

**Report of the Independent Civil Investigation  
of the  
March 14, 2006, Breach of Ka Loko Dam**

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**Volume 1**

Report  
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## Volume 2

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**Appendix D** – Summary of Law Relevant to Dams in Hawai‘i  
**Appendix E** – Survey of Dam Safety Programs in Other States



# **Report of the Independent Civil Investigation of the March 14, 2006, Breach of Ka Loko Dam**

On March 14, 2006, just before dawn, Ka Loko Dam on the island of Kaua‘i breached. Almost 400 million gallons of water – 1.6 million tons – came crashing down from the Ka Loko Reservoir into Kilauea Bay, taking trees, cars, buildings, and human lives with it. Aurora Fehring, Alan Dingwall Fehring, their son Rowan, Wayne Rotstein, Tim Noonan, Christina MacNees (8 months pregnant), and Daniel Arroyo died in the flood. It was a great human tragedy and an ecological disaster.

This report has been prepared as part of an independent civil investigation<sup>1</sup> of the failure of the Ka Loko<sup>2</sup> Dam. The scope of the investigation has included:

- 1) the role and possible culpability of the State of Hawai‘i,
- 2) the role and possible culpability of the County of Kaua‘i,
- 3) the role and possible culpability of the private landowners,
- 4) the role and possible culpability of any other parties,
- 5) recommended legislation or government actions that could help prevent another tragedy, and
- 6) other recommendations and relevant considerations believed to be appropriate.

The investigation began approximately August 1, 2006, and concludes with this report.

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<sup>1</sup> Robert Carson Godbey was appointed Special Deputy Attorney General by Attorney General Mark J. Bennett, pursuant to H.C.R. No. 192 (2006), for purposes of the investigation. Assisting in the investigation were Jess H. Griffiths and Chad M. Iida, attorneys with Godbey Griffiths Reiss Chong, LLLP, and Cameron B. Black, Joshua B.Y. Strickler, Deborah M. Ball, and Heather Gamache.

<sup>2</sup> Historical and contemporary references to Ka Loko Dam and Reservoir differ in spelling and word unit division used. This changes depending on the year the reference is written and the source used. Early maps and Kilauea historical documents refer to the dam and reservoir as “Koloko.” Other references to the dam/reservoir include: Ko Loko, Kaloko and Ka Loko. The report uses Ka Loko (“the pond”), but does not modify use in quoted materials. Similarly, the report attempts to follow contemporary Hawaiian orthography, but does not modify use in quoted materials. *See, e.g.*, Paul F. Nahoia Lucas, A Dictionary of Hawaiian Legal Land-Terms, Native Hawaiian Legal Corporation (1995).

# 1 Summary and Conclusions

The text of the report includes this summary and conclusions, the investigation's findings regarding the facts leading to the breach, a comparative overview of dam safety legislation in other states, and recommendations regarding governmental actions believed to be appropriate, including recommended legislation and potential modifications to Hawai'i's administrative rules. Maps and photographs are set out separately in an Images section following the text of the report.

Appendix A provides a more extensive treatment of the history of dams in Hawai'i generally, and Ka Loko Dam in particular, through 1971, approximately the end of the plantation era. This history is important to understanding both the circumstances that led to the breach of Ka Loko Dam and the challenges facing the State in dealing with dam safety in the future. Appendix B sets out reports from three experts: Dr. Kevin Hamilton, chair of the Department of Meteorology at the University of Hawai'i, Dr. Lelio H. Mejia, an engineering expert, and Harley P. Parks, a geospatial imaging expert. Appendix C provides illustrative comments from the community regarding the investigation. Appendix D is a summary of the evolution of state and federal statutory law relevant to dams and an overview of certain relevant aspects of the common law. Appendix E includes a state by state summary and analysis of dam safety legislation in other states.

Copies of all of the above are provided in digital form on a compact disk. The digital copy of the Images section on compact disk also contains a computer animation that shows the changes in Ka Loko Dam and Reservoir over the past half century, from



1955 to 2006. Also included on compact disk are several thousand pages of exhibits relied upon in the factual findings.

## **1.1 Methodology**

The investigation included factual research into the history of Ka Loko Dam and the circumstances leading up to its breach on March 14, 2006. The investigation reviewed many thousands of pages of public documents (over 5,000 pages of public documents are included in electronic form in the Exhibits section of the attached compact disk).

Historical sources on O‘ahu and Kaua‘i were searched for materials on the construction and plantation era management of Ka Loko Dam and Reservoir. Several trips were made to the dam site and other locations on Kaua‘i. Witnesses with knowledge of the history of the dam and reservoir, as well as the circumstances of the breach, were identified and consulted; these discussions were generally frank and informal. A number of interested parties were represented by counsel, and they were invited to provide information they thought appropriate to the investigation, and many did. Representatives from a number of Federal, State, and County of Kaua‘i agencies were interviewed. Comments from interested members of the community were solicited by way of an internet web site and personal contact.

Experts in several areas were consulted, both on the mainland and here in Hawai‘i, and both formally and informally. The engineering assessment included in the report of Dr. Lelio Mejia in Appendix B is a particularly important part of the investigation and this report. Significant effort was spent in identifying and analyzing historical and aerial photographs of Ka Loko Dam and Reservoir. The Images section of the report contains a visual history of Ka Loko Dam and Reservoir from aerial

photographs going back fifty years, and included on the attached compact disk is a computer generated animation that provides a three dimensional visualization of historical changes in the dam.<sup>3</sup>

The investigation also included legal research into the evolution of dam law in Hawai‘i and an analysis of how other states have handled dam safety issues, to help identify the best practices to follow in regulating and promoting dam safety. This portion of the investigation included state-by-state review of statutes and administrative rules, and review of the Association of State Dam Safety Officials (“ASDSO”) model acts.<sup>4</sup>

The principal goal of the investigation has been to provide constructive recommendations that may help avoid a similar tragedy in the future. Accordingly, the focus of this report is on identifying those conditions and practices that may have contributed to the breach of Ka Loko Dam,<sup>5</sup> and recommending legislation and actions to prevent or minimize the chance of a similar dam failure in the future. The report sets out factual findings in some detail, with supporting references to the included exhibits or other public documents. The report also sets out conclusions as to conditions and practices that may have contributed to the breach of the dam.

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<sup>3</sup> The investigation located eight stereo pairs of aerial photographs taken from 1955 to 2006, which allow a three dimensional view of the dam as of the date each flight was made; this data, with other data and mapping information, allows computer generated geospatial visualization of these historical changes in the form of a computer animation. See Expert Report of Harley Parks, attached in Appendix B.

<sup>4</sup> The ASDSO is a non-profit organization that serves as the preeminent non-governmental authority on federal and state dam safety. Its representatives were particularly helpful at numerous points in the investigation.

<sup>5</sup> The investigation addressed the “possible culpability” of certain parties. The term culpable “applies sometimes to the person found guilty of an act deserving severe censure or condemnation but it may also apply to a condition, practice, or the like, for which one is responsible or which leads to an accident, crime, etc.” Webster’s New Collegiate Dictionary (Second Edition) at 90 (“blameworthy” and synonyms). For the reasons set forth here, the investigation and this report focus on the second connotation of culpability.

The report does not draw conclusions as to legal blame, civil liability, or criminal guilt that may follow from those conditions or practices, however. There are several important reasons for this.

First, there are at least three civil lawsuits pending over this incident, as well as potential criminal investigations. To draw conclusions as to legal blame would be irrelevant and distracting to those legal proceedings that will, in fact, determine legal blame.<sup>6</sup> It could also unfairly prejudice the rights of one or more of the parties.

Second, while the pending civil lawsuits and potential criminal investigations are all focused on the past, and will determine legal blame for the failure of the dam, this investigation is the only proceeding focused on the future and the important job of recommending legislation and other governmental actions to prevent or minimize the chance of another dam failure at one of the many other antique dams in Hawai'i. Accordingly, this report emphasizes that focus.

Third, basic fairness demands restraint in a limited investigation such as this. While this investigation has been as complete and thorough as its constraints of time and budget have allowed, it is a limited investigation. It began in August and concluded only five months later. While the budget for the investigation is generous, it is not unlimited, and for the reasons set out above, significant resources were devoted to analysis and recommendation of legislative alternatives. Furthermore, there are issues of procedural fairness that weigh against drawing conclusions as to legal blame in this report: the courts allow cross-examination of witnesses, presentation of opposing evidence and testimony,

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<sup>6</sup> Conversely, there may also be acts or practices that contributed to the failure of the dam that may not be addressed in these legal proceedings, because for a variety of reasons they may not lead to legal blame; those are still important to this investigation, however, and should be addressed in recommending legislation.

and restrictions on hearsay, all important safeguards that are not part of a limited investigation such as this. Finally, the scientific evidence and opinions of experts are critical here: identifying the mechanism of failure is essential. While the expert opinions incorporated in this report provide a preliminary analysis and should provide substantial guidance to the Legislature, the investigation's experts have also been limited in time and resources. For example, our engineering experts were unable to make a site visit until November 28. Other engineering experts in the pending lawsuits and potential criminal investigations have access to other data, more time, more resources, have conducted additional testing, were on the scene soon after the failure, and may have additional and significant insights.

For all these reasons, the report does not attempt to come to conclusions regarding legal blame. It does not shy away from the facts, however, or from conclusions regarding their significance to the consideration of appropriate government action in the future. An impartial examination of the facts is essential to the investigation's goal of identifying those conditions and practices that may have contributed to the breach of the dam, and the results of the investigation are set out in the findings. The report attempts to set out the most significant of those conditions and practices in its conclusions, and – based upon those conclusions – to make recommendations to minimize the chance of any similar tragedy in the future.

## **1.2 Summary of Findings<sup>7</sup>**

A significant portion of Hawai'i's contemporary surface water system is made up of antique earthen dams and waterways from the plantation era. The majority of dams in

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<sup>7</sup> This portion of the report summarizes the factual findings set out in detail in the following section; citation to references is in the following section and has been omitted here.

Hawai‘i were developed to support of the sugarcane industry, but many small farmers still utilize water from these old reservoirs today. The sugar industry could afford to devote significant resources to maintaining the irrigation systems vital to its success, but that industry is now largely gone.

Ka Loko Reservoir was originally constructed in 1890, as part of a larger system of ditches, tunnels, and flumes that constituted the water system for Kilauea Sugar Plantation. In 1911, Ka Loko Dam was raised 12 feet by the hydraulic fill method. This increased the reservoir capacity to over 400 million gallons. The reservoir was fed by Ka Loko and Moloa‘a ditches, and its water source was Pu‘u Ka Ele stream and other streams in the government land of Pāpa‘a, within the Moloa‘a Forest Reserve.

In approximately 1971, Kilauea Sugar Plantation ceased operations. C. Brewer, its parent company, continued management of the lands for diversified agricultural purposes, and was assigned the rights to the water collected from the State lands previously held by Kilauea Sugar Plantation.

Several studies by the government and private parties were conducted over the next several years regarding the Kilauea water system. They note there had been no organized system of maintenance since Kilauea Sugar Plantation ceased operations, and various field inspections showed that some facilities had deteriorated. As one study for C. Brewer in 1977 notes, the “labor costs that were justifiable for the well coordinated use of a single owner irrigating thousands of acres could not be justified for 50 (potentially) disparate owners with only a small fraction of this acreage.”

The most extensive study at this time was the Kilauea Agricultural Water Management Study (“KAWMS”). This study took several years of effort and culminated

in a two hundred page report. Various field notes from that study are significant. They record the existence of an emergency spillway with a concrete slab about 15 feet wide for Ka Loko Dam, and field sketches indicate the spillway height was 747 feet above sea level. The field sketches also indicate dam embankment heights of 749.6, 749.8, and 750.7 feet above sea level, at three points on the dam. The field sketches note “high seepage” at the base of the dam at at least two of these points. The final KAWMS report in June 1984, at Appendix D, cautions that field surveys conducted by Soil Conservation Service engineers “indicate that the structural stability of the Ka Loko Reservoir is questionable because of the seepage observed at the toe of the embankment and the dense growth of hao, guava, and palm trees on the downstream face of the embankment.”

At about this time, a series of dam failures on the mainland brought national attention to the issue of dam regulation. The Army Corps of Engineers (“ACE” or “Corps”) compiled an inventory of dams in Hawai‘i. Over the next few years approximately 60 dams were inspected, which were all the high-hazard dams in the State. The Corps did not consider Ka Loko Dam a high-hazard dam and it was not inspected.

In the early 1980s, C. Brewer<sup>8</sup> formed the Kilauea Irrigation Co., Inc. (“KICI”), to operate and maintain the Kilauea water system and invested significant resources in maintaining the system. In 1985, KICI was issued a Certificate of Public Convenience and Necessity by the Hawai‘i Public Utilities Commission (“PUC”) and was authorized to operate as a public utility to provide irrigation water to farming interests in the Kilauea area. That same year, C. Brewer assigned to KICI its revocable permit from the State to

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<sup>8</sup> During this time there were multiple related C. Brewer corporate entities, set out in some detail in the Findings, but all referred to in this summary simply as “C. Brewer.”

utilize the government waters that flowed into Ka Loko Reservoir from Moloa‘a and Ka Loko ditches.

Relations were not always smooth between KICI and its customers. There seems to have been a certain amount of self-help; customers themselves would occasionally go onto government land to clear and maintain Ka Loko ditch.

In 1987 KICI and Lucas Trust, which owned a portion of the Reservoir, entered into a Water Rights Agreement in which they agreed to share the water from the Ka Loko system, with KICI being the responsible operator of the system. KICI, as the operator, was responsible for the maintenance of the system, including the dam. Lucas Trust granted easements to KICI for the operation, maintenance, and repair of the system on Lucas Trust lands. Later that year, C. Brewer sold its portion of the Ka Loko Reservoir and surrounding land to James Pflueger, expressly subject to the Water Rights Agreement.

In June of 1987, the Department of Land and Natural Resources (“DLNR”) became the lead agency for State regulation and inspection of dams in Hawai‘i. From 1993 to 1998, DLNR contracted with consulting firms to inspect high-hazard reservoirs. Ka Loko Dam was still not considered a high-hazard dam and was not inspected. In 1992, the Corps conducted an assessment of earthen dams on Kaua‘i after Hurricane Iniki. No on-site inspection of Ka Loko was conducted, because an initial aerial inspection indicated no fallen trees and good general appearance.

Multiple permits are required to modify a regulated dam.<sup>9</sup> Typically, anyone who alters a dam is required to get a County Building Permit, a Dam Construction or

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<sup>9</sup> Only dams of a certain size are regulated under the Hawai‘i program; generally, regulated dams have a dam height over 25 feet or impound more than 5 million gallons of water. Ka Loko Dam was a regulated

Alteration Permit, a National Pollutant Discharge Elimination System Permitting Program Permit, and possibly a Commission on Water Resource Management Stream Channel Alteration Permit.

On November 7, 1997, the County of Kaua‘i Department of Public Works performed an investigation that documented the grading of the hilltop adjacent to Ka Loko Reservoir and the presence of heavy equipment there. A Notice of Grading Violation was sent by certified letter to James Pflueger, stating that the County had “observed and verified the grading on the subject property to be in violation” of the County’s ordinances, and demanding that the work stop immediately. On November 26, 1997, the civil engineer involved in the investigation was summoned into the Mayor’s office, where he was questioned and ultimately instructed that he was “to stop all actions involving Mr. Pflueger.” The investigation appears to have come to an abrupt stop, and there is no record of any further action being taken on this Notice until 2002.

On November 24, 1997, Tom Hitch, working for KICI, went with two helpers to Ka Loko to attempt to clear a deep pit that contained a reservoir valve, which Mr. Pflueger had indicated he wished to fill in. At that time, although grading of the Makai rim of Ka Loko had begun, both the valve pit and the emergency spillway had not yet been affected.

Shortly after Mr. Hitch cleared the valve pit, it was filled with earth and, at or about the same time, earth was moved into the emergency spillway, apparently as part of a grading process that created flat building sites around Ka Loko Reservoir. A number of members of the community became aware of the grading and that the emergency

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dam, but not considered a high-hazard dam.



spillway had been affected. One member of the community sent Mr. Pflueger a facsimile in June 1998 expressing his concern:

It looks to me as if the Kaloko spillway is covered with 8 to 10 feet of new fill. The reservoir is about 1 to 2 feet above the old fill level. It would probably take at least several months for Kaloko to fill to the new level. Then I think water will flow over a broad area in the middle of your earth dam . . . just an eye ball guess.

I suggest you consider digging back down to the old concrete spillway, setting a small culvert on the spillway and then backfilling it to your current level. You would probably also need to cut a new overflow ditch to the valley below your dam. Your building sites are beautiful. Thanks for letting [my wife] and me hike up there.

Mr. Pflueger did not respond to the facsimile.

In 1999, DLNR sent a letter to James Pflueger, as trustee of the Lucas Trust, requesting assistance in accomplishing a visual dam safety inspection of Ka Loko Reservoir, among others. The letter was resent in 2000, again requesting assistance in scheduling a dam safety inspection. There is no record of any response to the second letter, and no inspection was conducted.

Disputes occurred over the years between KICI and its customers, including Mr. Pflueger. Generally KICI maintained Ka Loko Ditch and the irrigation system, and Mr. Pflueger managed the dam and reservoir. Mr. Pflueger was unhappy with the maintenance of Ka Loko ditch and the water level in the reservoir. KICI was unhappy with Mr. Pflueger because he kept turning off the irrigation water at the Reservoir and made access to the system difficult.

In July 2001, Mr. Pflueger took PUC staff on a field visit to the Reservoir and Ka Loko Ditch, “to see first-hand the condition of the ditch that supplies KICI’s storage, the Kaloko Reservoir.” PUC staff noted that Ka Loko Ditch “did not appear to be maintained, even casually.” Throughout this time C. Brewer was also trying to find

someone to take over the ownership of KICI; for a time C. Brewer was in discussion with Mr. Pflueger, but he did not want to be regulated by the PUC.

In 2001, DLNR sent a letter to Mr. Pflueger, as trustee of the Lucas Trust, urging him to review the Emergency Action Plan (“EAP”) for the dam, and stating that if “you do not have an EAP, we are willing to work with you to develop one.” There is no record of any response to this letter; since it was designated a low-hazard dam, there was no requirement that Ka Loko Dam have an EAP.

On December 27, 2001, DLNR sent a third letter by certified mail to Mr. Pflueger, as trustee of the Lucas Trust, again requesting assistance in performing a visual dam safety inspection of Ka Loko. There is no record of any response, and no inspection was performed.

