2.2 Organizational Structure

The Michigan Department of Environmental Quality and the Land and Water Management Division organizational structure are shown in Appendix A. The Dam Safety Program is assigned to the Land and Water Management Section.

2.3 Publications

Part 315, Dam Safety and Part 307 Inland Lake Levels of the Natural Resources and Environmental Act, 1994 PA451, as amended.

Michigan does not have promulgated standards or specifications for the design of dams. The following references are most often used as a basis for technical reviews:

Design of Small Dams – US Bureau of Reclamation

US Army Corps of Engineers Manuals (available on line)

Portland Cement Association information (for RCC and General Concrete)

ASDSO Technical Seminar Materials

NRCS engineering manuals

Hydraulics and other Civil Engineering Textbooks

TADS modules

HEC-RAS and HMS user manuals

3 OBSERVATIONS AND FINDINGS

The following observations were made of the Michigan Department of Environmental Quality (DEQ) Dam Safety Program during the Peer Review Team study on 20 to 22 March, 2006. As mentioned in Section 1.3, the following is structured among the seven areas of practice in a typical dam safety program:

3.1 Organizational Management

- The DEQ has clear written statements of its purpose and goals. Although a mission of the DEQ is to "Protect Public Health", the priority of protecting public safety in the DEQ Mission Statement appears to be less important because dam safety is not included as part of the stated mission. (Attachment 2)
- The Dam Safety Program in DEQ was eliminated for six months in calendar year 2005. Until that occurrence, the program was close to achieving its goals and objectives. The shutdown created a backlog of work and the loss of one Full Time Equivalent (FTE) position and loss of a dedicated vehicle.
- Written job descriptions are available for key employees.
- As evidenced by the 2005 elimination of the Dam Safety Program, communication between the DEQ Division and the Sections and Units is inadequate.

3.2 Management

- The DEQ Dam Safety staff maintains an excellent tracking system for report review and permitting. Follow-up for compliance appears less complete. Dam Safety Program follow up on compliance by delinquent dam owners is limited to the time available to the present staff and by their existing dam safety priorities.
- Emergency Action Plans (EAP) are required for 79 high hazard and 136

significant hazard state regulated dams. To date 77 (96%) high hazard and 128 (94%) have approved EAPs completed and in place.

- The Dam Safety personnel demonstrate good communications within the Dam Safety Program and work effectively as a team.
- Project files are well organized and provide a reasonably complete and accurate chronological record documenting project activity.
- Once a permit is issued to begin construction, there is no further Dam Safety Program involvement with the project until the post-construction inspection prior to issuing a permit to fill the reservoir.
- There is no post-construction follow-up. The post-construction inspection is scheduled by Rule, without consideration of critical performance and structural behavior during and immediately following first filling.
- The Dam Safety Program has good support form the Attorney Generals Office for enforcement.

3.3 Emergency Management Procedures

- The Division has defined emergency procedures under the Pollution Emergency Alert System (PEAS). Procedures for after-hours notification of Dam Safety Program personnel are included.

3.4 Technical Practice and Procedures

- There is no formal in-house quality assurance/quality control (QA/QC) program in place for the review of permit applications and consultant's inspection reports. QA/QC is limited to frequent communication between the technical staff.
- Management reviews Dam Safety Program staff inspection reports.
- The current technical staff is well qualified as measured by education, training and extensive experience.
- There are many opportunities for dam safety training through outside agencies, and management supports this training.

- Professional registration is recognized through job title and pay grade.
- There is a small technical library in place. Technical staff also maintains personal technical libraries.
- By Statute, the Michigan Dam Safety Program has not developed agency design standards, but uses recognized design and technical standards. (See Section 1.3)
- Up-to-date computer equipment is in place and used extensively for clerical, administrative, and technical work.