On July 3, 2002, the Hawai‘i Department of Health – Clean Water Branch (“DOH-CWB”) performed a site inspection at Ka Loko Reservoir, and reported that “a large area near the Kaloko Reservoir was leveled out by James Pflueger in 1997.” They observed other construction, including a concrete diversion upstream of the reservoir, apparently at Moloa‘a ditch. They concluded that “it appeared that unpermitted construction activities such as grading had occurred in the Kaloko Reservoir area.” In September 2002, inspectors from the U.S. Environmental Protection Agency (“EPA”) and the DOH-CWB performed a second site inspection at Ka Loko Reservoir. At that point the EPA and the County of Kaua‘i ordered a halt to all construction activities. (These issues were part of a larger enforcement action concerned primarily with 378 acres of coastal property at Pila‘a, which ultimately resulted in a multi-party Clean Water

Act settlement in federal court.) There is no indication that any of these inspectors noticed any alterations to the emergency spillway.

In 2005, with PUC approval, KICI was sold to Hitch Co., a sole proprietorship of Tom Hitch. Mr. Hitch had worked for years with KICI, and was quite familiar with the irrigation system.

The DLNR dam inspection program faced two significant challenges in 2005. First, the supervisor retired, leaving the Dam Safety and Flood Control section shorthanded. Second, due to natural disasters around this time, the section was instructed to focus on tsunami mapping and flood control issues. No dam inspections were made in 2005 or early 2006 by DLNR. Even at full staffing, there was only 1.5 FTE (“full-time equivalent” employee) in the section devoted to dam safety, or in other words, the equivalent of only one and a half employees assigned to this task. The Association of State Dam Safety Officials (“ASDSO”) recommends that a dam safety program the size of Hawai‘i’s should have 6.5 FTEs.

In early 2006, Hawai‘i experienced unusual weather. Starting February 18, National Weather Service flash flood watches were in effect over at least parts of the State for 31 of the next 42 days. The Ka Loko Reservoir rainfall data from this period indicates very unusual, but not unprecedented, rainfall: it is likely either the second or third wettest period prior to March 14 in a roughly 50 year period (depending upon the averaging length used). Governor Lingle declared a disaster in Kaua‘i on March 2, 2006, due to the heavy rains, and on March 12 issued a supplementary proclamation expanding the declared disaster, as a result of continued periods of heavy rains and flooding.

In late February, the DOH-CWB and EPA received a report that, during the previous week's rains, a five foot high wall of water had come downstream and destroyed a small bridge toward Moloa'a. The complainant said that Mr. Pflueger had diverted two of the three tributaries to Moloa'a stream to Ka Loko Reservoir and Pila'a stream, and thought that either the reservoir or the diversion dams may have broken in the high rainfall. Mr. Pflueger's foreman and an individual in the community familiar with the reservoir and irrigation system were asked to check the reservoir, and reported that they did not see evidence of the dam being broken. On March 7, 2006, DOH-CWB and EPA conducted a site visit, but their inspection was limited to the south and southeast sides of the reservoir, bordering the Moloa'a watershed.<sup>10</sup> They saw no evidence that Ka Loko Reservoir had discharged from the south and southeast sides to the Moloa'a stream.

One week later, on March 14 just before dawn, Ka Loko Dam breached. Almost 400 million gallons of water – roughly 1.6 million tons of water – came crashing down to the sea, taking dirt, trees, buildings, equipment, and human life with it. Seven people were killed. Huge areas of land and ocean reef were destroyed. It was a great human tragedy and an ecological disaster.

The County of Kaua'i was already on alert, due to flash flood warnings the night before. By later that morning, search and rescue missions were underway. By the second day, over thirty government agencies were involved in responding to the disaster.

There are different ways a dam may fail. The mechanism of the breach failure of Ka Loko Dam can only be inferred from available evidence. One possible failure mechanism is embankment overtopping. When a reservoir level rises above the dam crest, water flows over the crest and downstream slope and starts to erode the dam face

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<sup>10</sup> Ka Loko Dam is on the west side of the reservoir. *See, e.g.*, Fig. 4, attached.

and the foundation materials at the toe, or downstream base, of the dam. As flow over the top of the dam increases, erosion can increase rapidly until the breach is fully formed.

One important purpose of an emergency spillway on an earthen dam is to prevent overtopping. After the breach, the Corps examined Ka Loko and could not see a spillway. As his attached expert report indicates, Dr. Lelio Mejia inspected the dam site and also could find no spillway where it had previously been shown in photographs and engineering sketches. The lack of a spillway at Ka Loko Dam, as well as other circumstantial evidence, would indicate that the dam likely failed by overtopping.

There are other potential modes of failure, however. Internal erosion of the embankment or dam foundation materials by seepage can lead to formation of a conduit or pipe through the embankment or foundation that can lead to eventual collapse of the crest. There is evidence in the factual record going back for several decades of concern with seepage. There is also evidence in the factual record, however, to indicate that the reservoir had regularly (and safely) filled to the height of the emergency spillway in the past. So this failure mechanism is possible, although it does not appear to be fully consistent with other observed characteristics of the breach. Because the actual failure mechanism appears to have been complex, such a piping failure mechanism cannot be dismissed with full confidence without additional factual investigation and further analytical modeling that is beyond the scope of this limited investigation.

After March 14, the Army Corps of Engineers, in conjunction with DLNR and Civil Defense, inspected 54 dams. The inspection teams found at least one detrimental condition existed on every dam they inspected on Kaua'i, and noted that many of the

dams have lacked basic monitoring and maintenance programs for what appears to be an extended period.

Hawai‘i has an extensive system of antique dams and waterways. The economic engine of the sugarcane industry no longer provides the resources to maintain these water systems. More than 95% of regulated dams in Hawai‘i are earthen dams, which tend to be subject to a mechanism called “liquefaction” – in which soil loses its stability – and failure during an earthquake. It seems likely that a number of these earthen dams, including Alexander dam on Kaua‘i, were built using an outmoded construction technique known as the hydraulic fill method, and these dams may be particularly susceptible to earthquake damage.

Yet these antique water systems remain essential to Hawai‘i and its economy. Many of the dams and reservoirs are now part of municipal water systems. Diversified agriculture depends upon them, as do potential new technologies such as biofuel and ethanol production. There are hydroelectric plants that rely upon them. These water systems cannot simply be ignored or discarded. The alternative, then, is to regulate them safely and effectively.

### **1.3 Conclusions**

For the reasons explained previously, the focus of this limited investigation is on identifying the conditions and practices that may have contributed to the breach of the dam, not on legal blame. But the investigation does allow some conclusions, which are illuminating in considering legislation to minimize the risk of such tragedy in the future.

First, there are many general conditions that contributed to the failure of Ka Loko Dam that are beyond the control of any individual or institution, but which must be

recognized in considering legislative response. Primary among them, perhaps, is the age of the plantation era water systems so pervasive in Hawai‘i, and the change in our economy that has removed both the economic engine and the institutions that were required to maintain these water systems. This is a reality that must be taken into consideration in any planning for the future.

Similarly, the extraordinary weather undoubtedly contributed to the failure of Ka Loko Dam. But the historical record shows that while this period of rain was very unusual, it was not unprecedented. So again, periods of extraordinary weather are a factor that must be taken into consideration in planning for the future.

Finally, the earthquake of October 15, 2006, is a reminder that there are other naturally occurring events that may profoundly affect the safety of Hawai‘i’s dams. Indeed, there are some events that will cause any dam to fail. That reality, too, must be taken into consideration.

While there are general conditions that likely cannot be changed, but must be taken into consideration, the investigation also revealed specific conditions and practices that contributed to the failure of Ka Loko Dam, and which can be changed. Again, the discussion of culpability below attempts to identify the conditions and practices that may have contributed to the failure of Ka Loko Dam and which can be important to identify and address for the future, without regard to legal blame. Indeed, many of the conditions and practices identified below in all likelihood do **not** lead to any sort of legal blame or culpability in that sense. But if they were potentially contributing factors to the failure of the dam, they are still important to identify and address, regardless how the courts ultimately determine blame.

### **1.3.1 The Role and Possible Culpability of the State of Hawai‘i**

#### ***The State of Hawai‘i failed to conduct required dam safety inspections of Ka***

***Loko Dam.*** The State is required by its own statutes to inspect all dams at least every five years. Ka Loko Dam was never inspected. If Ka Loko Dam had been inspected by trained dam inspectors, the lack of a spillway would surely have been noted. Any other flaws that might have contributed to its breach could possibly have been identified, too. It may be true that Mr. Pflueger did not cooperate in scheduling a dam safety inspection, but that is not an excuse for the State to ignore its obligation to inspect. Dam safety inspections must take place – with or without the cooperation of the land owners. Undoubtedly, one contributing factor here is that Ka Loko Dam was classified as a low-hazard dam.

***Ka Loko Dam was not a low-hazard dam.*** Ka Loko Dam was initially categorized as a low-hazard dam by the Army Corps of Engineers as part of its inspection of all high-hazard dams pursuant to the National Dam Inspection Act of 1972. It was never reclassified. All high-hazard dams were inspected at that time, and have been reinspected since that time. It is reasonable, when allocating scarce governmental resources, that high-hazard dams should be inspected before low-hazard dams. Also, only high-hazard dams are required to have Emergency Action Plans. It seems likely that if Ka Loko Dam had been classified, or reclassified, as a high-hazard dam it would have been inspected and would have been required to have an Emergency Action Plan.

There is no indication that proper procedures were not followed in classifying Ka Loko Dam as a low-hazard dam, but the reality of the dam failure shows that this was a mistake. At the very least, this suggests that the definition of high and low hazard dams must be revisited and that dams must be reclassified with changing circumstances.



*The State of Hawai‘i inadequately funded its dam inspection program.* There simply are not enough trained inspectors to fulfill the required statutory mandate. DLNR has only 1.5 FTE funded for the State’s dam inspection program. The ASDSO recommendation, based on the number of dams in Hawai‘i is 6.5 FTE. Hawai‘i’s aging system of antique dams will require more vigilant inspections as time passes. The statutory mandate to conduct such inspections must be adequately staffed and funded. One issue this raises is the appropriate source for the necessary funding.

*Other State inspectors noticed nothing amiss at Ka Loko Dam.* The area around Ka Loko Dam and Reservoir was inspected on numerous occasions by other State inspectors. No one ever noticed anything amiss. In particular, inspectors from the PUC and DOH-CWB simply did not notice any problems with the emergency spillway. Presumably they had no training in identifying such problems. While not all inspectors can be trained as dam safety inspectors, all inspectors could receive at least some basic training in this area.

### **1.3.2 The Role and Possible Culpability of the County of Kaua‘i**

*The 1997 Notice of Violation at Ka Loko Reservoir was not enforced.* The County sent a notice to stop all work at Ka Loko Dam when it found unlawful grading occurring. This was before the spillway had been filled in. Had this notice to stop work been enforced, the spillway might never have been filled in. But the engineer involved was called into the office of the Mayor, questioned, and told to “stop all actions involving Mr. Pflueger.” This should not have happened. No further enforcement action was taken for the next five years.

*Other county inspectors noticed nothing amiss at Ka Loko Dam.* The area around Ka Loko Dam and Reservoir was inspected on numerous occasions by other County inspectors, as well as State inspectors. As noted above, no one ever noticed anything amiss with the dam. Inspectors specifically concerned with construction and grading did not notice problems with the spillway, for example. While not all inspectors can be trained as dam safety inspectors, all inspectors could receive at least some basic training in this area.

### **1.3.3 The Role and Possible Culpability of the Private Land Owners**

#### **James Pflueger and Pflueger entities**

*The Ka Loko Dam spillway should not have been altered.* The emergency spillway is an essential safety element of every earthen dam. It is dangerous to fill an emergency spillway on an earthen dam, or to allow it to become obstructed or unusable. It appears that is what James Pflueger did here.

While it seems likely that Ka Loko Dam failed by overtopping, and that the lack of a spillway on Ka Loko Dam caused or contributed to such failure, that is not certain at this time. That will not be clear unless and until the failure mechanism of the dam can be determined definitively by further study and analysis.

*Pflueger failed to maintain the dam.* The owner of a dam has the obligation to repair and maintain the dam. Even if Mr. Pflueger knew nothing of the alterations to the emergency spillway, that does not avoid his obligation to maintain the dam and therefore to discover and correct any problems with the spillway. Again, it is not yet certain that the problems with the spillway caused the failure of Ka Loko Dam. But if the failure of

the dam was caused by other problems, such as internal erosion and piping, then proper maintenance and inspection of the dam may still have prevented or minimized the risk of failure from those mechanisms as well.

### **1.3.4 The Role and Possible Culpability of Any Other Parties**

#### **Kilauea Irrigation Company, Inc. (“KICI”)**

*Kilauea Irrigation Company, Inc., failed to maintain the dam.* KICI, under the Water Rights Agreement, had the obligation to repair and maintain the entire irrigation system, including the dam. At the time the Water Rights Agreement was written, KICI and Ka Loko Dam were both owned by C. Brewer. The dam was then sold to Mr. Pflueger. Thereafter, as a matter of practice for almost twenty years, KICI left the dam to its owner and dealt only with the other elements of the irrigation system.

KICI had long standing conflicts with Mr. Pflueger over maintenance of the system and timely access to the reservoir and dam. It is not clear whether KICI had the obligation or the ability, under these circumstances, to force inspection and repair of the dam over Mr. Pflueger’s objection. But the issue this raises for the Legislature is whether, and to what extent, a dam owner should be able to shift responsibility to another party for repair and maintenance of a dam through contract.

*Kilauea Irrigation Company, Inc., failed to control the waters from Ka Loko ditch.* Separate and apart from any obligation to repair and maintain the dam, KICI may have had the opportunity to control the waters going into the reservoir from Ka Loko ditch. While it is arguable that Mr. Pflueger may have assumed control of the dam by his actions, KICI did continue to control Ka Loko Ditch and the irrigation system itself.

Given the heavy rains prior to March 14, KICI may have had the opportunity to monitor and control, or attempt to control, the flow of water into the reservoir. It is not clear that KICI had the ability to do this; the mechanism for closing down Ka Loko Ditch had not been used for years. Whether the inflow of waters into the reservoir contributed to or caused the failure of the dam remains to be determined, and may depend upon the mechanism ultimately determined to have caused the failure of the dam. Even if it is determined that the inflow contributed to overtopping, and thus to the failure of the dam, the first line of defense for an earthen dam against overtopping is its emergency spillway.

The issue this raises for the Legislature, however, is what obligation should exist, and for whom, to monitor the rise of waters in reservoirs, to divert them if possible and appropriate, and, potentially, to provide a mechanism for warning those persons downstream who may be affected by the rising or diverted waters.

#### **1.4 Summary of Recommendations**

The conditions or practices identified above that may have contributed to the failure of Ka Loko Dam suggest some needed changes in the way Hawai‘i regulates its extensive network of antique earthen dams. This report also provides a survey of dam safety programs throughout the country (in Appendix D) and – based upon that survey – sets out an analysis of Hawai‘i’s current Dam Safety Act and how it compares to that of other states. The report then takes the factual findings and the guidance from the best practices of other states discussed in the comparative analysis and makes specific recommendations.

In summary, a review of the conditions or practices that may have contributed to the failure of Ka Loko Dam leads to the following recommendations:

- The level of funding for the State’s dam safety program should be increased to allow for regular dam safety inspections and periodic updating of the State’s dam inventory to accommodate changes in the hazard classification of dams.
- The process for updating the State’s dam inventory should allow for periodic review of the hazard classification of dams and for timely updating of such classification.
- Dam safety inspections should include comprehensive safety reviews and visual inspections. Visual inspections of high-hazard dams should be conducted at least once every two years, and comprehensive safety reviews, going beyond merely visual inspection, should be conducted once every five years.
- The guidelines for safety inspection of dams should be reviewed with a view to develop more streamlined dam inspection procedures that are consistent with the budgetary constraints of the State’s dam safety program.
- Consideration should be given to developing guidelines for instrumentation monitoring of “high hazard,” and perhaps “significant hazard” dams.
- Hawai‘i’s Dam Safety Act should be reviewed to reconsider the recurrence interval of natural events for which owners are exempt from liability for damages.
- All State and County inspectors should receive proper basic dam safety training, as should all dam owners.

The analysis of the best practices from other states leads to the following recommendations:

- Hawai‘i’s Dam Safety Act should be amended to incorporate tougher enforcement provisions, including stricter penalties for non-compliance with the law.
- Hawai‘i’s Dam Safety Act should be amended to incorporate a specific funding mechanism to provide funds necessary to administer the program, probably collected from dam or reservoir owners to help cover BLNR and DLNR’s costs.
- Hawai‘i’s Dam Safety Act should be amended to incorporate more thorough provisions that specifically grant BLNR and DLNR certain authority to administer certain important aspects of the dam safety program.

Accordingly, the proposed legislation includes clearer authority to BLNR and DLNR to administer the dam safety program, tougher enforcement provisions, and an internal funding mechanism, which are believed to be critical to an effective dam safety program. The proposed legislation also modifies a few definitions and defines some

terms that are not currently defined in the statutes. Most, if not all, of the proposed changes have been taken from other state dam safety statutes.

### **1.5 Summary of Proposed Legislation and Administrative Rules**

The proposed amendments to Hawai‘i’s Dam Safety Act and Administrative Rules contained in the last section of the report reflect prevailing dam safety practices found nationwide, and recognize industry guidelines established by dam safety authorities such as the Association of Dam Safety Officials (“ASDSO”), the Federal Emergency Management Agency (“FEMA”), and the Army Corps of Engineers. The proposed legislation is intended to reflect the conceptual changes to the current statute that the report recommends. There may be other statutory language that is more appropriate to adopt to incorporate these concepts, but the proposed legislative language is submitted for consideration as one way to accomplish those goals. The following summarizes the key elements of the proposed amendments.

First, insufficient program funding, leading to inadequate agency staffing, has been a key factor leading to the reduced program efficiency in Hawai‘i. An alternative funding mechanism seems appropriate. The comparative overview within this investigation provides numerous examples of state programs funded in part by revenues created internally through dam safety program administration (e.g. fees, reimbursements for state inspection costs, interest from low interest loans and civil penalties). These funding mechanisms are often designed to recover some of the state’s costs to administer the dam safety program, effectively providing for necessary state agency staffing, program control, and fulfillment of state duties granted under legislative authority.

Second, the proposed state dam inspection and enforcement provisions are relatively lenient compared to other states' laws and general industry guidelines. A more rigid and defined inspection protocol for both the enforcing state agency and dam or reservoir owners warrants consideration. This investigation has revealed a number of states with established inspection schedules requiring more frequent inspections and more defined inspection practices than those under existing State laws. A major part of the inspection process is based upon the proper classification – and reclassification as necessary – of all water impoundment structures under State jurisdiction. Inaccurate or overdue dam classification can cause dangerous dams or reservoirs, which would otherwise warrant stringent regulation, to be overlooked or neglected. The creation of an up-to-date database of all dams within the State's jurisdiction, listing their respective hazard classifications, should be considered to establish a foundation for the dam inspection program.

The enforcement provisions under the existing Hawai'i Dam Safety Act and Administrative Rules may be strengthened considerably; penalty amounts could be increased from the current \$500 per day to upwards of \$1,000 to \$5,000 per day, as ordered in other states. Violators of the dam safety laws put the public at considerable risk, warranting criminal penalties as well.

State agency actions authorized in cases of emergency may also be expanded to include prolonged or permanent State control over dams or reservoirs determined to pose a significant or imminent public threat.

Third, the proposed expansion of the "Definitions" section of the Dam Safety Act includes more stringent "Engineer" qualifications, setting forth minimum experience and

certification criteria for any engineers employed by the State or dam owners to perform inspections or to design and oversee the construction of dams. A clearer definition for “Dams” is also necessary so that the State can regulate a dam that was previously unfound or unreported, but yet still poses a threat to life or property, regardless of the dam’s height or storage capacity. Similarly, the definition for a “High Hazard” dam needs modification so that any dam whose failure would most probably result in the loss of human life is classified as high hazard. The importance of proper dam definition and classification sets the stage for a particular dam’s inspection policies: high hazard dams require elevated maintenance, operation, and supervision protocols. Additional definitions or modifications, such as those for “Owner,” “Hazard Potential,” “Person,” and “Spillway,” are also warranted to clarify existing State dam law ambiguities.

Finally, there are many other subjects addressed in other state dam safety laws and industry guidelines that existing Hawai‘i dam laws do not adequately address: increased right of entry to the State; environmental impact associated with dam construction and operation; statutory severability; dam operation and maintenance requirements; and recordkeeping. The proposed amendments attempt to address these issues.

Similarly, the purpose of the proposed Administrative Rules is to provide an example of how the conceptual changes can be applied to the administrative rules. Like the proposed statutory provisions, the particular provisions found in the proposed Administrative Rules are not essential. They are merely meant to illustrate one approach to incorporating these concepts into new Administrative Rules. Ultimately the choice of suitable language is the responsibility of the Board of Land and Natural Resources.



The proposed Administrative Rules attempt to provide some detail regarding the administration of the three critical aspects mentioned above: clearer administrative authority, tougher enforcement provisions, and more funding. The proposed Administrative Rules are based on rules promulgated in other states, with the goal of keeping existing administrative rules in place where possible, and supplementing the rules with other provisions.



## **2 Findings: the History of Ka Loko Dam and its Breach**

### **2.1 Kilauea Sugar Company and Ka Loko Dam**

The facts and circumstances that led to the breach of the Ka Loko Dam stretch back for decades. Ka Loko Dam was one of many antique earthen dams in Hawai‘i, built to support the sugarcane industry in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. Some history of Ka Loko Dam from its construction and maintenance as part of Kilauea Sugar Plantation Company is essential to understand the events that led to its breach. A more extensive history of Ka Loko Dam and the network of antique dams in Hawai‘i is found in Appendix A.

#### **2.1.1 The Plantation Era and the HSPA**

A significant portion of Hawai‘i’s contemporary water infrastructure stems from the sugar era when plantations developed large irrigation systems.<sup>11</sup> As the Department of Land and Natural Resources (“DLNR”) has noted:

Historically, the majority of dams in Hawai‘i were devoted to support the sugar cane industry. Although many of the larger plantation companies have since folded, there are still many smaller farmers that utilize the water from these old reservoirs.<sup>12</sup>

The primary purpose of these water-systems was to provide irrigation to cane fields. Regulated use of the reservoirs and their appurtenant parts also enabled them to be used for transporting cane from the cane fields to mills, for cleaning and processing sugar, as a supply of hydraulic power, and for other plantation needs.

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<sup>11</sup> For example, a significant portion of Maui’s water supply structures today were originally constructed by plantations for the purpose of irrigating sugarcane.

<sup>12</sup> Department of Land and Natural Resources: Engineering Division, “Hawai‘i Flood Management News” (June 2006) at 1.

Sugarcane requires a plentiful and consistent supply of water throughout its growing-cycle. Producing one pound of sugar requires 4000 pounds of water (500 gallons).<sup>13</sup> Surface water in Hawai‘i is unreliable, however. The flow rates in the Island’s streams are flashy, they tend to rise and fall rapidly with rainfall. This can happen over the period of a few hours. Frequently, storm flows will be hundreds or thousands of times greater than median stream flow rates.<sup>14</sup> Therefore, in order to establish a successful sugar business it was critical to establish a reliable water system. The system needed to supply enormous quantities of water consistently over long distances to numerous cane fields. Additional water was needed to flume the cane to the mill and for cleaning and processing the cane.<sup>15</sup>

In 1882, sugar planters in the Kingdom of Hawai‘i organized the Planters’ Labor and Supply Company. This later became the Hawaiian Sugar Planters’ Association (“HSPA”) in 1895.<sup>16</sup> The voluntary organization worked to improve and promote sugar production in the islands and advance relevant areas of science and engineering for the mutual benefits of its members.<sup>17</sup> HSPA conducted research on plantations’ soil chemistry and recommended irrigation methods that would be appropriate to Hawai‘i’s terrain. HSPA established a research station that enabled Hawai‘i to become a world leader in agricultural technology, research and science. By 1929, HSPA had 75 scientists and investigators in different departments, including; Agriculture, Entomology, Forestry,

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<sup>13</sup> Carol Wilcox, “Sugar Water: Hawai‘i’s Plantation Ditches” 1 (1996). This is an excellent reference regarding Hawai‘i’s plantation water systems.

<sup>14</sup> *Id.* at 7.

<sup>15</sup> At harvest, gate tenders at the reservoirs would open the sluice gates and cane could be flumed downstream to mills. William H. Dorrance, *Sugar Islands: The 165-year Story of Sugar in Hawai‘i* 89 (2000).

<sup>16</sup> This organization still exists today as Hawai‘i Agriculture Research Center (“HARC”), and conducts research on a broad diversity of crops. <http://www.Hawaiiag.org/harc/HARCHS11.HTM>.

<sup>17</sup> William H. Dorrance, *Sugar Islands: The 165-year Story of Sugar in Hawai‘i* 155 (2000), and [http://en.wikipedia.org/wiki/Hawaiian\\_Sugar\\_Planters'\\_Association](http://en.wikipedia.org/wiki/Hawaiian_Sugar_Planters'_Association)

Sugar Technology, Pathology and Chemistry.<sup>18</sup> The HSPA investigated a variety of technologies potentially useful to the plantations, including over the years methods for the construction of dams, such as the hydraulic fill method.<sup>19</sup>

At the beginning of the 20<sup>th</sup> century, the hydraulic fill process was considered “a novel manner of building dams of earth and gravel.”<sup>20</sup> The “hydraulic fill” was the embankment that was created as earth was sluiced, or transported in suspension in water, to the embankment. “It consists in excavating, transporting, and depositing the material required by the erosive action of water, which is obtained either under pressure from a jet or by gravity from a flume.”<sup>21</sup> The low embankments were built up as the fill progressed defining the dam’s edges. The separation of the coarse and fine material through the process of sedimentation produced a watertight core. Hydraulic fill dams rely on their weight to hold back the water.<sup>22</sup>

### **2.1.2 Kilauea Sugar Company and Ka Loko Dam**

In 1863, Charles Titcomb purchased a parcel of land at Kilauea to raise cattle. Edwin P. Adams and Captain John Ross, both from Honolulu, purchased three thousand acres and six thousand head of cattle from Charles Titcomb in 1877. While running the ranch, they gradually converted the ranch lands into sugarcane fields.<sup>23</sup> Adams eventually bought out Ross.

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<sup>18</sup> Posted information about HSPA in Sugar Plantation exhibit at Kaua‘i Historical Museum, October 25, 2006.

<sup>19</sup> F.E. Hance, Report on Hydraulic Dam Construction by Chemical and Engineering Control H.S.P.A. (September 24, 1929).

<sup>20</sup> Edward Wegmann, The Design and Construction of Dams: Including Masonry, Earth, Rock-fill, Timber, and Steel Structures also the Principal Types of Movable Dams 248 (1908).

<sup>21</sup> *Id.*

<sup>22</sup> Embankment dams, subtopics: earthen dams and hydraulic fill, <http://www.answers.com/topic/dam>

<sup>23</sup> Posted information about Kilauea Sugar Company in Sugar Plantation exhibit at Kaua‘i Historical Museum, October 25, 2006.

Sugar operations began in 1877 and Kilauea Sugar Plantation Company was incorporated with the first harvest 3 years later.<sup>24</sup> C. Brewer became the agent for the plantation in 1909, and eventually acquired the company.<sup>25</sup> Kilauea Sugar Plantation steadily grew in its work force, acreage, irrigation infrastructure, and production. The town of Kilauea was developed entirely as an extension of the plantation community.<sup>26</sup> At its height, the plantation employed 400 people; when it closed, it had decreased to 200.

Ka Loko Reservoir was originally constructed in 1890. The dam and reservoir were part of a larger system of ditches, tunnels and flumes that constituted Kilauea's water systems. The water-system was dependent upon surface water. The availability of surface water fluctuated, according to the yearly rainy seasons and occasional droughts. In 1910, Ka Loko Reservoir was assessed to be in good condition,<sup>27</sup> and was recorded as holding 30 feet of water in April this same year.<sup>28</sup> In May of 1911, the reservoir held 33.3 feet of water.<sup>29</sup> Yet, the plantation struggled to have a consistent and adequate amount of water to irrigate through out the year, and therefore decided to expand Ka Loko's water capacity. The Company's 1911 Annual Report states, "Lack of water has always been a serious handicap to this plantation and with the . . . [reservoir] improvements, we will plant our crops with more assurance than heretofore." Ka Loko Reservoir was authorized for enlargement and the work started in 1911.

Photographs taken during its expansion show men identified as "sluicing" Ka Loko; sluicing was a method used to construct hydraulic fill dams. *See* Fig. 23 ("Sluicing

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<sup>24</sup> William H. Dorrance, *Sugar Islands: The 165-year Story of Sugar in Hawai'i* 32 (2000).

<sup>25</sup> C. Brewer was founded in 1826 by James Hunnewell.

<sup>26</sup> Carol Wilcox, John Wehrheim and T.K. Kunichika, *The Kauai Album* 127 (1981).

<sup>27</sup> Kilauea Sugar Plantation, "Annual Report," December 31, 1910.

<sup>28</sup> Kilauea Sugar Plantation, "Water in Reservoirs," hand written report, 1910. Kaua'i Historical Society Archives (Box 56, Folder 3).

<sup>29</sup> Kilauea Sugar Plantation, "Water in Reservoirs," hand written report, July 1910 - June 1911. Kaua'i Historical Society Archives.

Koloko Dam”).<sup>30</sup> The enlargement of Ka Loko Reservoir was completed in 1912; its capacity was increased by 140,957,000 gallons, to its modern capacity of slightly over 400 million gallons. Ka Loko Dam was raised 12 feet, to approximately 750 feet above sea level. The total cost of the dam’s renovation, including the dam and gate, was \$9,642.92.<sup>31</sup>

Kilauea Sugar Company had a comparatively small reservoir network. The plantation’s six reservoirs, Ka Loko, Kalihiwai, Stone Dam, Pu‘u Ka Ele, Morita and Waiakalua, were connected by four small ditch systems fed by many small streams. With a capacity of over 400 million gallons, Ka Loko was the largest reservoir on the plantation.<sup>32</sup> Ka Loko’s water sources were on state lands and fed Ka Loko and Moloa‘a ditches.<sup>33</sup>

The historical strength of Ka Loko is demonstrated in the Kilauea Sugar Company records that show that numerous times the dam was quite full, at times holding its maximum capacity over extended periods. Following the reconstruction of the dam, the maximum depth of the reservoir was 43 feet, which was the height of the emergency spillway. Between 1940 and 1954 Ka Loko Reservoir reached its 43 foot maximum capacity twenty different times.<sup>34</sup>

In 1959, after public auction, the Territory of Hawai‘i granted General Lease No. 3577 to Kilauea Sugar Company, Ltd., granting it the “right, privilege, and authority” to “enter the Government Land of Papaa lying within the Moloaa Forest Reserve, Kauai,

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<sup>30</sup> Mr. and Mrs. H.W. Thomas, “H. W. Thomas Album, “Kilauea Sugar Plantation, early 1900,”” at 23 - 24. Hawai‘i Historical Society.

<sup>31</sup> Kilauea Sugar Plantation, “Analysis of Cost of Kaloko Dam” (1912). Kaua‘i Historical Society.

<sup>32</sup> Carol Wilcox, “Sugar Water: Hawai‘i’s Plantation Ditches” 84 (1996).

<sup>33</sup> *Id.*

<sup>34</sup> Kilauea Sugar Plantation record, entitled: “Kaloko Reservoir Level: Highest Readings (Max.- 43’)” (April 21, 1954) Kaua‘i Historical Society.

and to operate, reconstruct and repair therein a water transportations system within a right-of-way twenty (20) feet in width known as the Kaloko Ditch,” together with “the right to develop and take all government-owned waters” from the associated watershed.<sup>35</sup>

From Ka Loko Reservoir the water continued down in three directions, with the main ditch going to Morita Reservoir.<sup>36</sup> One ditch drained to Waiakalua Reservoir. Another drain went to Ko‘olau Reservoir and water from Ko‘olau ditch was pumped back to Ko‘olau Reservoir. Almost all the water eventually irrigated the cane fields. One reservoir, Kalihiwai, known as “Drinking Water Reservoir,” had an 8-inch pipe that supplied Kilauea town with water for domestic use.<sup>37</sup> See Figs. 2, 4, and 5 (aerial photo 1955) and Figs. 6 and 7 (aerial photo 1965).

## **2.2 Water Rights After Kilauea Sugar Company Ceased Operation in 1971**

In approximately 1971, Kilauea Sugar Company ceased operations. At its meeting of September 22, 1972, the Board of Land and Natural Resources authorized the assignment of General Lease No. 3577 (Water License) from Kilauea Sugar Company to Metcalf Farms Hawaii, Inc. Metcalf Farms subsequently went bankrupt.<sup>38</sup> Eventually, in 1977, the water license was assigned back to other subsidiaries of C. Brewer: Brewer Properties, Inc., and C. B. Kilauea, Inc., doing business as Kilauea Plantations.<sup>39</sup> The Department of Land and Natural Resources summarized the events from 1973 until 1977 as follows:

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<sup>35</sup> General Lease No. 3577 (July 15, 1959) at 1. (DLNR 518)

<sup>36</sup> Kilauea Sugar Plantation, hand drawn flow chart of Kilauea Reservoir System. Kaua‘i Historical Society.

<sup>37</sup> Carol Wilcox, *Sugar Water: Hawai‘i’s Plantation Ditches* 85 (1996).

<sup>38</sup> USDC Case No. BK-74-107 (DLNR 763).

<sup>39</sup> Assignment of Lease (May 25, 1977) (DLNR 724).



In the interim period, C. Brewer, Inc., parent company for the defunct Kilauea Sugar, had to foreclose on its lands within the Kilauea area and rather than selling same at a loss or no profit, plus to keep with the wishes of the community and government agencies, they decided to continue management of their lands for diversified agricultural purposes. Therefore, they request assignment of the above license to Kilauea Plantations, its subsidiary company, in order to supply water to its agriculture lands.<sup>40</sup>

The requested assignment was approved, and this General Lease remained in effect until 1980, when it was changed to a revocable permit, as discussed in more detail below.

### **2.3 Early Studies of the Kilauea Irrigation Water System**

At or about this time, various agencies of the State and federal government, as well as private entities involved, began to look at the Kilauea Irrigation Water System to discuss its future.

One of the earliest such studies was “The Kilauea Irrigation Water System, Island of Kaua‘i,” by DLNR in 1976.<sup>41</sup> That study begins:

Since the shutdown of C. Brewer & Co.’s sugar plantation in Kilauea, the irrigation water system that was used for sugarcane production has not been fully operated and maintained. Former sugarcane lands have changed ownership and are now used primarily for cattle grazing and for grain and forage crop production. For these purposes, water from the system continues to be used.

The study also notes the State’s goal of establishing an agricultural park in Kilauea, and that the “preservation of the existing irrigation water system is considered basic to the park plan.”<sup>42</sup>

The study notes that the recent case (at that time) of *McBryde Sugar Co. v. Robinson* “would appear to upset the earlier principles governing the adjudication of water rights.”<sup>43</sup> The study continues:

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<sup>40</sup> Board of Land and Natural Resources Item F-15, approved April 7, 1977. (DLNR 512)

<sup>41</sup> DLNR, “The Kilauea Irrigation Water System, Island of Kauai” 1 (2/18/76). (DLNR 1790).

<sup>42</sup> *Id.*

The foregoing Hawai'i Supreme Court decision has far-reaching implications, but much remains to be decided . . . .

With regards to the Kilauea area, the rights to the past use of water for irrigation were established under the system of Hawaiian water law then prevailing. As far back as 1880 when Kilauea Sugar Company was formed, the company secured title to the area's waters through purchase of the lands to which water was appurtenant. Where the purchase of land was not feasible or possible, water rights were acquired through long-term permits. Up until it ceased operations in 1971, Kilauea Sugar Company utilized the Puu Ka Ele Stream waters arising in lands owned by the State and Lucas Estate, the Halaulani and Pohakuhonu streamflows arising in company-owned land, and Kalihiwai Stream diversions arriving on lands owned by Lihue Plantation Co. The closing of Kilauea Sugar Company and the subsequent transfer in ownership of the company lands have altered the water supply situation somewhat. . . . .