3.5 Human Resources Management

- The staff has been stable for many years with no significant turnover.
- Staff is satisfied with the Program and Section leadership.
- Staff noted organization skills of the Program manager.
- Staff has limited contact with management above Section leader.
- Staff appears satisfied with current jobs.
- In 2005, the Dam Safety Program was eliminated for budgetary purposes. When reconstituted, the Dam Safety Program lost one FTE.
- Each employee has an annual performance review, based on agreed goals set at the beginning of the fiscal year ("Performance Management and Competency Rating Form").
- Technical/professional training is a major part of the goals for each staff member. FEMA training grants administered by ASDSO are a major source of funding.
- At this time, all key Dam Safety Program staff and management have Professional Engineering licenses.
- All current staff are at grade and pay level ceilings. Although a specialist classification is available it is under-utilized due to personnel practices.
- Presently there is no significant opportunity for career advancement within

the Dam Safety Program while remaining in a technical career path (engineering). Advancement can only be obtained by changing to a management career path.

- The compensation and benefits package is reported to be consistent with similar positions in adjacent states.
- Pay grades are below typical architect/engineer consulting firm packages.

3.6 FINANCIAL MANAGEMENT

- The operating budget is developed at the Division level with no input from the Dam Safety Program.
- The Dam Safety Program is highly dependent on ASDSO and FEMA grant funds for necessary training and equipment. Loss of these funds could compromise program improvements as demonstrated when the Dam Safety Program was eliminated in 2005.

3.7 PUBLIC RELATIONS PRACTICES

- Michigan Dam Safety staff is authorized to respond to media inquiries with follow up to the agency Press Secretary. From time to time, staff is advised by the agency Press Secretary not to respond to specific questions.
- There is a conscious effort through middle management to promote the importance of an effective Dam Safety Program and the potential consequences of a dam failure. These consequences include the high probability of loss of life, the certainty of environmental damage, and likely significant economic loss. The awareness of the importance of the Dam Safety Program has been lost as it progresses forward through senior management to the executive offices. This is apparent by elimination of the Michigan Dam Safety program in 2005.

3.8 STATUTES AND REGULATIONS

- The Michigan Dam Safety Program participated in an ASDSO project sponsored by FEMA that evaluated their program against the 1997 Model State Law and the ASDSO model program. The Michigan staff completed an

ASDSO questionnaire in 1997 developed to assess the response to the Model Law. Based on the 1997 questionnaire the Michigan dam safety program meets 18 of the 20 requirements for legislation and 13 of 16 of the requirements for regulations. Exceptions are as follows:

Michigan Legislation does not provide authority to:

- Provide a liability disclaimer for state and agency personnel.
- Require dam owners to retain records.

Michigan regulations do not provide authority to:

- Establish permit or applications approval requirements for operation and maintenance of existing dams.
- Require emergency action procedures for all dams.
- Establish owner financial responsibilities.

4 RECOMMENDATIONS

From the interview and documents reviewed by the Peer Review Team, the following recommendations are made.

- Dam Safety Program staff may have legal liability exposure involved with permitting, construction, and inspection of dams. Personnel liability of staff engineers needs to be evaluated and addressed if it exists.
- The Dam Safety Program workload necessitates the restoration of the one FTE position lost in 2005, and one additional FTE staff to assist in tracking and enforcement of compliance issues including EAPs.
- The state of Michigan should consider developing a "revolving fund" program to assist private owners of dams to make repairs/modifications required to meet legislative safety regulations.
- Because of equipment transport needs, the Dam Safety Program should have their dedicated vehicle returned.

- The DEQ should consider a fee schedule system to assure long term funding for the Dam Safety Program required to meet its legislative responsibility to protect the health and safety of Michigan citizens.
- The Dam Safety Program should develop a quarterly newsletter (web/e-mail).
- Dam Safety Program staff should resume "Health and Safety" training for fieldwork.
- When visiting remote sites, a backup should accompany the Dam Safety Program inspector in the event an emergency arises.
- The Dam Safety Program should institute scheduled periodic staff meetings.
- Potential for retirements of experienced technical staff indicates a need for a staff succession plan.
- Update the DEQ Mission Statement to recognize the contribution of the Dam Safety Program within DEQ.
- Provide periodic seminars to all other DEQ Units and Sections outlining it's the Dam Safety Program's mission and contribution to protecting the environment.
- Address the issue of professional engineers' grade and pay ceilings if they want to stay engineers rather than move into management career paths.
- Develop a written technical internal QA/QC program.
- Develop legislative and public advocates to increase awareness and visibility of the Dam Safety Program.
- Further consideration should be given as to where the dam safety program should be located within the Michigan government system. In DEQ, the priority of public safety seems to be diminished. The review team considered that protection of reservoirs might be better described as a Natural Resource.
- Modify Michigan statutes and dam safety regulations to include authority for