At the present time, it is difficult to firmly establish the ownership rights to the Kilauea waters because of the unsettled issues surrounding the above-mentioned *McBryde Sugar Co. v Robinson* water right case. . . .<sup>44</sup>

The study then goes on to discuss the irrigation water system, observing that it is “typical of the gravity-type collection and conveyance system employed by the sugar plantations throughout the island, where surface waters are extensively collected, stored, and subsequently distributed by gravity to the lower-lying fields.”<sup>45</sup> The study reports that the “largest storage facility is Kaloko Reservoir, which has a capacity of about 400 million gallons.”<sup>46</sup> The Ka Loko Reservoir receives the headwaters of Pu'u Ka Ele Stream by way of the Ka Loko Ditch; this portion of the watershed was (and is) State owned.<sup>47</sup> “Open, unlined ditches make up the entire conveyance system, except in isolated areas where flumes or tunnels were seen to be necessary or more economical.”<sup>48</sup>

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<sup>43</sup> *Id.* at 2; see discussion of the *McBryde* case and the evolution of water law in Hawai'i in Appendix D hereto.

<sup>44</sup> *Id.* at 4.

<sup>45</sup> *Id.*

<sup>46</sup> *Id.*

<sup>47</sup> *Id.*

<sup>48</sup> *Id.* at 7.

The study also reviews the issue of maintenance of the water system, noting, “The Kilauea irrigation water system has not been maintained since 1970 when Kilauea Sugar Co. announced its intentions to cease operations, and there is no program of organized maintenance at present.” The study goes on to say, “recent field inspections of the water system show that some facilities have deteriorated to a level where immediate repairs are needed to keep them operational,” and goes on to estimate that “about \$20,000 is needed to make the system useable again and about \$25,000 would be required annually thereafter for operation and routine maintenance.”<sup>49</sup>

The study concludes by suggesting that “the government proceed to acquire the water system so that the issue of water availability will not hold back any agricultural pursuits.”<sup>50</sup>

One of the next significant studies was the “Irrigation System Plan for the Kilauea Agricultural Subdivision” prepared by Belt, Collins & Associates, Ltd., for C. Brewer Corporation on February 23, 1977.<sup>51</sup> That report begins by noting the importance of inexpensive irrigation water to the development of agricultural subdivision lots by C. Brewer, and says that a “key aspect of the water development plan in this report is use of portions of the abandoned irrigation system of the sugarcane plantation.” The study continues: “This system has not been used or maintained since the plantation closed six years ago, and storms, rank growth, dry rot, and grazing cattle have taken their toll in the

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<sup>49</sup> *Id.* at 16-17.

<sup>50</sup> *Id.*

<sup>51</sup> Belt, Collins & Associates, Ltd., “Irrigation System Plan for the Kilauea Agricultural Subdivision” (February 23, 1977). (B00671).

intervening years.”<sup>52</sup> As part of the study, almost all elements of the system were examined in four days of field work. The report states:

The three highest elevation reservoirs – Kaloko, Puu Ka Ele, and Kahihiwai – appear to be in excellent structural shape and the outlet control valves for all three are in working order. Kaloko and Kalihiwai have uncontrolled overflow spillways . . . .<sup>53</sup>

The report goes on to note that the scale of operations of the plantations system was “far greater than would ever be achieved on the proposed agricultural subdivisions.”<sup>54</sup> The study summarizes: “The labor costs that were justifiable for the well coordinated use of a single owner irrigating thousands of acres could not be justified for 50 (potentially) disparate owners with only a small fraction of this acreage.”<sup>55</sup> Ultimately, the report recommends development of an irrigation system for the agricultural subdivision at a cost of over \$1,000,000, although noting, “No remedial work at Kaloko Reservoir would be required.” *See* Figs. 8 and 9 (aerial photo 1976).

## **2.4 The Kilauea Agricultural Water Management Study (“KAWMS”)**

The next major study, and perhaps the most extensive ever conducted, was the Kilauea Agricultural Water Management Study (“KAWMS”) prepared by the United States Department of Agriculture Forest Service and Soil Conservation Service (“SCS”), in cooperation with the State of Hawai‘i Department of Land and Natural Resources and the East Kaua‘i Soil and Water Conservation District. Published in June of 1984, this was the result of several years of work. In 1979, the Board of Land and Natural Resources

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<sup>52</sup> *Id.* at 2-3.

<sup>53</sup> *Id.* at 6.

<sup>54</sup> *Id.* at 7.

<sup>55</sup> *Id.* at 7.

approved an application for federal assistance in conducting the study under the Watershed Protection and Flood Prevention Act.<sup>56</sup> Field work began in 1980.

Field notes from April 9, 1980, made to “get an overview of study area and to check existing reservoir conditions” for the KAWMS note the following about Ka Loko Reservoir:

- a. No visible erosion that would require land treatment
- b. Embankment looks in good shape except upstream bank is eroded in places and < 3:1 side slopes
- c. Emergency spillway consists of a concrete slab about 15 feet wide.
- d. Principal spillway goes under the emergency spillway. Flow in ditch from principal spillway very small but further down at the prawn ponds the flow was substantially bigger indicating additional inflow.<sup>57</sup>

Throughout the KAWMS, there is a distinction drawn between the “principal spillway,” which is the valve and piping that provides the water for the Kilauea irrigation system, and the “emergency spillway,” which is the concrete slab that allows water out of the reservoir in an emergency.

Field notes from December 14, 1981, state that Ka Loko Reservoir is “in good condition” although they also note that the embankment is overgrown with trees. The notes indicate the reservoir is generally in good condition, stating the “principal spillway is not functioning,” although the “gate downstream of embankment is working.”<sup>58</sup>

Field notes from February 1982 indicate that Ka Loko Reservoir was “usually critically low each year during sugar production due to high seepage losses in reservoir

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<sup>56</sup> Letter from Robert T. Chuck to Board of Land and Natural Resources dated September 14, 1979 (DLNR 503); “Application for Assistance” to U.S. Dept. of Agriculture (July 1979) (DLNR 504).

<sup>57</sup> KAWMS Field Notes (April 9, 1980) (DLNR 1811).

<sup>58</sup> (DLNR 2021).

and high sugar demand.”<sup>59</sup> Contemporary field drawings show a spillway on the right hand side of Ka Loko Dam facing downstream, the north end of the dam.<sup>60</sup>

In June of 1982, the U.S.D.A. prepared a Water Resources Technical Paper as part of the KAWMS.<sup>61</sup> The paper included an assessment of existing conditions of the reservoirs in the system, “based upon field surveys done in December 1981 and February 1982, and also reports done by Belt Collins and Associates.” The paper stated:

The Ka Loko Reservoir at elevation 747 feet stores water diverted from the Moloaa and Puu Ka Ele streams via the Ka Loko Ditch. The stability of this reservoir is structurally questionable because of the seepage losses observed at the toe of the embankment and the abundant growth of hao, guava, and palm trees on the downstream face of the embankment. The control valve at the inlet is in working order and the emergency spillway is an uncontrolled concrete section.<sup>62</sup>

On July 15, 1982, a subsidiary of C. Brewer wrote to the U.S.D.A.<sup>63</sup> to provide their comments regarding this and two other technical papers. In that letter, they write:

The statement is made that the stability of Kaloko Reservoir is structurally questionable. It would be helpful to know the source of this comment as Kaloko is one of the most important reservoirs in the Kilauea area and we have had our engineers check this reservoir.<sup>64</sup>

On September 21, 1982, as part of KAWMS a computer analysis of a Ka Loko Reservoir breach was run.<sup>65</sup> The calculated result of such a breach indicated that the “flow in the valley immediately downstream from the dam is supercritical.”<sup>66</sup> The maximum depth of the water at peak discharge was calculated to be in excess of 34 feet.<sup>67</sup>

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<sup>59</sup> (NRCS0060).

<sup>60</sup> (DLNR 2035, NRCS 0050).

<sup>61</sup> (DLNR 1825).

<sup>62</sup> *Id.* at 7.

<sup>63</sup> (DLNR 2057).

<sup>64</sup> *Id.* at 1.

<sup>65</sup> (DLNR 2089).

<sup>66</sup> (DLNR 2090).

<sup>67</sup> (DLNR 2091).

In November 1982, field notes regarding hydrologic design data for Ka Loko reflect the following --

Assumptions:

1. Assume ditch acts as a diversion and runoff from watershed above ditch gets into Ka Loko reservoir.
2. A Class – B structure was assumed since there is no threat of loss of life and a major highway may be damaged.
3. Vegetated emergency spillway.<sup>68</sup>

The field notes, in the drawings, indicate “High seepage” at the base of the dam at at least two points.<sup>69</sup> The drawings also indicate that the emergency spillway is only a few feet lower than the dam height: the dam height at three different stations along the dam is recorded to be 749.8, 750.7, and 749.6 feet above sea level; the spillway is noted to be 747 feet above sea level.<sup>70</sup> These field notes also suggest repairs to the principal spillway, and certain other repairs to the dam, for an estimated total of \$1,886,598.<sup>71</sup> The spillway (presumably the emergency spillway) is described as “earth sides, concrete bottom.”<sup>72</sup>

In January of 1983, seven different Agricultural Water System Proposals were presented by the U.S.D.A. in a public meeting at the Kilauea Neighborhood Center. Two proposals involved Ka Loko, and both proposed:

Kaloko Reservoir will be repaired and dredged to store its original capacity – 410 MG [Million Gallons]. Irrigation and flood control structures will be installed. A filtering plant below the reservoir will provide water that is suitable for drip irrigation.<sup>73</sup>

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<sup>68</sup> (DLNR 1898).

<sup>69</sup> (DLNR 2036).

<sup>70</sup> (DLNR 2035, 2036, 2037) (a fourth station is noted to be only 748.5 feet above sea level).

<sup>71</sup> (DLNR 1921) It is worth note that only about \$650,000 of that amount appears to be for repair work to the dam; the balance appears to be for improvements to irrigation and flood control structures, and for dredging the dam to its original capacity.

<sup>72</sup> (DLNR 1925).

<sup>73</sup> *Id.* at 10, 11. (DLNR 2067).

The capital cost for this ranged from \$1,852,000 to \$1,932,000, with annual costs of approximately \$150,000.<sup>74</sup>

In June of 1984, the KAWMS Report was issued. It is a massive report, 200 pages long. Its purpose is well summarized in the first paragraph of the report:

The lack of an adequate supply of agricultural water in the Kilauea area of Kauai prevents farmers from achieving their full income potentials and limits opportunities to make more productive use of land already committed to agriculture. In a state where over 60 percent of the fresh vegetable and melons and over 75 percent of the fresh fruits consumed locally are imported from the U.S. mainland, continued production and expansion in agricultural areas such as Kilauea are especially important. Yet, over two billion gallons of water flows unused from Kilauea's reservoirs to the ocean each year. Conserving the water would help alleviate the agricultural water problems in the Kilauea area.<sup>75</sup>

The Report goes on to note that the “major problems in the study area all center around the lack of an adequate agricultural water system.”<sup>76</sup> The Report shows graphically that in 1970, the water system delivered 4,195 million gallons a year to agricultural consumption, and only 75 million gallons flowed into the ocean. Yet a little over a decade later, in 1982, only 95 million gallons went into agricultural consumption and 2,345 million gallons flowed into the ocean. This is a profound degradation of the water system, in a relatively short time. The Report proposes ten alternative plans, “formulated to address the problems, opportunities, and concerns in the study area.”<sup>77</sup>

Appendix A to that report discusses the location, climate, and topography of the study area. With regard to rainfall, it reports:

Rainfall in the study area varies from an average of 60 inches annually along the coastline to over 100 inches annually near the mountains. Most of the rainfall

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<sup>74</sup> *Id.*

<sup>75</sup> KAWMS Report at 1 (digital copy included in Exhibits).

<sup>76</sup> *Id.* at 4.

<sup>77</sup> *Id.*



occurs from October through May. An average of over 8 inches of rain falls during March, the wettest month of the year.<sup>78</sup>

Appendix D to that report addresses water resources. Its primary purpose was “to provide an inventory of the existing water resources in the study area.”<sup>79</sup> The present condition of four of the six reservoirs is described as “good,” Pu‘u Ka Ele is described as “poor,” and Ka Loko is described as “fair.” The Appendix goes on to report regarding Ka Loko Reservoir:

Field surveys conducted by SCS engineers indicate that the structural stability of the Ka Loko Reservoir is questionable because of the seepage observed at the toe of the embankment and the dense growth of hao, guava, and palm trees on the downstream face of the embankment. Sedimentation has decreased the storage capacity of the reservoir from 408.9 MG [Million Gallons] to an estimated 390 MG. The control valve at the inlet is in working order and the emergency spillway, and uncontrolled concrete section, is in good condition.<sup>80</sup>

Ownership of Ka Loko Reservoir is listed as C. Brewer and Lucas Estate, and ownership of the contributing watershed is listed as the State of Hawai‘i.<sup>81</sup> See Figs. 10 and 11 (aerial photo 1968).

In January, 1985, the State of Hawai‘i determined that while it fully supported the project in principle, it would not commit State funds for the project, principally because the main service areas did not include State lands, and because all of the reservoirs and all but one of the contributing watershed areas were in private ownership.<sup>82</sup> On February 10, 1987, the Board of Land and Natural Resources notified KICI that it had “decided to forego further sponsorship of the Kilauea Agricultural Water Managements study.”<sup>83</sup>

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<sup>78</sup> KAWMS Report, Appendix A at 1.

<sup>79</sup> KAWMS Report, Appendix D at 1.

<sup>80</sup> KAWMS Report, Appendix D at D-7.

<sup>81</sup> *Id.* at D-9.

<sup>82</sup> Letter of Susumu Ono, Chairperson, Board of Land and Natural Resources to East Kaua‘i Soil and Water Conservations District, dated January 23, 1985 (DLNR 1085); see also Letter of Manabu Tagomori to Joseph Vierra, Chairman, East Kaua‘i Soil and Water Conservation District, dated May 6, 1985.

<sup>83</sup> Ltr. From Mike Shimabukuro, Acting Land Management Administrator, to Gordon C. Wentworth, Vice

## **2.5 Water Rights and Kilauea Irrigation Co., Inc.**

As mentioned previously, the 1959 General Lease (Water License) from the State of Hawai‘i to Hawaiiiana Investment Company, a C. Brewer subsidiary, expired by its terms in 1979, but was held over for one year until December 31, 1980.<sup>84</sup>

At that time, DLNR noted that the Kilauea Agricultural Water Management Study (“KAWMS”) had not been completed, and offered an annual revocable permit until the study was completed.<sup>85</sup> Accordingly, Revocable Permit No. S-5821 was granted to Hawaiiiana Investment Company, Inc., for the year 1981, and it continued in effect until 1985.<sup>86</sup>

Kilauea Irrigation Co., Inc. (“KICI”), another subsidiary of C. Brewer, was incorporated on or about May 6, 1981. In December, 1982, Wilson Okamoto & Associates prepared a Management Plan for Operations and Maintenance of Kilauea Irrigation Company. That plan notes that the regular maintenance requirements necessary for the day-to-day operation of the Ka Loko Reservoir Irrigation System include the following:

- Inspect reservoir dike for erosion seepage and other visible signs of structural defects
- Maintain reservoir intake, spillway, and outlet free of vegetation and sediment accumulation
- Periodically inspect and maintain reservoir outlet control valves
- Maintain optimal water levels in reservoir
- Monitor water quality of impounded water<sup>87</sup>

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President, Kilauea Irrigation Co., Inc. dated Feb. 10, 1987 (DLNR 205).

<sup>84</sup> DLNR Agenda Item F-16, dated May 23, 1980, approving hold over of General Lease No. L-3577 (DLNR 499).

<sup>85</sup> Letter from James J. Detor to Harold P. Luscomb, Hawaiiiana Investment Co., Inc. dated December 8, 1980 (DLNR 644).

<sup>86</sup> Letter of Alfred P. Souza, Hawaiiiana Investment Co., Inc., to DLNR, dated December 19, 1980, and enclosing executed approval of offer to issue revocable permit (DLNR 641).

<sup>87</sup> Wilson Okamoto and Associates, “Management Plan for Operations and Maintenance, Kilauea Irrigation Company (Pre Final) (December 1982) at II-3, II-4 (DLNR 343, 366).

At about this time, a series of dam failures on the mainland brought national attention to the issue of dam regulation. DLNR summarizes this as follows:

The National Dam Inspection Act, Public Law 92-367 authorized the Army Corps of Engineers to inventory and inspect dams in the U.S. This act was Congress's response to a string of dam failures in the country.

Here in Hawai'i the Army Corps of Engineers compiled an inventory of dams identifying a one-page description of critical features.

Between 1979-1981, after several more dam failures, additional funding for this Act was provided and the Army Corps of Engineers did more detailed investigations of the dam structures that were classified as having a high downstream hazard potential. Various local consulting firms assisted in this inspection effort and approximately 60 dams were inspected.<sup>88</sup>

Ka Loko Dam was not considered a high-hazard dam and was not inspected.

Over the years, Hawaiiana Investment Co., Inc., and KICI made significant investment in the Ka Loko system. By December of 1983, they had invested over \$400,000 in the system, in contemplation of continued use of the water, including \$250,000 for irrigation system pipelines and pumps, \$34,000 to restore damage to Ka Loko ditch, and \$67,000 for engineering studies on alternative system designs, ditch and reservoir restoration, and water management policies.<sup>89</sup> They also attempted on numerous occasions to convert the revocable permit from the State to a more permanent long term license.<sup>90</sup> Although the sale of this long term license was approved in 1988, it was apparently never consummated, and the revocable permit remained in effect.<sup>91</sup>

The relationship between KICI and its customers was not always smooth. In March of 1983, Allan Rietow wrote DLNR saying:

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<sup>88</sup> DLNR New Release (March 21, 2006) (DLNR 4031). These laws are discussed in more detail in Appendix D hereto.

<sup>89</sup> Letter of Gordon Wentworth to Susumu Ono, Chair, DLNR of December 19, 1983 (DLNR 1184).

<sup>90</sup> See, e.g., letter of Gordon Wentworth to Susumu Ono, Chair, DLNR of November 1, 1985 (DLNR 233).

<sup>91</sup> See, e.g., DLNR Memorandum of November 27, 1989, requesting status of pending public auction (DLNR 51).

In 1982 Kaloko ditch suffered major damage and no longer supplies water for the recharge of Kaloko Reservoir, a major agricultural water storage reservoir in the Kilauea area. Due to the magnitude of the problem, we, as users of this water system, are unable to repair it ourselves and would like to request your assistance for the repairing of the damage as soon as possible.

Currently, Prawns of Hawai‘i, Kauai Papaya and Meadow Gold Dairy are using this water. Other agricultural developments are expected to need water soon.<sup>92</sup>

On April 8, 1983, DLNR received information that Mr. Rietow had “commenced action to repair and clear out the Kaloko Ditch” and that “heavy equipment was employed (bulldozer) to cut a road to the ditch intake and along the ditch without proper approval.” A series of three quick telephone calls from Rietow and James Pflueger followed, in which they confirmed that a contractor had been hired “to accomplish the ditch repair and cleaning in an effort to restore the water supply to the Kaloko Reservoir.” Apparently there was no written permission to enter State lands for this purpose, but “Mr. Pflueger stated that he had met with Chairman Ono earlier the same week, discussed the need to proceed with the ditch work and had received verbal approval from Mr. Ono to go ahead.”<sup>93</sup> In view of the chairman’s verbal approval, no action was taken.<sup>94</sup>

Similarly, in June of 1983, Mr. Pflueger wrote Mr. Ono indicating there had been another water break and asking permission to go back on State land to repair the break. He was granted approval for no longer than three days.<sup>95</sup>

On September 7, 1984, KICI filed its application with the PUC to provide non-potable irrigation water service to certain areas in Kilauea, Kaua‘i.<sup>96</sup> At that time, KICI was owned by Hawaiiana Investment Co, Inc., a wholly owned subsidiary of C. Brewer

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<sup>92</sup> Letter of Allan Rietow, Kauai Papaya, to Robert Chuck, DLNR of March 16, 1983 (DLNR 1197); DLNR Memorandum of March 21, 1983 (DLNR 1206).

<sup>93</sup> DLNR Memorandum of April 8, 1983 (DLNR1191).

<sup>94</sup> *Id.*

<sup>95</sup> Letter from James Pflueger for Kauai Papaya to Sus Ono, DLNR, of June 16, 1983, and handwritten note thereon (DLNR 1190).

<sup>96</sup> Application, Docket No. 5165 (PUC 118).

and Company, Ltd.<sup>97</sup> After hearing, the PUC granted the application on January 15, 1985.<sup>98</sup>

On August 20, 1985, KICI filed an application seeking approval to acquire easements associated with the establishment and maintenance of irrigation lines from Ka Loko Reservoir through eminent domain.<sup>99</sup> It was then a wholly owned subsidiary of C. Brewer Properties, Inc. (formerly Hawaiiiana Investment Co., Inc.).<sup>100</sup> Paul Cassiday and James Pflueger, as trustees for the Estate of Mary N. Lucas, were granted permission to intervene.<sup>101</sup> The goal of the application was to acquire an easement from the Lucas Estate to place an underground pipeline, at a cost in excess of \$250,000, to carry irrigation water along the prior ditch route to land makai of Ka Loko Reservoir. The parties reached agreement on the easement, and the proceeding was dismissed.<sup>102</sup>

In 1985, C. Brewer Properties, Inc., requested permission to assign the Ka Loko Ditch Revocable Permit No. S-5821 to KICI.<sup>103</sup> At its meeting of September 13, 1985, the Board of Land and Natural Resources authorized cancellation of Revocable Permit No. S-5812 to Hawaiiiana Investment Co., Inc., and reissuance of a new revocable permit to Kilauea Irrigation Company Inc.<sup>104</sup>

In 1985, KICI was issued the new revocable permit to use government waters flowing into the reservoir. KICI was granted the

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<sup>97</sup> Application at 1 (PUC 118).

<sup>98</sup> Decision and Order, Docket 8221 (PUC 70).

<sup>99</sup> Application, Docket No. 5368 (PUC 199).

<sup>100</sup> *Id.* at 3 (PUC 200).

<sup>101</sup> Order, Docket No. 5368 (PUC 183).

<sup>102</sup> Decision and Order, Docket No. 5369 (PUC 173).

<sup>103</sup> Letter of Gordon C. Wentworth to Susumu Ono, Chairman DLNR, dated August 5, 1985 (DLNR 254). See also Letter of Gordon C. Wentworth to Susumu Ono, Chairman DLNR, dated December 14, 1984 (DLNR 1087) summarizing engineering work performed by Kilauea Irrigation Co., Inc. “in furtherance of establishing a viable irrigation system based upon the State water source.”

<sup>104</sup> Letter of James J. Detor, Land Management Administrator to C. Brewer Properties, Inc. of Sept. 24, 1985 (DLNR 1084).

“right, privilege and authority to develop and utilize government waters from government land at Papaa within the Moloaa Forest Reserve, together with the right to construct, operate, repair, and maintain a water transportation system within the Ka Loko Ditch Right of Way and Puu Ka Ele Stream.”<sup>105</sup>

Initially, KICI paid a monthly rental of \$22 to the State for the right, later raised to \$27 a month.<sup>106</sup> This revocable permit and monthly rental rate continued on a month to month basis through 2006.<sup>107</sup>

Throughout this time, and into 1990s, it appears the DLNR Division of Land Management conducted annual field inspections of the Moloa‘a forest reserve area for purposes of monitoring the revocable permit. These reports generally note only that the property was “used as per conditions of lease.” There is no indication the dam or reservoir were inspected.<sup>108</sup>

KICI was required as part of its permit to have comprehensive public liability insurance coverage for the land covered by the permit, naming the State of Hawai‘i as a co-insured and in a minimum amount of \$300,000 for personal injury and \$100,000 for property damage.<sup>109</sup> Certificates of Insurance were filed through January 2005.

On January 16, 1985, KICI (at that time, a subsidiary of C. Brewer and Co., Ltd.) was issued a Certificate of Public Convenience and Necessity by the Hawai‘i Public Utilities Commission, pursuant to HRS 269-1.<sup>110</sup> The certificate authorized the applicant

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<sup>105</sup> Item F-1-b, Approved by the Board of Land and Natural Resources at its Meeting Held on September 13, 1985 (DLNR 293); Revocable Permit No. S-6240 (DLNR 299).

<sup>106</sup> *Id.*

<sup>107</sup> See, e.g., DLNR Letter of Nov. 30, 2005, approving continuing permit through December 31, 2006. (DLNR 7).

<sup>108</sup> See, e.g., DLNR Division of Land Management Field Inspection Report (January 22, 1993) (DLNR 32); DLNR Division of Land Management Annual Inspection Report for 1994 (field inspection date August 4, 1994) (DLNR 26); DLNR Division of Land Management Annual Inspection Report for 1995 (date of inspection March 8, 1995) (DLNR 23); DLNR Division of Land Management Annual Inspection Report for 1997 (date of inspection February 18, 1997) (DLNR 21).

<sup>109</sup> Permit at paragraph 14 (DLNR 301); see also Letter from Sam Lee, Land Agent, to Gordon Wentworth, Kilauea Irrigation Co, Inc., of December 20, 1985.

<sup>110</sup> Decision and Order in PUC Docket Nos. 5165 and 5166; Application 5165 (DLNR 1110); Application

to operate as a public utility to provide non-potable irrigation water to farming interests in the Kilauea area, between Moloa‘a and Kalihiwai, at rates approved by the Commission.

The DLNR remarked:

Through its subsidiaries, C. Brewer & Co., Ltd. has for many years operated and maintained the Ka Loko Ditch system for the irrigation of lands earlier cultivated in sugar cane to the present farming of diversified crops such as : papayas, guavas, and prawn aquaculture. This has been accomplished by a long-term water license, and revocable permits authorized by the Land Board in the past.

The operation, then and now, involves the transmission of water via the Ka Loko Ditch system, from State-owned sources with the Moloaa Forest reserve to Ka Loko Reservoir; thence to farm lands located makai of the reservoir.<sup>111</sup>

## **2.6 The Water Rights Agreement**

On February 11, 1987, KICI and Lucas Trust entered into a Water Rights Agreement, in which they agreed to sharing of the waters from the Ka Loko system with KICI being the responsible operator of the system.<sup>112</sup> KICI is the “Operator” of the system, and is responsible for the “uniform operation and continuing maintenance of the Ka Loko System.”<sup>113</sup> Maintenance includes “the maintenance of intake structures, ditches, pipelines, access roads and the reservoir and dam.”<sup>114</sup> The costs of Major Repairs (those exceeding \$7,500) are shared.<sup>115</sup> Also, the costs of dam liabilities are shared, “in the event of a rupture of the Ka Loko Reservoir dam, provided that such rupture does not

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5166 (DLNR 1140).

<sup>111</sup> DLNR Resubmittal: Sale of Lease (Water License) at Public Auction (October 14, 1988) at 2 (DLNR 59).

<sup>112</sup> Water Rights Agreement By And Between Kilauea Irrigation Co., Inc. And The Trustees Under The Will And The Estate Of Mary N. Lucas, Deceased, recorded with the Bureau of Conveyances on February 18, 1987 at Book 20375 at Page 700. (DLNR 134)

<sup>113</sup> *Id.* at 4-6.

<sup>114</sup> *Id.* at 6.

<sup>115</sup> *Id.* at 17-18.

proximately result from the breach by the Operator of any of its obligations hereunder.”<sup>116</sup> That agreement expressly notes the existence of the dam spillway: it defines a period of “Surplus” as one when “the reservoir is full and water is overflowing the spillway.”<sup>117</sup> It also notes that the parties recognize that the “capacity of the reservoir could be increased by either dredging the reservoir or by raising the level of the embankment and spillway.”<sup>118</sup>

On that same day, the Lucas Trust granted necessary easements to KICI for the operation, maintenance, and repair of the system on Lucas Trust lands.<sup>119</sup>

## **2.7 Transactions in 1987, including the sale of Ka Loko Reservoir to James Pflueger in 1987**

In a memorandum dated December 11, 1987, from KICI to DLNR, KICI notes the “embankment of the reservoir also has a seepage” and “when the reservoir is full and overflowing, water which was measured at the flume on the ditch passes over the spillway.”<sup>120</sup> Also in 1987, KICI completed a \$500,000 18-inch pipeline and filter system to connect the Ka Loko Reservoir to the Kilauea Farms Subdivision’s system.<sup>121</sup>

On December 17, 1987, C. Brewer Properties, Inc., quitclaimed its water rights “in and to the Ka Loko Waters” to KICI, but not the right to “disturb the surface of the Land or any improvements thereon or any right to the recreational or other use of the surface of the impounded waters with Ka Loko Reservoir.”<sup>122</sup>

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<sup>116</sup> *Id.* at 15.

<sup>117</sup> *Id.* at 10.

<sup>118</sup> *Id.* at 25.

<sup>119</sup> Grant of Easement, recorded with the Bureau of Conveyances at book 20375 on page 748 on February 18, 1987. (DLNR 182)

<sup>120</sup> Memo from KICI to DLNR Staff (12/11/1987) (DLNR 93).

<sup>121</sup> Letter from KICI to William Paty, Chair, BLNR (Dec. 11, 1987) (DLNR 97).

<sup>122</sup> Quitclaim of Water Rights, recorded with the Bureau of Conveyances at book 21461 on page 761 on December 24, 1987 (LE 0049).



On December 18, 1987, C. Brewer Properties, Inc., sold the Ka Loko Reservoir and surrounding land to James Pflueger, expressly subject to the Water Rights Agreement.<sup>123</sup>

On June 22, 1989, KICI sought the PUC's consent to institute another eminent domain proceeding, to acquire an easement to access its irrigation system located in the Kilauea Agricultural subdivision. The access was for the purpose of maintaining the irrigation system.<sup>124</sup> Allan S. Rietow, Catherine Richards-Rietow, and Leila Walker Rietow intervened. The matter went to hearing on March 27, 1990, and the PUC issued a 21 page Decision and Order on November 30, 1990.<sup>125</sup> The Decision and Order provides a useful summary of the history of the irrigation system in the 1970s and 1980s:

The applicant is a wholly owned subsidiary of C. Brewer Properties, Inc. (formerly known as Hawaiiiana Investment Co.). C. Brewer Properties, Inc., is in turn a wholly owned subsidiary of C. Brewer and Company, Limited. C. Brewer and Company, Limited, is a party to an agreement with the State of Hawaii, dated March 16, 1977. The principal purpose of that agreement is the preservation of certain lands owned by C. Brewer and Company, Limited, in Kilauea, Kauai, for agricultural purposes. Among other things, the agreement authorizes C. Brewer and Company, Limited, to create agricultural subdivisions in certain specifically designated parcels and requires it to install and maintain a water transmission system for irrigation purposes. The agreement provides that the purchaser of each lot in the agricultural subdivisions will have access to the water transmission system, the purchaser being responsible for the construction of any facility from the transmission system to his own property.

Pursuant to the agreement with the State, C. Brewer Properties, Inc., developed the Kilauea Agricultural Subdivisions. File plan 1646 for the subdivision was filed with the bureau of conveyances of the State of Hawaii on December 23, 1979. . . . Also, as contemplated by the agreement, the applicant, as the subsidiary company, has completed a water transmission system, which services the

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<sup>123</sup> Facsimile of April 3, 2001, from Willie Tallett, C. Brewer, to Jimmy Pflueger, transmitting "confirmation of your purchase of the Kaloko Reservoir" (a copy of the recorded Deed of December 18, 1987) (LE 0058). Subsequently other legal entities apparently owned or controlled by Mr. Pflueger may have become involved in the ownership or control of the property, such as Pflueger Properties, a limited partnership, and Pflueger Management, LLC, a limited liability company. *See, e.g.,* Complaint, *James H. Pflueger, et al., v. State of Hawai'i, et al.*, Civ. No. 06-1-1391-08 GWBC (First Circuit).

<sup>124</sup> Application, Docket No. 6466 (PUC 353).

<sup>125</sup> Decision and Order, Docket No. 6466 (PUC 239).

agricultural subdivisions developed by C. Brewer Properties, Inc. including the Kilauea Agricultural Subdivision. . . .

The applicant and the estate of Mary N. Lucas, deceased, (and their respective predecessors in interest) have historically shared the beneficial use of the waters arising in the Ka Loko basin. The Ka Loko waters rise from the Puu Ka Ele stream on State land and has been taken for many years pursuant to a permit, lease or license. The applicant currently holds the license. A 3.5 mile ditch system and a reservoir (Ka Loko Reservoir) were constructed and used to irrigate both the applicant's and the Lucas' lands makai of the reservoir. The ditch system links the Puu Ka Ele stream to the reservoir. In light of the historical, joint beneficial use of the Ka Loko waters, the applicant needed to enter into a water rights agreement with the trustees of the Lucas estate in the construction of the irrigation system which services the agricultural subdivisions developed by C. Brewer Properties, Inc. The applicant and the trustees entered into such an agreement which was recorded on February 18, 1987. The water rights agreement provides for the sharing of the water from the water distribution system put in place by the applicant between the Lucas estate and the applicant.

The water transmission system constructed by the applicant consists of component valves, a filter station, a chlorinator and an 18-inch pipeline from the Ka Loko Reservoir down to and throughout the agricultural subdivisions.<sup>126</sup>

Mr. Rietow prevailed in this proceeding, and the PUC denied KICI's request.

## **2.8 Regulation and Inspection of Dams at That Time**

From 1978 through 1981, the U.S. Army Corps of Engineers ("ACE" or "Corps") conducted inspections of all high-hazard dams throughout the State of Hawai'i, in accordance with the National Dam Inspection Act of 1972.<sup>127</sup> Ka Loko Dam was not inspected at that time as it was not considered a high-hazard dam.<sup>128</sup>

In June of 1987, DLNR became the lead agency for State regulation and inspection of dams here in Hawai'i. The DLNR has explained:

In June of 1987, the Hawai'i Dam Safety Act was passed and HRS 179D was adopted, identifying DLNR as the lead agency. Two years later in 1989 Administrative Rules chapter 190 was drafted.

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<sup>126</sup> Decision and Order, Docket No. 6466 at 3-4 (PUC 242-43).

<sup>127</sup> See further discussion of this Act in Appendix D hereto.

<sup>128</sup> ACE e-mail May 18, 2006 (ACE 28).

The Administrative Rules authorized the Board of Land and Natural Resources to inspect and require reports, require written approval for new dam construction and alterations (permits), require emergency action plans for high hazard dams, be authorized to enter private property, require maintenance and repairs as required.<sup>129</sup>

In June 1991, DLNR issued its “Guidelines for the Design and Construction of Small Embankment Dams,” a 104 page document with some 30 pages of appendices.<sup>130</sup> In December 1992, DLNR issued its “Guidelines for Safety Inspection of Dams,” a 63 page document describing the inspection procedures.<sup>131</sup>

DLNR has summarized its procedures for the regulation of dams in this time period as follows:

From 1993 to 1998, DLNR utilized several contracts with various consulting firms to provide additional inspections of the high hazard reservoirs.

In 1999 DLNR lost the operational budget to contract out dam inspections and therefore initiated in-house inspections. A schedule was set up based partially on the National Dam Safety Model Dam Safety Program recommendations and the resources available within the program.

Since that time the program has suffered additional state funding reductions and had to rely on Federal Grants to sustain the expenditures within the program. The inventory was last updated in 2002 with minor updates beyond that.

The Engineering Division of the Department of Land and Natural Resources (DLNR) administers the Hawai‘i Dam Safety Program. Referred to as the Hawai‘i Dam Safety Act of 1987, it was part of a National Dam Safety movement that began as a result of several large dam failures in the mainland US during the mid-1900s.

Hawai‘i’s program budget is approximately \$164,000 (all but \$2,000 is for salary). In the late-1990s, three positions (Program Engineer, one draftsman, one Senior Engineer) were established to deal with Dam Safety and Flood Control.

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<sup>129</sup> DLNR New Release (March 21, 2006) (DLNR 4031).

<sup>130</sup> DLNR Report R88 (DLNR 1493).

<sup>131</sup> DLNR Report R92 (DLNR 1425).

The staff activities are evenly divided between these two programs: Dam Safety and Flood Control; meaning, the Dam Safety Program has the equivalent of approximately 1.5 FTE.<sup>132</sup>

By way of comparison, according to the Association of Dam Safety Officials (“ASDSO”) Model State Dam Safety Program, there should be 7.9 technical FTEs and 2.4 clerical/administrative FTEs per 200 dams.<sup>133</sup> The ASDSO Statistical Analysis indicates that the recommended number of FTEs for Hawai‘i, per its Model Program, would be 6.5.<sup>134</sup>

In September 1992, the Army Corps of Engineers conducted an assessment of Earthen Dams on Kaua‘i after Hurricane Iniki.<sup>135</sup> No on-site inspection of Ka Loko was conducted, however, because an initial aerial inspection indicated no fallen trees and good general appearance.<sup>136</sup> See Figs. 12 and 13 (aerial photo 1990) and Figs. 14 and 15 (aerial photo 1992, after Iniki).

In 1996, the Corps and DLNR entered into a Memorandum of Understanding regarding “a mutual framework governing the respective responsibilities of the parties for the provision of goods and service” by the Honolulu Engineer District to DLNR.<sup>137</sup>

In general, there are multiple permits required to modify an existing dam, from a variety of state and federal agencies:

Most of the dams in Hawai‘i were constructed prior to any dam safety regulations being promulgated.