constructions and post-construction inspection activities including first filling and the critical first year of operation.

5 CERTIFICATION

This report was prepared by the undersigned members of the Peer Review Team of the Association of State Dam Safety Officials (ASDSO) as requested David A. Hamilton, P.E., Chief, Water Management Section, Land and Water Management Division. The statements in the report reflect the engineering and professional observations, findings and judgments of the Peer Review Team based on interviews and review of documents presented by the Dam Safety group of the Division.

Team Coordinator

Thomas A.. Kelly
(Dam Owner)

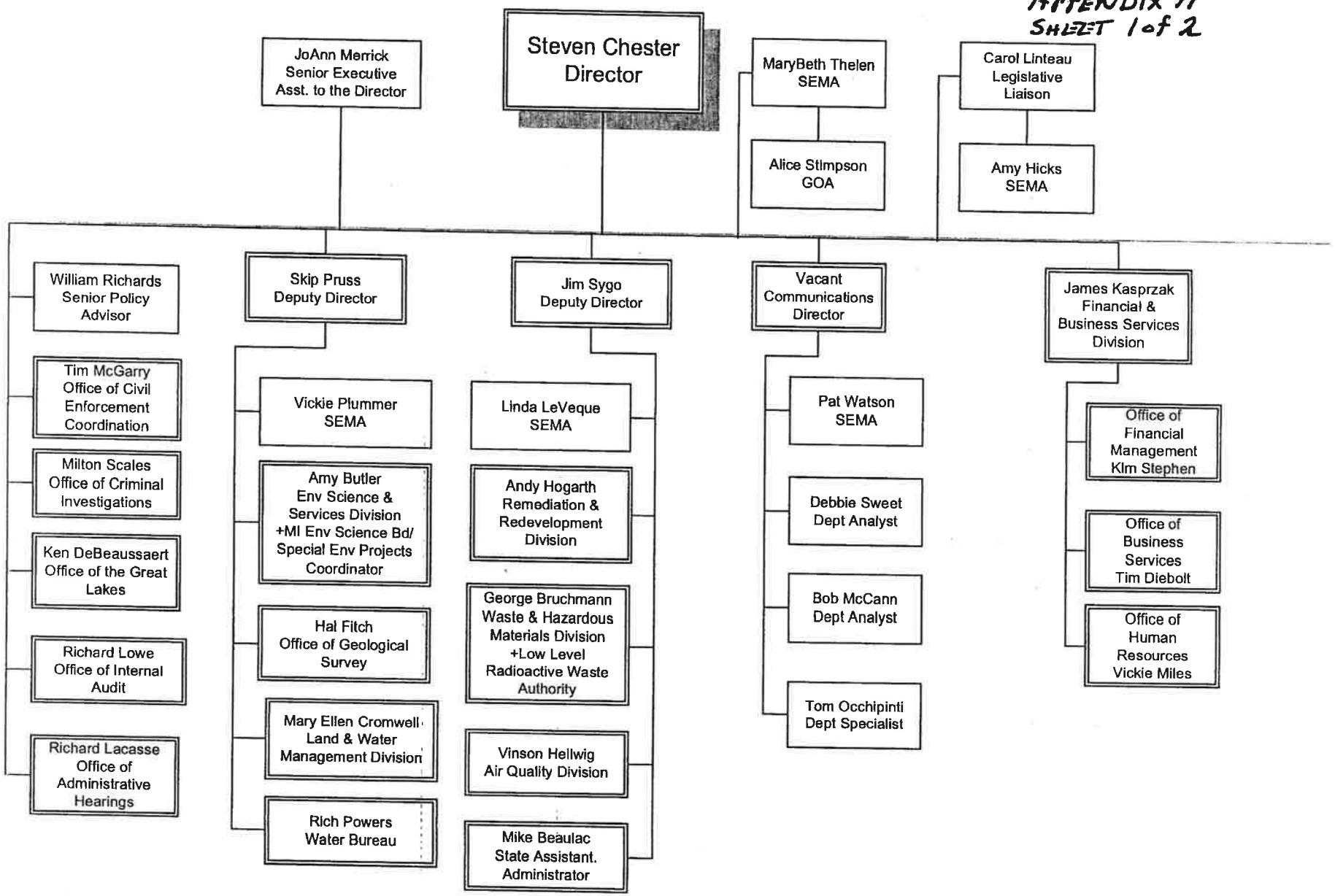
Alton P. Davis
(Consultant)

Greg Hammer
(State)

Date: 05 APRIL 2006

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

APPENDIX A
SHEET 1 of 2



Last updated 4/06/05

+Has direct access to Director on an as needed basis.

LAND AND WATER MANAGEMENT DIVISION

APPENDIX A
SHEET 2 of 2
23 MAR 06

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Vacant, SEMA 11

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Lynda Jones, Exec Sec E10

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Margaret Bostwick, EQS 14
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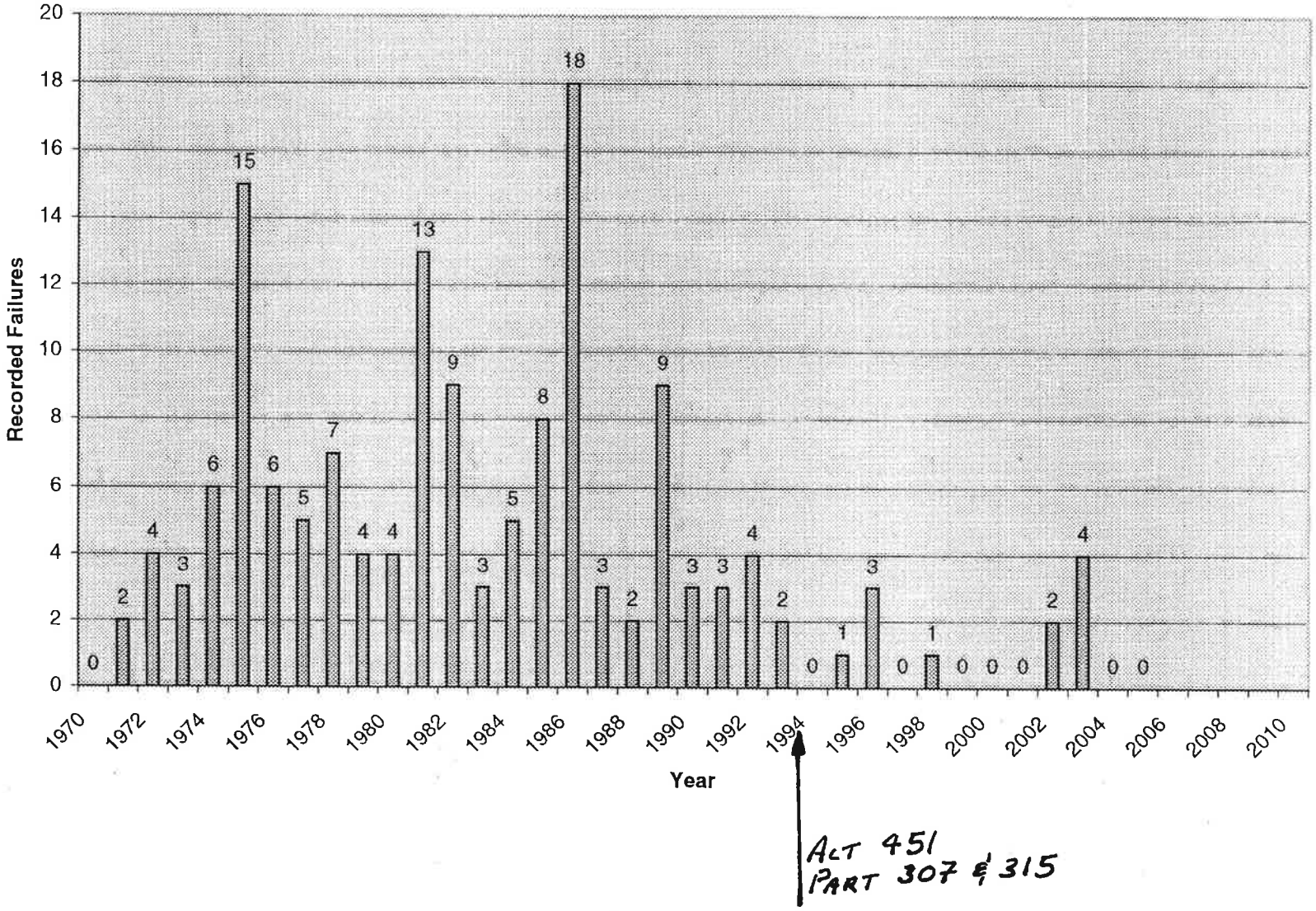
APPENDIX B
22 MAR 06