A Dam permit is only required if owners alter, enlarge, remove, construct or improve the dam structure or appurtenant features.

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<sup>132</sup> DLNR News Release (March 21, 2006) (DLNR 4031).

<sup>133</sup> ASDSO, Model State Dam Safety Program, FEMA 316 (March 1998), Appendix I.

<sup>134</sup> ASDSO Statistical Analysis (October 2006) (ASDSO 002).

<sup>135</sup> (DLNR 1864).

<sup>136</sup> (DLNR 1887).

<sup>137</sup> It appears the Corps efforts to assist the State subsequent to the Ka Loko Dam breach may have been pursuant to this understanding; note, however, this was with DLNR Division of Boating and Ocean Recreation. (ACE 1081.)

Typically, when someone alters a dam they get a County Building Permit, a Dam Construction/ Alteration Permit, National Pollutant Discharge Elimination System (NPDES) Permitting Program (NPDES) Permit and possibly a Commission on Water Resource Management (CWRM) Stream Channel Alteration Permit. Permitting for dams requires County, State and Federal permits.

Only dams of a certain size (height and volume) criteria are regulated under the Hawai‘i program. Generally, regulated dams have a dam height over 25 feet and impound more than 5 million gallons of water (Some exceptions apply).

Dam owners must operate and maintain their dams in a safe manner to ensure its continued service and integrity as well as reducing the risk to public safety and the environment.<sup>138</sup>

See Figs. 16 and 17 (aerial photo 1995).

## **2.9 Grading at Ka Loko Reservoir in 1997 and the County of Kaua‘i Notice of Violation**

On November 7, 1997, apparently in response to an anonymous complaint, the County of Kaua‘i Department of Public Works performed an investigation that documented the grading of the hilltop adjacent to Ka Loko Reservoir and presence of heavy equipment there.<sup>139</sup> A further citizen’s complaint was received on November 16.<sup>140</sup> On November 18, 1997, the Department of Public Works for the County of Kaua‘i sent a Notice of Grading Violation regarding Ka Loko Reservoir, by a certified letter to Mr. Pflueger, stating that they had “observed and verified the grading on the subject property to be in violation” of the County’s ordinances.<sup>141</sup> The letter demanded that Mr. Pflueger “stop work immediately with the exception of work to correct any hazards to public safety and health.”<sup>142</sup>

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<sup>138</sup> DLNR News Release (March 21, 2006) (DLNR 4031); see also, DLNR Email of 3/15/2006 (DLNR 1366).

<sup>139</sup> County of Kaua‘i Department of Public Works, Investigators Report No. 97-001 (K 1567); Investigation Report of W. Kudo of November 7, 1997 (K 1570).

<sup>140</sup> *Id.*

<sup>141</sup> Letter from County Engineer to James Pflueger of November 18, 1997 (K 1579).

<sup>142</sup> *Id.*

On November 26, 1997, John Buist, Jr., a civil engineer with the county, was “summoned by Mayor Kusaka” to her office for a meeting.<sup>143</sup> The subject of the conversation was the grading violation for Mr. Pflueger. Mr. Buist informed the Mayor that the investigation was prompted by an anonymous phone call, but that the inspector saw and took a picture of “the equipment being used for the work and the cut mountain top.”<sup>144</sup> Mr. Buist wrote:

I was questioned as to why we responded to an anonymous phone call and responded that it was our procedure to respond with an investigation. She questioned as to the other wasted manhours to follow up on anonymous tips and that no other County Agency responded to anonymous tips.<sup>145</sup>

Mayor Kusaka asked whether Mr. Pflueger had applied for a grading permit, and was told that a permit application had been filed, but without any grubbing plans. The Mayor and the Assistant Administrator, Wallace Rezentes, Sr., questioned why Mr. Pflueger should be required to obtain a permit for work in such a remote area. Mr. Buist explained that the ordinance applied no matter how remote the site may be, and noted that this was not the first violation for which Mr. Pflueger had been cited. He ends by writing:

In closing, Mr. Portugal instructed me that I was to stop all actions involving Mr. Pflueger and all further communications from or to Mr. Pflueger are to go directly to Mr. Portugal.<sup>146</sup>

And indeed, all “actions involving Mr. Pflueger” seemed to come to an abrupt stop.

There is no record that any further action was taken to enforce this Notice of Grading Violation until 2002.

On November 24, 1997, Tom Hitch went with two helpers to Ka Loko to attempt to clear the reservoir valve pit.<sup>147</sup> Mr. Pflueger had indicated to Mr. Hitch that he thought

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<sup>143</sup> County of Kaua‘i, File Memorandum from John Buist of November 26, 1997 (K1577).

<sup>144</sup> *Id.*

<sup>145</sup> *Id.*

<sup>146</sup> *Id.*

the reservoir valve pit – which was rather deep – was unsightly and a safety hazard, and that he wanted to fill in the pit. Mr. Hitch needed to clear the pit before this work could be done. At this time, although grading of the north rim of Ka Loko Reservoir had begun, Mr. Hitch recalls that both the valve pit and the emergency spillway had not yet been affected.

Shortly after Mr. Hitch cleared the pit, the valve pit was filled with earth and, at or about that same time, earth was moved into the emergency spillway, too. A number of members of the community were aware the emergency spillway had been covered. In about May of 1998, Michael Dyer of Kilauea Management Company was shown the earthwork by Mr. Pflueger and told it was to create building sites. Mr. Dyer recognized that the emergency spillway had been covered. He sent a facsimile to Mr. Pflueger on May 22, 1998, saying “I have a question about the spillway out of Kaloko into Morita Reservoir. Please call me.”<sup>148</sup> Several days later, on June 4, 1998, he wrote again:

It looks to me as if the Kaloko spillway is covered with 8 to 10 feet of new fill. The reservoir is about 1 to 2 feet above the old fill level. It would probably take at least several months for Kaloko to fill to the new level. Then I think water will flow over a broad area in the middle of your earth dam . . . just an eye ball guess.

I suggest you consider digging back down to the old concrete spillway, setting a small culvert on the spillway and then backfilling it to your current level. You would probably also need to cut a new overflow ditch to the valley below your dam. Your building sites are beautiful. Thanks for letting [my wife] and me hike up there.<sup>149</sup>

Mr. Pflueger never responded to Mr. Dyer.

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<sup>147</sup> Letter from Tom Hitch to C. Brewer of December 18, 1997 (TH 001).

<sup>148</sup> Facsimile from Mike Dyer to Jimmy Pflueger of May 22, 1998 (MD 001).

<sup>149</sup> Facsimile from Mike Dyer to Jimmy Pflueger of June 4, 1998 (MD 002).

## **2.10 DLNR Tries Twice to Inspect Ka Loko in 1999 and 2000**

On November 29, 1999, DLNR sent a letter to James Pflueger, as trustee of the Lucas Trust, requesting assistance in accomplishing a visual dam safety inspection of reservoirs<sup>150</sup>. The dam or reservoirs listed on the attached information sheet were Waiakalua Reservoir, Pu‘u Ka Ele Reservoir, Morita Reservoir, and Ko Loko Reservoir. A response was requested by December 15, 1999.<sup>151</sup>

On August 30, 2000, the letter was resent to the Mary N. Lucas estate, with a Letter of Transmittal noting a prior discussion and stating, “As discussed . . . , I would like to schedule dam safety inspection for Puu Ka Ele Reservoir and Koloko Reservoir, both on Kauai. Please get back to me on when we can schedule this, and also if a formal Right-of-Entry Permit is required.”<sup>152</sup> There is no record of any response to this second request, and no inspection was conducted.

## **2.11 Problems with the Ka Loko Water System**

In the summer of 1997, KICI “decided to discontinue water service” to Allan Rietow’s lot, because of his “insistence that Tom Hitch, our only agent on Kauai be restricted from entering your property to read the meter.”<sup>153</sup> Mr. Rietow complained to the PUC about this, and about low water pressure.<sup>154</sup> Robert J. McGraw for KICI responded to the PUC regarding the complaint about low water pressure by writing,

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<sup>150</sup> Letter of Andrew Monden, DLNR, to James Pflueger dated Nov. 29, 1999 (DLNR 1405).

<sup>151</sup> *Id.* A print-out in DLNR files from July 20, 1999, apparently from the DLNR dam database, lists the Mary Lucas Estate, presumably as the dam owner, and the contact person as James Pflueger, for all four reservoirs (DLNR 1418); see also November 19, 1999 Dam Owner Information Sheet (DLNR 1406).

<sup>152</sup> Letter of Transmittal from Edwin Y. Matsuda, DLNR, to Sherly Apa, Mary Lucas Estate, of August 30, 2000, noting enclosure of letter of November 29, 1999, with attachments (DLNR 1419).

<sup>153</sup> Letter from Willie Tallet, C. Brewer, to Allan Rietow of August 4, 1997 (PUC 983), and letter of July 2, 1997 (PUC 9878).

<sup>154</sup> PUC Telecopier Memorandums to Willie K. Tallett, C. Brewer & Co., dated July 25, 1997 (PUC 985), and August 25, 1997 (PUC 982).



I have been able to confirm through our maintenance contractor, Tom Hitch, that our system serviced by the Ka Loko Reservoir had been turned off by Mr. Pflueger on or about July 1, and again on July 3. In both cases, apparently, the interruption was less than a day's duration. In neither situation was there any advance notice to either us or our customers.<sup>155</sup>

The water was an important resource to the farmers on Kaua'i. On March 15, 2000, Michael Dyer wrote the PUC encouraging the expansion of the Ka Loko irrigation system into adjoining areas that need water for agricultural purposes. He observes,

There has been a great deal of discussion on Kauai lately regarding the preservation and expansion of the former plantation irrigation infrastructure. There seems to be agreement that saving these systems will encourage diversified farming and decrease the irrigation usage of the County's potable water. The Ka Loko system is the largest and potentially the most productive irrigation system on the north shore. It would be sad to see this important resource underutilized or lost.<sup>156</sup>

In June of 2000 Mr. Ming Fang filed a written, informal complaint, alleging that KICI was "selling/servicing Jim Pflueger's new agricultural subdivision situated east of Kilauea Farms Subdivision/C . . . outside of the Public Utility Service district."<sup>157</sup> In essence, he complained that KICI had denied his application for water service, because he was not in the regulated service area, but was serving other customers outside the regulated service area, and he asked for similar treatment.<sup>158</sup> In response to subsequent inquiry from the PUC, C. Brewer and Company, Ltd., stated that it had 10 customers in the regulated area and 10 customers outside the regulated area, and that it was providing water to Mr. Pflueger outside the regulated service area, without charge.<sup>159</sup> Staff notes indicate they were told by C. Brewer and Company that Pflueger acquired his property from the Lucas Estate, had water service for about 6-8 months in fiscal '99, and used

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<sup>155</sup> Letter from Robert J. Mc Graw, KICI, to Nathan Kawakami, PUC, of July 16, 1997 (PUC 990).

<sup>156</sup> Letter from Michael M. Dyer, Kilauea Management Company, to PUC, of March 15, 2000 (PUC 1002).

<sup>157</sup> Letter from Ming Fang to PUC of June 3, 2000 (PUC 1039).

<sup>158</sup> PUC Memorandum of August 25, 2000 (PUC 1059).

<sup>159</sup> Letter of Willie Tallet, C. Brewer, to PUC of August 1, 2000 (PUC 1046).

approximately 21 million gallons of water without charge.<sup>160</sup> In October 2000, the PUC resolved the matter by expanding the service area and allowing Mr. Fang and others to request service, and requiring that Mr. Pflueger be billed immediately on a going-forward basis and back-billed for all water used to date, unless C. Brewer could “sufficiently explain to the Commission how the [Water Rights Agreement] allows him to receive water without charge.”<sup>161</sup>

By 2000, C. Brewer and Co., Ltd., had actively begun trying to dispose of the Ka Loko Water System.<sup>162</sup> In September 2000, PUC staff reported:

Kilauea Irrigation Company, Inc. (KICI). An investigation still continues after an informal complaint was filed with this office in June 2000. The complaint involves water service to a non-regulated service area and preferential water service to a customer without charge. As mention in last month’s report an application transferring the ownership of KICI may be submitted to us within the next three to six months.<sup>163</sup>

In April 2001, PUC staff met with Mr. Pflueger. They reported that “Mr. Pflueger is one of two trustees of the Mary N. Lucas estate, . . . as well as the owner of the Kaloko Reservoir, KICI’s storage, that he purchased in 1987, unbeknownst to the Commission.”<sup>164</sup> The memorandum goes on, “During the course of the meeting, . . . Mr. Pflueger indicated serious problems with the KICI’s pipeline infrastructure, as well as, C. Brewer’s offered to sell KICI to him for one dollar (\$1.00) – C. Brewer does not want to be in the utility business especially, a money losing one.”<sup>165</sup> The PUC asked C. Brewer to respond to Mr. Pflueger’s allegations.<sup>166</sup>

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<sup>160</sup> PUC Memorandum of August 7, 2000 (PUC 1054).

<sup>161</sup> Letter from PUC to Willie Tallett, C. Brewer, of October 2, 2000 (PUC 1066).

<sup>162</sup> Letter of Willie Tallett, C. Brewer, to PUC of July 14, 2000 (PUC 1050).

<sup>163</sup> PUC Staff Report from Kaua’i for September 2000, at 6 (PUC 857).

<sup>164</sup> PUC Memorandum of April 5, 2001 (PUC 1113).

<sup>165</sup> *Id.*

<sup>166</sup> PUC Memorandum of April 4, 2001 (PUC 1111); see also PUC Staff Report from Kaua’i for April 2001, at 8 (PUC 1186).

The April 2001 Monthly Staff Report also notes, “it was discovered during the course of the investigation that KICI sold its reservoir storage to Mr. Pflueger without the Commission’s knowledge or approval.”<sup>167</sup>

In July 2001, the controversy continued, with KICI complaining that Mr. Pflueger was interrupting water service to KICI, and Mr. Pflueger complaining that there was no water in the reservoir because KICI was not maintaining Ka Loko Ditch, which feeds the reservoir.<sup>168</sup> C. Brewer wrote the PUC that the “water system is unreliable because Jimmy Pflueger continues turning off the water.”<sup>169</sup> They also complain that Mr. Pflueger “uses water uncontrollably” and that he is “using the water for non-crop uses and is responsible for using large quantities of water to the detriment of others.”<sup>170</sup> PUC staff made a field visit to join Mr. Pflueger “to see first-hand the condition of the ditch that supplies KICI’s storage, the Kaloko Reservoir.”<sup>171</sup> The forty-five minute tour examined the ditch, the Ka Loko Reservoir, and other aspects of the water system. PUC staff notes that the Ka Loko Ditch “does not appear to be maintained, even casually.”<sup>172</sup> Staff reports that Mr. Pflueger, in parting, “stated in no uncertain terms, that although he was not on speaking terms with KICI he still wanted to acquire KICI but did not want to be regulated by the Commission.”<sup>173</sup>

On July 13, 2001, C. Brewer and Company, Ltd., wrote the PUC stating that the Board of Directors had voted to liquidate the company, and that KICI was “targeted to be

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<sup>167</sup> PUC Staff Report from Kaua‘i for April 2001, at 8 (PUC 1186).

<sup>168</sup> PUC Memorandum of July 5, 2001 (PUC 1119).

<sup>169</sup> Letter from Willie K. Tallett, C. Brewer, to PUC of July 6, 2001 (PUC 1122).

<sup>170</sup> *Id.*

<sup>171</sup> PUC Fax of July 6, 2001 (PUC 1130); PUC Staff Report from Kaua‘i for July 2001, at 7 (PUC 1248).

<sup>172</sup> *Id.*

<sup>173</sup> *Id.*

included on the list of companies to be disposed of.”<sup>174</sup> The letter goes on to state that they had been negotiating with Mr. Pflueger “to give him ‘as is’ the Kaloko water system including the responsibility for maintaining customer service and PUC requirements,” but that negotiations had recently been terminated “as a result of the complaints he made to you.”<sup>175</sup> The letter goes on to discuss the difficulty of maintaining the system, due to miles of “open ditch, heavy vegetation and rough terrain, no legal and vehicular access, and the Kaloko reservoir is owned by Mr. Pflueger.”<sup>176</sup> The letter also notes, the company “has never been profitable in its twenty years of existence.”<sup>177</sup> The letter attaches another letter from Tom Hitch, who writes, “I have been maintaining the Ka Loko pipeline for 11 years as an independent contractor working for C. Brewer.”<sup>178</sup> Mr. Hitch goes on:

I disagree with Jimmy Pflueger that the pipeline is in eminent danger of disintegrating. I find it ironic that Pflueger is so concerned with the condition of the pipeline seeing as he has denied us access to the pipeline easement through non easement Lucas Estate lands for years, in breach of his agreement with Brewer. The last time I ran into Pflueger on the pipeline easement on Lucas Estate land he threatened (without basis) to have me charged with trespassing. Because of his locking us out of non easement Lucas Estate land we are forced to rely on access to the easement through Allen Rietow’s lot, at Rietow’s prerogative. We often have to waive/forgive Rietow’s water bill in order to continue receiving access through his lot. Should Rietow deny us access we will be unable to maintain the filter station and the pipeline will shut down within two to three months. Rietow is an old business partner of Pflueger and when Pflueger is extremely upset with Brewer, coincidentally Rietow will also lock us out.

. . . . In all my years of maintenance I would say that Pflueger has turned off the pipeline as many times if not more than the pipeline has been shut down because of breaks. . . . [T]here is no doubt that Pflueger’s unauthorized shut offs are by far the greatest problem to steady service as compared to lack of maintenance. I find his concern over the lack of maintenance of the pipeline just ludicrous and since I do not believe he will buy the pipeline, I feel it masks some other agenda.<sup>179</sup>

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<sup>174</sup> Letter of Willie Tallett, C. Brewer, to Nathan Kawakami, PUC, of July 13, 2001 (PUC 1132).

<sup>175</sup> *Id.*

<sup>176</sup> *Id.*

<sup>177</sup> *Id.*

<sup>178</sup> Letter from Hitch Co. to Nathan Kawakami, PUC, of July 9, 2001 (PUC 1135).

<sup>179</sup> *Id.* (PUC 1135-35).