Michigan Dam Failure Incidents



APPENDIX C

Biographical Data

THOMAS A. KELLY, P.E.

Mr. Thomas A. Kelly retired from Southern California Edison, an Edison International Company on July 1, 1966, where he had practiced as a Senior Civil Engineer in the field of dam safety. He has 41 years of engineering experience. In 1966, while at Southern California Edison, Mr. Kelly became responsible for the dam safety program for 34 Edison owned dams that included 17 high hazard and 8 significant hazard dams. In the early 1970s, he became responsible for a seismic monitoring system that expanded from 22 to 36 accelerographs located throughout the Company's power generation area, including eight located at large dam sites.

Mr. Kelly is a Registered Civil Engineer in California and a member of the American Society of Civil Engineers (ASCE), the U. S. Society of Dams (USSD) and the Affiliate Member Advisory Committee (AMAC) of the Association of State Dam Safety Officials (ASDSO). Mr. Kelly participated in the ASDSO Pilot Peer Review Program and is a member of the ASDSO Peer Review Committee. He has participated in 15 state peer reviews. Mr. Kelly was the team leader of the 1996-1997 peer review of the U. S. Department of Interior Dam Safety Program and in 1998 was a member of the team which performed the peer review of the U. S. Department of Labor, Mine Safety and Health Administration Impoundment Safety Program. Mr. Kelly was the team leader for the peer review of Seattle Public Utilities Dam Safety Program and participated in the peer review of the Seattle City Light Dam Safety Program. He is the author and/or co-author of five technical papers.

APPENDIX C

Biographical Data

ALTON P. DAVIS, JR., P.E.

EDUCATION: M.S., Soil Mechanics, Massachusetts Institute of Technology, 1965

B.S., Civil Engineering, Northeastern University, 1963

REGISTRATION: Massachusetts, Maine, New York, Vermont, New Hampshire, Nebraska, North Carolina, South Carolina, Pennsylvania, Virginia, Montana, and Georgia

PROFESSIONAL AFFILIATIONS:

- American Society of Civil Engineers (Fellow)
- Association of State Dam Safety Officials (Affiliate Member Advisory Committee, Peer Review Committee, Journal Editor)
- US Society on Dams
- American Society of Professional Engineers
- National Society of Professional Engineers
- Canadian Dam Association

GENERAL BACKGROUND:

Mr. Davis is an independent consultant with over thirty-five years experience in the design, analysis, construction, performance monitoring, and safety inspection of dams for large and small water resource and hydroelectric projects.

Mr. Davis was the principal geotechnical engineer for design, construction, and startup of the Blenheim-Gilboa and Bear Swamp Pumped Storage Power Projects.

Mr. Davis has been an independent consultant for FERC Part 12D quinquennial safety inspections of over 150 licensed projects including over 200 dams and generating facilities. These safety inspections include evaluation of project inflow design floods versus spillway capacity, review of stability and deformation studies, review of adequacy of performance monitoring programs, detailed site inspections, and assessment of adequacy of the project Emergency Action Plans. Recommendations for remedial or emergency actions are made.

Mr. Davis is a member of the FERC select Committee that developed the new FERC Performance Monitoring Program and chaired the teams developing the new Part 12D Independent Consultant and Supporting Technical Information Document (STID) outlines included in the new Chapter 14 of the FERC Engineering Guidelines for Evaluation of Hydropower Projects.

Mr. Davis participated in the Potential Failure Mode Analysis (PFMA) workshops, wrote the PFMA reports, developed the STIDs, and was the Independent Consultant for the Part 12D inspections and reports for two projects as part of the beta test of the new FERC process. Mr. Davis has been a presenter at three FERC training courses for the new program in March, April, and October 2003, and January 2004. Mr. Davis has participated in 20 PFMA workshops as Part 12D Independent Consultant and facilitated 8 PFMA workshops during 2003/4.

Mr. Davis has consulted on studies evaluating downstream incremental dam break flood impacts as related to the Hazard Potential Classification of dams and Emergency Action Plans.

Mr. Davis chaired the ICODS Task Committee to define the Hazard Potential Classifications (FEMA Publication No. 333) and to draft guidelines for assigning Hazard Potential Classifications.

Mr. Davis has worked on over twenty task orders under Indefinite Delivery Contracts for the New England District of the US Army Corps of Engineers. Tasks included instrumentation assessment, instrumentation installation, rock slope stabilization, blasting assessment, and removal of hazard waste from a set of relief wells.

Mr. Davis has been an expert witness before FERC and participated as a geotechnical expert on four federal independent project review teams. In addition, Mr. Davis was engaged as geotechnical specialist in the exploration, design, construction inspection, and performance monitoring of over 40 major dams and dikes around the world. Mr. Davis has conducted site investigations to define causes of inadequate performance of dams, provided designs and permitting support for remedial repair to dams, and conducted peer review of designs by others.

Mr. Davis provides consulting services to an international Highly Protected Risk property damage insurance firm with respect to potential risks associated with dams and levees.

Mr. Davis conducted the feasibility studies for the Zungeru hydroelectric project in Nigeria, including a 200m high concrete faced rockfill dam. Mr. Davis also designed the Stage 2 raising of the concrete faced rockfill dam at La Fortuna in Panama. As a Part 12D Independent Consultant, Mr. Davis has conducted inspections of six concrete faced rockfill dams including the Wishon, Courtright, and Fordyce dams in California.

Mr. Davis conducted the assessment of the Harriman, Sherman, and Somerset semi-hydraulic fill dams on the Deerfield River in Vermont/Massachusetts for liquefaction and deformation

concerns with GEI Consultants, Inc. Studies included sampling, laboratory testing, and analyses. The studies demonstrated adequate stability and deformation factors of safety. Mr. Davis was also responsible for the design and construction of an overlay berm at Harriman Dam to mitigate potential seepage concerns. Mr. Davis also analyzed the Sherman Dam for heavy hauls associated with the decommissioning of the Yankee-Rowe Nuclear Plant.

Mr. Davis was responsible for the design of modifications to the Hinckley Dam in New York for earthquake stabilization. Methods included downstream berms, stone columns in a steel sheetpile cell, and excavate and replace loose material on the downstream shell while the reservoir remained in service.

APPENDIX C

Biographical Data

Gregory G Hammer, P.E.

EDUCATION: BSCE, Georgia Institute of Technology, 1978
Graduate studies in Geotechnical Engineering, Oklahoma State University

REGISTRATION: Professional Engineer, Colorado

PROFESSIONAL AFFILIATIONS:

- American Society of Civil Engineers
- Association of State Dam Safety Officials
- US Society on Dams (Dam Safety Committee)

GENERAL BACKGROUND:

Mr. Hammer has served as a field engineer for the Colorado Division of Water Resources for 21 years. As a member of the Dam Safety Branch, Mr. Hammer performs routine field inspections and analyses for existing dams. He is responsible for approximately 75- 80 inspections, and the accompanying reports each year.