On August 17, 2001, C. Brewer and Company, Ltd., wrote the PUC noting that a previous prospective purchaser “did not purchase Kilauea Irrigation Co., Inc. (“KICI”), and we are continuing negotiations with the sale/transfer of KICI to Mr. James Pflueger.”<sup>180</sup>

## **2.12 DLNR Tries Again to Inspect Ka Loko in 2001**

On October 18, 2001, DLNR sent a letter to James Pflueger, as trustee of the Lucas Trust, urging him to review security measures regarding dams, and to review and update the Emergency Action Plan (“EAP”) for the dam. DLNR states, “If you do not have an EAP, we are willing to work with you to develop one.” DLNR requests a response describing the security measure to protect the dams.<sup>181</sup> There is no record of a response from Mr. Pflueger.

In October 2001, DLNR received a complaint regarding obstruction or diversion from Moloa‘a stream in the vicinity of the Ka Loko Reservoir. DLNR sent a notice of request to enter property to investigate the complaint.<sup>182</sup> The Mary N. Lucas Trust responded, through counsel, stating that no diversion on private property could affect the flow into the Ka Loko Reservoir, and that any diversion that would feed Ka Loko Reservoir “would have to originate far back in State of Hawai‘i land.”<sup>183</sup>

On December 27, 2001, DLNR sent a third letter to James Pflueger, as trustee of the Lucas Trust, again requesting assistance in accomplishing a visual dam safety

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<sup>180</sup> Letter of Willie Tallett to Nathan Kawakami, PUC, of August 17, 2001 (PUC 64, 1138).

<sup>181</sup> Letter from Sterling Young, DLNR, to James Pflueger dated October 18, 2001. Only high-hazard dams are required to have an EAP; Ka Loko Dam was not considered a high-hazard dam.

<sup>182</sup> Notice of Request on Feb. 1, 2002 (DLNR 1294).

<sup>183</sup> Letter of William M. Tam, counsel for James Pflueger, Trustee of the Mary N. Lucas Trust, to DLNR of February 13, 2002 (DLRN 1300).

inspection of reservoirs.<sup>184</sup> The letter encloses a right-of-entry agreement, and also notes that if the right-of-entry agreement is not returned, DLNR “will assume that you intend to waive this formality.”<sup>185</sup> This letter was sent by certified mail. This was the only letter of this type DLNR ever sent by certified mail. Again, there is no record of a response by Mr. Pflueger, and no inspection was conducted.

### **2.13 Grading at Ka Loko Reservoir in 2002**

On July 3, 2002, the Hawai‘i Department of Health -- Clean Water Branch (“DOH-CWB”) performed a site inspection at Ka Loko Reservoir. The background description in the report of that site inspection provides as follows:

On June 21, 2002, representatives from the County of Kauai, Department of Public Works (CKDPW) and Planning Department (CKPD) conducted an aerial survey on Kauai to search for areas where possible unpermitted grading and grubbing activities had occurred. As a result, the CKDPW and CKPD observed additional potential problem areas on Pflueger’s property identified by TMK (4) 5-14:008 and on another property owned by Pflueger, identified by TMK (4)5-1-2:01.

On July 3, 2002, Michael Tsuji, Leanne Watanabe, Gerald Yonashiro and Gary Ueunten of the Department of Health (Department) conducted a reconnaissance inspection (RI) at the Pflueger property identified by TMK (4) 5-1-2:01 (referred to as the KaLoko Property in this report) where additional unpermitted grading activities were suspected. Others present during the site inspection included: Mr. Wally Kudo, from the CKDPW, Mr. Leslie Mimes, from the CKPD, Ms. Amy Esaki, from the County of Kauai’s Attorney’s Office, and Ms. Nancy McMahon of the State Department of Land and Natural Resources, State Historic Preservation Division. David Stringer and David Ayer of Stringer Tusher Architects Inc., and Joe Vierra of Belt Collins Hawai‘i. Ltd. represented Mr. James Pflueger and accompanied the Department representatives during the inspection.<sup>186</sup>

The report goes on to list the following findings:

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<sup>184</sup> Letter of Andrew Monden, DLNR, to James Pflueger dated Dec. 27, 2001 (DLNR 1402).

<sup>185</sup> *Id.*

<sup>186</sup> Investigation Report DOH-CWB July 3, 2002 (DOH-CWB 458).

- The Kaloko Property was located mauka of the Plia'a Property and was accessed via Kapuna Road.

- The Department observed what appeared to be a smaller constructed pond before reaching the Kaloko Reservoir (see Photo No. 1).

- According to the Department's Kauai representative, a large area near the Kaloko Reservoir was leveled out by James Pflueger in 1997.

- The Department observed a slope of bare dirt on one side of the Kaloko reservoir (see Photo Nos. 2 thru 8).

- Upstream of the reservoir, water from a ditch flowed over a concrete-lined diversion and into the Kaloko reservoir. The CKDPW, CKPD and the Department followed the water source for the Kaloko Reservoir to a tunnel (see Photo Nos. 9 thru 13).

In conclusion, it appeared that unpermitted construction activities such as grading had occurred in the Kaloko Reservoir area. The bare slope observed on one side of the reservoir should be stabilized to prevent erosion into the reservoir.<sup>187</sup>

The "concrete lined diversion" upstream of the reservoir was apparently a reference to modifications made to the Moloa'a ditch. The report does not comment on Ka Loko Dam, or any issues associated with the dam or its emergency spillway.

In September, 2002, inspectors from the U. S. Environmental Protection Agency ("EPA") and the DOH-CWB the performed a second site inspection at Ka Loko Reservoir. The visit was made in response to grading ordinance violation notices from the County of Kaua'i, and the concern that past construction activities may have been conducted on the property without proper permit authorization under the Clean Water Act. On November 13, 2002, the EOA issued a Findings of Violation and Order for Compliance to James Pflueger and Pflueger Properties for unpermitted discharges of storm water resulting from past construction activities at Ka Loko Reservoir.<sup>188</sup> In

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<sup>187</sup> *Id.*

<sup>188</sup> Letter from EPA to James Pflueger of November 13, 2002 (DOH-CWB 340); Findings of Violation and Order for Compliance, EPA Docket No. CWA-402-9-03-005, November 13, 2002 (DOH-CWB 342).

summary, the inspectors observed evidence of past grading activities above the shores of Ka Loko Reservoir as well as the construction of a road approaching the reservoir from the east. Again, there is no reference to Ka Loko Dam itself, or any issues associated with the dam or its emergency spillway. The EPA determined that these construction activities had led to the unauthorized discharge of sediment into waters of the United States, in violation of the Clean Water Act.<sup>189</sup> The attached site inspection report stated:

There was evidence of past grading activity on the plateau area around the reservoir. This grading activity was estimated, visually and using a vehicle odometer, to exceed 5 acres in extent. Much of the disturbed area had been grassed in, but there were parts, particularly on the slopes toward and away from the reservoir, where bare, unstable soils remain exposed.

The owner's representative reported that grading activities began in 1997 with some activity continuing in 2001.<sup>190</sup>

The Order required a halt to all construction activities, and implementation of corrective measures to stabilize the site by March 31. In June of 2003, the EPA wrote Belt Collins expressing concern about the apparent lack of progress toward compliance with this order and necessary remediation for the site.<sup>191</sup>

In August 2003, Pflueger Properties applied for a General Permit for the remedial work at Ka Loko Reservoir, with the assistance of Belt Collins Hawai'i, Ltd. ("Belt Collins").<sup>192</sup> On June 10, 2004, Pflueger Properties received its Notice of General Permit Coverage ("NGPC").<sup>193</sup> The general goal of the remediation was to stabilize the slopes in the vicinity of the reservoir.

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<sup>189</sup> *Id.*

<sup>190</sup> *Id.* (DOH-CWB 352).

<sup>191</sup> Letter from Jeremy Johnstone, EPA, to Belt Collins of June 26, 2003 (DOH-CWB 268).

<sup>192</sup> DOH-CWB General Permit Datasheet File No. R10B642 (DOH-CWB 1); NOI Letter from Belt Colling to DOH of August 20, 2003 (DOH-CWB 141).

<sup>193</sup> NGPC File No. HI R10B642 (DOH-CWB 84).



The Department of Public Works of the County of Kaua‘i (“Public Works”) alleged that from time to time during and after 1997, Pflueger Properties undertook certain clearing and grading operations on the Pflueger Property and the Lucas Estate Property (the “Grading Work”); and that Pflueger Properties did not have a grading permit or any other necessary governmental permits to conduct such Grading Work on either the Pflueger Property or the Lucas Estate Property. As a result, Public Works reasserted its old Notice of Grading Violation from November 18, 1997, issued a Second Notice of Grading Violation dated July 11, 2002, and issued a follow-up letter dated July 24, 2002 for the grading activities on the Pflueger Property. In response, Pflueger Properties retained Belt Collins to prepare engineering plans and apply for an After-The-Fact Grading Permit from Public Works.<sup>194</sup>

In its July 11, 2002, Second Notice of Grading Violation, the County of Kaua‘i wrote:

This is a follow-up to our field investigation on July 3, 2002 of the subject property and our notice of grading violation dated November 18, 1997 . . . . Although the December 19, 1997 deadline has elapsed, we are still waiting for your action to correct the grading violation.<sup>195</sup>

On July 29, 2002, Belt Collins wrote the County of Kaua‘i in response to its July 11, 2002, Second Notice, stating:

It is our understanding that the 1997 notice relates to grading of the northern slope of the reservoir. We understand that this slope has become naturally revegetated and will not contribute to future erosion. In July of this year, you observed a disturbed area that is not fully vegetated. This area is on the south side of the reservoir.<sup>196</sup>

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<sup>194</sup> Letter from Max Graham, Jr. (counsel for Pflueger Properties), to DLNR of May 7, 2003 (DOH-CWB 248-249). Notice of Grading Violation November 18, 1997 (DOH-CWB 225); Notice of Grading Violation July 11, 2002 (DOH-CWB 227).

<sup>195</sup> Second Notice of Grading Violation, July 11, 2002 (DOH-CWB 413).

<sup>196</sup> Letter from Belt Collins to Ian Costa, County of Kaua‘i, of July 29, 2002 (DOH-CWB 404); attaching map showing “1997 Grading” on the north side of the reservoir (DOH-CWB 407).

On January 23, 2003, and again on July 17, 2003, the County of Kaua‘i wrote to Belt Collins regarding the remediation grading plans for Ka Loko Reservoir, noting their comments were in reference to remediation in response to both the Notice of Grading Violation dated November 17, 1987 and that of July 11, 2002.<sup>197</sup> The remediation areas are shown on several maps; they are all to the east and south east of the reservoir.<sup>198</sup> Ka Loko Dam is on the west side of the reservoir. *See* Figs. 18 and 19 (aerial photo 2004; the remediation work around the reservoir is visible).

These issues involving the Ka Loko Reservoir were addressed as part of a larger enforcement action concerned primarily with 378 acres of coastal property at Pila‘a, which was ultimately resolved in a multiparty Clean Water Act Settlement in federal court on March 9, 2006, a guilty plea by Mr. Pflueger in May 2005 to ten felony counts in Hawai‘i state criminal court, and a BLNR fine in July 2005 of \$4 Million for natural resource damages.<sup>199</sup>

## **2.14 Kilauea Irrigation Company, Inc., is Sold to Hitch Co. in 2005**

In its Staff Report from Kaua‘i for March 2005, PUC staff wrote:

Kilauea Irrigation Company, Inc. (“KICI”). Possibly, the last remaining asset of C. Brewer & Company, Ltd., (“Brewer”) may be transferred to a Kauai entity in the near future. The individual inquiring into the transfer has noted that Brewer literally wants to “give it away.” The non-potable KICI was created to support the development of agricultural subdivisions on former Amfac sugar cane lands. KICI has never made a profit and more than often than not, has been a source of disputes among the KICI, the farmers and the previously interested acquirer of

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<sup>197</sup> Letter from County of Kaua‘i to Belt Collins of January 23, 2003 (DOH-CWB 207). Letter from County of Kaua‘i to Belt Collins of July 17, 2003 (DOH-CWB 135).

<sup>198</sup> (DOH-CWB 118, 152, 153).

<sup>199</sup> Additional information regarding the Pila‘a settlement is available at the EPA website: <http://www.epa.gov/region09/water/npdes/pflueger/index.html>

KICI, Mr. Jimmy Pfluger. Previous allegations that Brewer would simply “walk-away” from this property is not something new.<sup>200</sup>

And in its Staff Report from Kaua‘i for April 2005, PUC staff wrote:

Kilauea Irrigation Company, Inc. (“KICI”) Transfer of Ownership Meeting. Representatives of KICI and the prospective transferee, Mr. Thomas Hitch met with the Commission’s section chiefs – legal, audit, engineering, research, as well as, district staff during the afternoon of April 4, 2005, in Honolulu. Questions regarding, among other things, the transfer process, expansion of the service area and the treatment of a KICI asset outside of the service area were answered in a thoughtful, competent and constructive manner. As a result of the meeting it does not appear that KICI will, without warning, abandon the utility on a cold, wind and moonless northshore night, but honestly, attempt to transition ownership in a smooth and orderly fashion.<sup>201</sup>

On July 8, 2005, KICI filed an application with the PUC requesting approval of the transfer of its stock to Hitch Co. and approval of an expanded service area.<sup>202</sup> The application notes that KICI was a wholly owned subsidiary of C. Brewer and Company, Ltd., which at that time was in liquidation, and expecting to proceed to dissolution prior to the end of 2005.<sup>203</sup> (Under Hawai‘i law, PUC approval is required before a utility may sell its plant or other similar property, including its permit.)<sup>204</sup>

KICI requested approval to sell 100% of its stock to Hitch Co., a sole proprietorship owned by Thomas Hitch of Kilauea, Kaua‘i, for a purchase price of \$10.00. Hitch Co. had maintained the Ka Loko Water System as an independent contractor for KICI for the past 15 years.<sup>205</sup> KICI also paid Hitch Co. \$15,000 before the stock transfer to improve and maintain the ditch system.<sup>206</sup> In its application, KICI noted that it had operated the water system at a loss over each of the past 25 years, and had

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<sup>200</sup> PUC Staff Report from Kaua‘i for March 2005, at 4 (PUC 661).

<sup>201</sup> PUC Staff Report from Kaua‘i for April 2005, at 3 (PUC 691).

<sup>202</sup> Application, PUC Docket No. 05-0168 (PUC 3).

<sup>203</sup> *Id.*

<sup>204</sup> See, e.g., KICI Application for Transfer of Stock at 6 (PUC 8), admitting obligation to seek PUC approval before selling any part of its plant.

<sup>205</sup> Application, PUC Docket No. 05-0168 at 4 (PUC 6).

<sup>206</sup> *Id.*

never requested a rate increase.<sup>207</sup> All of its customers had access to County water, but it is more expensive than that supplied by KICI: in 2005, KICI sold its non-potable water to 19 customers at a rate of less than half the County rate for non-potable water.<sup>208</sup>

The Stock Purchase Agreement provides for indemnification of Hitch Co. by the C. Brewer and Co., Ltd., for any loss arising from any act or omission that took place before the closing of the sale.<sup>209</sup> The sale, however, was an “as is, where is” purchase, without any warranty or representations.<sup>210</sup>

The Division of Consumer Advocacy did not object to the proposed transfer.<sup>211</sup> The Division notes, “the financial statements of Mr. Hitch reveal that Mr. Hitch’s net work is approximately \$400,000,” and that this “should be sufficient to provide financial support to KICI until such time that the utility is able to increase its rates to recover a reasonable level of operating costs.”<sup>212</sup>

On November 23, 2005, the PUC approved the transfer of stock and the expansion of the authorized service area.<sup>213</sup>

## **2.15 The DLNR Dam Inspection Program in 2005**

The DLNR dam inspection program faced two significant challenges in the middle of 2005. First, the supervisor for the Dam Safety and Flood Control sections, the Program Engineer, retired, leaving the section shorthanded. Second, due to natural disasters around this time, the section was instructed to focus on tsunami mapping and flood control issues. DLNR summarized its dam inspection program in 2006 as follows:

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<sup>207</sup> *Id.*

<sup>208</sup> Application, PUC Docket No. 05-0168 at 3 (PUC 5)

<sup>209</sup> Stock Purchase Agreement at 2 (PUC 37, 37.)

<sup>210</sup> *Id.* at 4 (PUC 39).

<sup>211</sup> Division of Consumer Advocacy Statement of Position, Docket No. 05-0168 (PUC 26).

<sup>212</sup> *Id.* at 7 (PUC 32).

<sup>213</sup> Decision and Order, Docket No. 05-0168 (PUC 51).

At the end of June 2005, the Program Engineer retired and the Senior Engineer assumed a temporary assignment as Program Engineer. Since the middle of 2005, the Dam Safety and Flood Control section has had one engineer.

No dam inspections were made during 2005 and early 2006 by DLNR. We have requested inspection, maintenance and operations information from all dam owners, so that we make sure that we have a complete record of these activities.

Rules require dam owners to provide for the adequate and timely maintenance, operation, and inspection of their dams and reservoirs and owners shall be responsible for any engineering and geologic investigations which may be required to insure public safety.

While Dam Safety and Flood Control activities continued, attention was diverted to tsunami mapping for State Civil Defense and dealing with response to the Manoa floods.

Presently, there is a permanent Program Engineer in place and recruitment for the Senior Engineer position has finalized and the offer to fill the position should be completed soon.

DLNR's Dam Safety Program conducts visual inspections of dams and notifies owners of repairs needed, permit required, and will review plans for repairs.

The State Dam Safety Program does not do the construction or repairs to dams; Dam owners are responsible for repairs of their dams.<sup>214</sup>

In October 2005, DLNR received a citizen complaint regarding an alteration to the free flow of water upstream on the Wailapa stream leading to the Morita reservoir. The complaint asserts that upstream it appears the "water flow has been restricted and downstream the water is being dammed up, collected and drained" so the Wailapa Stream bed dries out.<sup>215</sup> On November 18, 2005, DLNR responded by forwarding to the complainant a copy of the "Registration of Stream Diversion Works and Declaration of Use" filed by the Lucas Estate for Puu Ka Ele Stream.<sup>216</sup>

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<sup>214</sup> DLNR New Release (March 21, 2006) (DLNR 4031)

<sup>215</sup> Complaint of Michael K. Perius of October 28 2005 (DLNR 1327).

<sup>216</sup> Facsimile from DLNR to Mr. Perius of November 18, 2005 (DLNR 1325)

## **2.16 The Weather in Winter of 2006**

The Ka Loko Dam breach on March 14, 2006, occurred 24 days into one of the most unusual periods of extended wet and stormy weather ever observed in Hawai‘i. The following discussion is taken from the Expert Report of Dr. Kevin Hamilton, Chair, Department of Meteorology, University of Hawai‘i, attached in Appendix B.