While serving with the Colorado DWR, Mr. Hammer was responsible for development of the dam inventory database to facilitate submission to the national inventory of dams. Mr. Hammer has served a supervisory function as necessary to oversee the field inspection and analysis activities of fellow engineers. He recently served as the principle developer for implementation of the Failure Assessment Index, a tool to evaluate the risk based failure potential of dams in the state.

Prior to joining the Colorado dam safety program, Mr. Hammer was employed by the US Bureau of Reclamation. Assigned to the Embankment Dam Design Branch, he was responsible for the safety analysis of several USBR dams, including seismic evaluation for liquefaction potential. As a designer, Mr. Hammer was the lead design engineer for the embankment raise to Pactola Dam, near Rapid City, South Dakota. This structure was the first application in the United States where a geomembrane was used as the impervious element in an embankment dam. Other projects included the analysis of stability of the riverbank below Grand Coulee dam, and the initial designs for the San Justo Dam and Dike, located near the San Andreas fault.

Mr. Hammer is a member of the Dam Safety Committee of the US Society of Dams, where he is a life member. He is also a member of the American Society of State Dam Officials and the American Society of Civil Engineers.

II. HOW DOES YOUR PROGRAM COMPARE TO THE ASDSO MODEL STATE DAM SAFETY PROGRAM? States will pick elements of the Model to establish an "advanced assistance" agreement with FEMA under the National Dam Safety Program

A. LEGISLATION AND REGULATIONS	YES	NO	COMMENT
Legislation (check yes or no if these provisions are in the law *or* regulations)			
1. Include statutory language that establishes the dam safety regulatory program and defines jurisdictional dams	X		PART 315, Dam Safety, Natural Resources & Environmental Protection Act, P.A. 451 of 1994
2. Authority to adopt rules, regulations and established standards	X		SEC. 31528 4 281.1301-1313
3. Authority to require that the design of initial construction, reconstruction, enlargement, alteration, repair, operation, abandonment, breach or removal of dams and supervision of construction be in charge of an engineer	X		SEC 31508 (1)
4. Authority to require that a permit for application approval be obtained in writing prior to the start of any activity involving initial construction, reconstruction, enlargement, alteration, modification, operation, abandonment, breach, repair or removal of dams.	X		SEC. 31509 (1)
5. Authority to approve or deny impoundment of water.	X		PART 301, Inland Lakes and Streams
6. Authority to inspect dams during construction and periodically during the life of dam including the authority for agency personnel to enter private lands	X		SEC. 31527 31518 31527
7. Authority to order repairs of a dam or modifications to a dam's operation to assure the dam's safety	X		SEC. 31518 31519 31521
8. Authority to take such corrective action as required to carry out the purpose of the statute.	X		SEC. 31519 31521
9. Authority to take emergency action.	X		SEC. 31521
10. Authority to apply penalties for non-compliance	X		SEC/ 31525
11. Authority to provide a liability disclaimer for state and agency personnel		X	Have General Govemmental Immunity
12. Authority to implement the statutory authority under one agency	X		Department of Env. Quality

13. Authority to require the owner to: a. Fully comply with all state laws and regulations	X		PART 315
b. Monitor, operate or maintain the dam in a safety condition and make required repairs in accordance with the regulations, terms and conditions of permits or approved applications, approved operating plans and orders of the agency issued pursuant to the statute.	X		PART 315
c. Conduct periodic inspections and analyses as may be reasonably required by the agency and submit certified reports on the condition of the dam to the agency (or equivalent reports prepared by governmental agencies).	X		SEC. 31518
d. Immediately notify the state agencies and responsible authorities in downstream communities of any condition which threatens the safety of the dam and take all necessary actions to protect against loss of human life, economic loss and lifeline disruption including action required under an EAP or agency order issued pursuant to the law.	X		SEC. 31520
e. Retain records		X	DEQ retains files on dams, but not in statute and encourage owners to keep
14. Authority to establish fee structures for application review and inspection of dams and annual registration fees.	X		SEC. 31509 (2)
16. Authority to require proof of financial responsibility	X		SEC. 31515 (5) Performance Bond
17. Responsibility to report dam incidents to the National Performance of Dams Program	X		No Requirement, Done voluntarily
OVERALL COMMENT:			

Regulations (check yes or no if these provisions are in the law *or* regulations)	YES	NO	COMMENT
1. Reference to statutory auth. for adopting regs.	X		SEC. 31528
2. Definition of terms	X		SEC. 31501
3. Purpose of regs.	X		
4. Define scope of jurisdiction; e.g., according to drainage area, height of dam, maximum storage capacity, or hazard potential class	X		SEC. 31502 (6) 31506
5. Established classification criteria (by size, hazard potential, purpose)	X		SEC. 31518 (2) 31503 31504
6 Establishes design criteria	X		SEC. 31516
7. Permit or applications approval requirements for new construction, reconstruction, enlargement, repair, or alteration	X		SEC. 31509
8. Permit or applications approval requirements for operation and maintenance of existing dams		X	
9. Permit or applications approval requirements for breach, removal or abandonment	X		SEC. 31509
10. Construction requirements and procedures including notice of start of work, status report, approval of supervision, construction reports, prior approval of agency on major changes to approved plans, and authorization to impound	X		All work must be consistent with permit. We are not involved with status or construction reports, or supervision approval
11. Establishes owners' responsibilities for operation and maintenance	X		
12. Requirement for inspection by owners including submittal of periodic inspection reports to the agency, retention of records and acceptance of reports of equivalent inspections conducted by governmental agencies	X		SEC. 31518
12. Requirement of emergency action procedures by owner for all dams		X	Only High and Significant are Required
13. Establishes enforcement procedures	X		SEC. 31524 31525
14. Establishes fee structures for applicant/permit review and/or for inspection of dams by state and annual registration fees.	X		Permit Fee Only SEC. 31509
15 Establish owner financial responsibilities		X	Bond for Permit Work Only SEC. 31515 (5)
OVERALL COMMENT:			
TOTALS: Michigan fulfills 31 of 35 requirements under the Model Program for Legislation and Regulations.			

Attachment 2
Michigan DEQ Mission

Vision and Commitment Statement

Our Vision and Commitment

Our Vision

We, in the Michigan Department of Environmental Quality (DEQ), protect and enhance Michigan's environment and public health. As stewards of Michigan's environmental heritage, we work on behalf of the people of the Great Lakes state for an improved quality of life and a sustainable future. In service to the public, we administer programs and enforce laws that protect public health and promote the appropriate use of, limit the adverse effects on, and restore the quality of the environment. We encourage voluntary actions to enhance our natural resources and the environment. We preserve biologically diverse, rare, sensitive, or endangered plants, animals, and ecosystems through identification, education, management, and public/private partnerships and initiatives. We advance environmental protection through innovation and improvements to regulations and programs.

Our Commitment

We act with integrity and strive for excellence in all we do. We act professionally, within the authority granted to us by law. Our decisions are timely, principled, and based on facts and our best professional judgment. We fairly and consistently apply regulations. We are open to criticism and accept responsibility for our actions. We make the best possible use of the financial and other resources entrusted to us.

Our success depends on working in partnership with others. We communicate with all interests, welcome their input, and respect all viewpoints. Through teamwork, we develop solutions that move us toward our long-term goals. We foster environmental awareness and stewardship.

We are the DEQ's most important resource. We create an enjoyable working environment that fosters teamwork and promotes leadership. We invest in ourselves and our coworkers to ensure success. We encourage creativity, innovation, and personal growth. We approach our purpose with enthusiasm, dedication, and courage.

Graphic Design, John Vial
Kirtland Warbler Photograph Courtesy of Dave Kenyon
Satellite Photograph of Great Lakes Basin, U.S. Army Corps of Engineers, Detroit District