### **2.16.1 An Unusually Wet Late Winter/Early Spring in Hawai‘i**

The unusual weather began almost a month prior to the Ka Loko Dam breach on March 14, 2006. Starting February 18, National Weather Service (“NWS”) flash flood watches (i.e. flooding is determined to be possible within the next 36 hours) were in effect over at least parts of the state for 31 of the next 42 days (the last of this series of warnings was issued for April 2). During that 42 day period, one hundred and eleven (111) flash flood warnings – potentially dangerous flooding already occurring or expected within the next hour – were issued for various locations. In most years typically only 2 or 3 such flash flood warnings would be issued during the same calendar period.

Kaua‘i shared fully in the anomalous rainfall during the period commencing February 18. The rain gauge at Lihue Airport recorded 45.33 inches of rain over the 42 day February 18-April 2 period. Just in March the Lihue rainfall was 36.13 inches, which was almost 60% more than ever recorded in any single calendar month (the previous record was 22.91 inches in December 1968). The rain gauge on Mt. Wai‘ale‘ale, regarded by some as the rainiest spot on earth, recorded an impressive 138.79” of rain during this 42 day period.

## **2.16.2 Rainfall Near Ka Loko Reservoir Before March 14**

Rainfall is currently measured at 23 stations throughout Kaua‘i. These are mainly cooperative observing stations with daily rainfall measurements. The NWS cooperative observing network includes a Ka Loko Reservoir Station (NWS coop ID #514758) close to the reservoir itself and it has quite a long record. The Ka Loko Reservoir Station coordinates are given by the NWS as 22° 11' N and 159° 23' W and its elevation is given as 490 feet above sea level. The station opened on October 1949 and has provided daily data since then, although with numerous large and small gaps. Notably data are non-existent or very intermittent between October 1972 and February 1979. However outside of this period, the data should be adequate to determine the rainfall at the station for the January-March periods in each year of operation, i.e. 1950-1972 and 1980-2006, for a total of 50 years. This is a long data set which should provide some context for understanding how exceptional the winter 2006 rainfall in the vicinity of the reservoir really was.

The 2006 results certainly stand out, with this year determined to have either the second wettest or the third wettest pre-March 14 period, depending on the averaging length used. By this measure at least, the 2006 rainfall near Ka Loko Reservoir in the pre-March 14 period can be called very unusual, but not unprecedented in a roughly 50 year record.

The Ka Loko Reservoir rainfall data can also be analyzed to find all wet spells of a particular length that exceed a given threshold, regardless of time of the year. So, for example, the 14-day period of March 1-14, 2006, daily average rainfall (1.206 inches) has been exceeded 11 times in the earlier record, with the largest such daily mean rainfall

being 1.70” in November 13-28, 1990. The 28 day February 15 to March 14, 2006 period mean daily rainfall (1.130 inches) was exceeded 4 times in the earlier record, with the largest 28-day mean daily rainfall rate being 1.394” during March 26-April 21, 1963. Once again the data suggest that the heavy pre-March 14, 2006 period rainfall is rare, but far from unprecedented.

### ***2.17 The Inspection of Ka Loko Reservoir in March 2006***

On February 23, 2006, the Department of Health – Clean Water Branch (“DOH-CWB”) and United States Environmental Protection Agency (“EPA”) received a report that during the previous week’s rains a five foot high wall of water had come downstream and destroyed a small bridge toward Moloa‘a. The reports were forwarded by multiple parties, including the Sierra Club Blue Water Campaign, Earthjustice, and others.<sup>217</sup> The DOH-CWB responded to the Sierra Club on February 23: “I received the call this morning. I have received reports that the reservoir dam has not breached. I will forward more info as it becomes available.”<sup>218</sup> The DOH-CWB later wrote on March 10, “FYI, I was at the Kaloko Reservoir on Tuesday and the dam is intact.”<sup>219</sup> Blue Water Campaign wrote back, asking “Was the bridge referred to damaged/repared?”<sup>220</sup> On March 11, DOH-CWB further noted:

Kauai has received its share of rain over the past three weeks. The Kaloko Reservoir is well below the top of the dam and the water levels are managed. The wall of water that took out the bridge may have been caused by a debris dam in the stream that broke creating a flash flood. The dam [bridge?] still has not been replaced or repaired. I saw on the TV news that the County and the State are trying to repair the bridge in a cooperative effort.<sup>221</sup>

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<sup>217</sup> Blue Water Campaign email to DOH of February 22, 2006 (DOH-CWB 48); Earthjustice email to EPA of February 23, 2006 (DOH-CWB 79); EPA email to DOH of February 24, 2006 (DOH-CWB 78).

<sup>218</sup> DOH e-mail to Blue Water Campaign of February 23, 2006 (DOH-CWB 49).

<sup>219</sup> DOH email to Blue Water Campaign of March 10, 2006 (DOH-CWB 49).

<sup>220</sup> Blue Water Campaign e-mail to DOH of March 10, 2006 (DOH-CWB 50).

<sup>221</sup> DOH email to Blue Water Campaign of March 11, 2006 (DOH-CWB 50).



Later, DOH-CWB memorialized the sequence of events in several reports or memoranda. One DOH-CWB “Phone Call/Visit Report” summarizes as follows:

Wendy relayed the message via David Hendkin, from Hope Kallai (sp?) . . . that this past week during heavy rainstorms, Ms. Kallai thinks that the Kaloko reservoir or diversion dams failed and sent a 5 ft high wall of water down the stream and destroyed a small bridge towards Moloaa. I called Gary on Kauai to see if he can inspect the site. He replied at 1pm, that no way Kaloko if failed would have gone to Kilauea side. He called Gordon Rosa who referred him to Jack Gushiken (worked for Kilauea irrigation system, retired, but still active) . . . who thought it might be a blocked irrigation ditch that overflowed. He would check up on this. I called Ms. Kallai and left a message for her to call Jack to give him more info on where the flooding occurred so he could locate the source of the flooding.

March 1, 2006, called Gary and Jack. Gary did not inspect the area of the flooding. Jack worked with Ms. Kallai to come to the conclusion since there was no evidence of dam failures or overtopping, that the flooding was caused by a high rainfall event within a short period of time. Jack stated that apparently Ms. Kallai was satisfied with this explanation.

Rainfall events reported by Belt Collins for Pila‘a site.

0.60 inches 5:30am February 19, 2006, to 5:15 am February 20, 2006.

0.58 inches 5:45 am February 20, 2006 to 5:30 am February 21, 2006

6.69 inches 5:45 am February 21, 2006 to 5:30 am February 22, 2006

1.85 inches 9:00 am February 22, 2006 to 8:45 am February 23, 2006 <sup>222</sup>

The formal Investigation Report by Mr. Tsuji, the Enforcement Section

Supervisor, provides more detail on the complaint, and notes as follows:

On February 23, 2006, I received an e-mail from Dr. Wendy Wiltse (EPA PICO), who had forwarded an e-mail from Mr. David Henkin (Earthjustice). Mr. Henkin stated that he received a message from a complainant on Kauai who reported that on February 22, 2006, that in a torrential rain, Kaloko Reservoir failed, sending a 5-foot wall of water down Moloa‘a Stream that, among other things, wiped out a 2-ton temporary bridge. A lot of sediment was also involved. Complainant seemed to think that Pflueger should be held responsible. I then called Gary Ueunten on Kauai and asked if he could inspect the site. Later that afternoon, Dr. Wiltse sent another e-mail stating that she called the complainant who lives makai of the Kuhio Highway at Moloa‘a, Kauai. The complainant stated to Dr. Wiltse that she saw a wall of water 5 ft high and 50 yards wide come down the stream

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<sup>222</sup> DOH-CWB Phone Call/Visit Report from Wendy Wiltse to M. Tsuji of February 23, 2006 (DOH-CWB 18) (phone number omitted).

about 11AM on February 22, 2006. It overtopped the banks and flooded her farm for a couple of hours. Complainant said that Pflueger has diverted two of the three tributaries to Moloa'a stream to Kaloko reservoir and Pila'a stream. She thinks that either the reservoir or the diversion dams may have broken in the high rainfall. Since these features are on Pflueger's property, she and her neighbors have not been there to inspect.

Mr. Ueunten spoke with Gordon Rosa (Pflueger's foreman) and Jack Gushiken (retired Kilauea Agronomics employee who is familiar with the Kaloko Reservoir and the irrigation system which was once part of the Kilauea Sugar system). Mr. Gushiken said he checked the areas below the reservoir and did not see evidence of the dam being broken. Both Mr. Rosa and Mr. Gushiken stated that water from Kaloko does not drain to Moloaa. Mr. Rosa who is familiar with the area thought that the flood was caused by debris blocking the stream and suddenly releasing. He said that the weather was dry through the winter and debris probably accumulated in the stream.

On February 24, 2006, Mr. Jeremy Johnstone (EPA, Region 9) who also has been receiving these e-mails, e-mailed to Leland Lee (Belt Collins, Pflueger consultant), Noel Wise and Wesley Ching (Pflueger attorneys) notifying them that we have received reports of a large rainfall event on Kauai, as well as a flood down Moloa'a stream. Mr. Johnstone asked if they could advise us as to the condition of the reservoir, as well as the work areas and associated BMPs there. He also asked of any problems/concerns with regard to the Pila'a property. Mr. Lee returned Mr. Johnstone's e-mail soon after stating that Mr. Waily Kudo (Kauai County engineer) had also called for them to check on Kaloko Reservoir. Mr. Lee also stated that all the Kaloko remediation work has been completed and grown in, with the exception of Area C. The Kaloko remediation areas were on the upper side of the reservoir, so he doubted there were any remediation areas that could have breached. Of course, the reservoir could have just filled up, so they would check. Pila'a was OK. Mr. Lee had e-mailed to Mr. Calvin Lai (assistant engineer to Mr. Leyland Lee), who contacted Mr. Rosa. Mr. Lai returned e-mailed to Mr. Lee and stated he contacted Mr. Rosa and the Kaloko Reservoir showed no sign of it being breached. Mr. Rosa took pictures of the reservoir on February 23, 2006.

As Mr. Johnstone will be in the Islands on early March, we will schedule an inspection for the site on March 7, 2006.<sup>223</sup>

On March 7, 2006, DOH-CWB and EPA conducted a site visit, as a follow-up "to consent decree and report of flooding."<sup>224</sup> Their findings description was as follows:

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<sup>223</sup> DOH-CWB Investigation Report ID# KA0266, File No. R10B642 (3/24/2006), (DOH-CWB 19).

<sup>224</sup> *Id.*

March 7, 2006. At about 1130 A.M., Gary Ueunten of the DOH, drove Mr. Jeremy Johnstone and myself to the Pflueger's Kaloko Reservoir project site after completing an inspection of the Pflueger Pila'a project site. Mr. Gordon Rosa, unlocked the gate on the east side of the property allowing us to enter and we followed Mr. Rosa to southeast side of the Kaloko reservoir. Near the entrance to the property, we passed an excavator that appeared to be under repair. Upon arrival at the project site, there was a front loader and an excavator parked there. (Photo # 2) The land around the south side of the reservoir looked stabilized with vegetation. Since we were interested in Area C of the remediation plans, we walked over to look over the edge of the cliff on the southeast side of the property where the work was being done. Mr. Rosa stated that the work had been done on or about January 25, 2006 and work had stopped due to the rains. We observed heavy equipment tracks and evidence of earth disturbance from the top of the cliff going down the steep slope. (photo #1, 2, 3, 4) At the bottom of the work area, there was a silt fence along the perimeter of the work area which was overwhelmed by dirt. (photo #4) It appeared that they worked from the top to the bottom, putting up the excavated dirt and placing it on area E. As it appeared that the slope of the cliff was too steep and slippery to walk on, we stayed at the top of the cliff.

It appeared that the work in this area was being done in according to the EPA/Pflueger Consent Decree, Appendix C, Kaloko Work Plan, plans to bench and reduce the angle of the slope. After taking photographs of this site and looking at this area, Mr. Johnstone told Mr. Rosa that they had to stabilize the bare slope and repair the overwhelmed silt fence at the bottom of the slope. Mr. Rosa then started calling someone to comply with Mr. Johnstone's request. We then left after spending about 20 minutes at the site. Mr. Rosa stated that he would stay and talk to the mechanic who was at the lower part of the property. As the reservoir dam is located on the northwest side of the property and no remediation work was planned for that area, we did not go to that side of the property.<sup>225</sup>

No action was taken as a result of the site visit. Photographs of the remediation area were attached to the report.

Gary Ueunten also did a memorandum regarding the complaint and subsequent site inspection:

The Environmental Health Office received a call from Hope Kalai . . . , a resident of Moloaa reporting that a wall of water 5 feet high and 50 feet wide came down the Moloaa Stream. She thought that it came from the Kaloko Reservoir. I was out of the office in Kilauea with Ed Chen visiting construction sites and I returned Hope's call on 2/23/06. She indicated that a wall of water 5 feet high and 50 feet wide came down the Moloaa Stream and damaged a bridge. She thought that

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<sup>225</sup> *Id.* (DOH-CWB 20).

Kaloko reservoir blew out sending water into the Moloaa Stream. On 2/23/06, I received an e-mail message from the Sierra Club's Blue Water Campaign. That morning I received a call from Mike Tsuji who received the same information. Mike asked me to investigate. I placed a call to Gordon Rosa, an employee of James Pflueger informing him of the complaint. Gordon said that water from the Kaloko Reservoir would not flow into the Moloaa Stream and that he would check on it. He thought that the wall of water in the Moloaa Stream was probably caused by debris blocking the stream, then breaking creating a wall of water. He mentioned that because of the dry January and February debris may have accumulated in the Moloaa Stream. On the same day at 2:40 p.m. Jack Gushiken called the Environmental Health Office saying that "cannot be -- don't see any evidence" referring to the Kaloko Reservoir. I called Jack later in the afternoon when he said he checked the areas below the Kaloko Reservoir and did not see any evidence that the Kaloko Reservoir had blown out. He also said that water from the Kaloko Reservoir would not flow into the Moloaa Stream. I relayed the information to Mike Tsuji.

On March 7, 2006 Mike Tsuji, Jeremy Johnstone and I, accompanied by Gordon Rosa inspected the Pflueger Pilaa Project sites and the Kaloko Reservoir where remediation work was being carried out under a consent decree. At the Kaloko Reservoir, we inspected the south side of the reservoir where a steep slope was being stabilized. Gordon explained that work had stopped because of the heavy rains. Jeremy discussed with Gordon the Best Management Practices for the area. The inspection was limited to the south and southeast sides of the reservoir where remediation work under the consent decree was being carried out. The south side of Kaloko Reservoir borders the Moloaa watershed. There was no evidence that the Kaloko Reservoir discharged from the south and southeast sides to the Moloaa Stream.<sup>226</sup>

Mr. Gushiken has subsequently confirmed that he had checked the reservoir in February, but – like the inspectors in March – had focused his attention on the Moloa'a, or east, side of the reservoir. He recalls the reservoir level was below the top of the dam at the time of his inspection, but he did not inspect the dam, or west, side of the reservoir.

## **2.18 The Breach of Ka Loko Dam on March 14, 2006**

On March 14, 2006, just before dawn, Ka Loko Dam breached. One witness described the sound of the resulting flood as a 747 crashing in the valley: the roar of the water was like a jet engine and the trees, cars, buildings, and other materials carried along

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<sup>226</sup> Memo to File from Gary Ueunten of May 19, 2006 (DOH-CWB 28).

by the water crashed against each other and the valley as the flood rushed to the ocean. It began to get light about ten minutes after the event, and witnesses could see trees, vehicles, and debris rushing down the valley. They describe the flood as not so much water as a slurry of mud and debris.

The waters from the Ka Loko breach crashed in to Morita reservoir and overtopped Morita dam. Apparently, the overtopping was relatively even and although the face of Morita dam began to erode, it did not breach (as discussed below, it was later deliberately breached).

In the early morning hours of March 14, Kaua‘i was already on general alert because of a flash flood warning issued the night before.<sup>227</sup> The first the County government learned of the disaster was when a police officer saw a huge albesia tree on Kuhio Highway and fifteen to eighteen feet of water rushing across the roadway. Calls to 911 began at about 5:30 that morning.

The County was soon on full emergency activation, with the mayor, county department heads, and representative of the state in the Emergency Operations Center there by 6:00 am. The initial goal was to try to identify any missing persons. The roar of the flood down Wailapa stream had warned some people who managed to escape the flood. Later in the morning, however, the Emergency Operations Center learned that people might be missing from below the highway.

They were notified by the U.S. Coast Guard that a fisherman had reported spotting a victim in the ocean. This defined the area of the search, and they concentrated on the area from below the highway to roughly a mile out into the ocean. The Coast

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<sup>227</sup> This rough chronology is drawn from information provided by Mark B.L. Marshall, Administrator of Kaua‘i Civil Defense Agency, and the Public Information Office releases made on a regular basis during the emergency response, available on the County of Kaua‘i web site: [www.Kauai.gov](http://www.Kauai.gov).

Guard searched the ocean area, and the Hawai'i Urban Search and Rescue Task Force teams (generally composed of specially trained firefighters and emergency medical personnel) were activated, probably for the first time in the state, to search the area downstream of the highway. Ultimately teams flew in from several neighbor islands to assist in the search.<sup>228</sup>

Kuhio Highway (State Highway 56) was closed because authorities did not know if Morita dam, holding about 50 million gallons, was in danger of breach, or if the remnant of Ka Loko, still holding over 30 million gallons, might fail, or if the highway itself was stable. They secured heavy equipment and began working to clear the highway. The water main adjacent to the highway had also been damaged. The highway remained closed until late afternoon of the 14<sup>th</sup>, when a single lane was reopened. Two National Guardsmen were stationed at Ka Loko Reservoir, and two at Morita Reservoir, to monitor the situation there and to warn the police at the highway, should either of those dams appear to be in danger of breaching.

The priority was (1) victim rescue and recovery, (2) dam assessment and monitoring, and (3) overall damage assessment. The teams began to search the area in grids and continued until dark. They resumed the next day, when two additional victims were found in the debris left by the event. By the second day of the response, over thirty governmental agencies were involved. A command vehicle was sent to the site to help coordinate efforts.

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<sup>228</sup> Urban Search and Rescue teams in Hawai'i were organized by State Civil Defense in 2000 and trained by the FEMA Urban Search and Rescue Task Force in Sacramento. Their mission involved the location, rescue, and initial medical stabilization of victims trapped in confined places. *See* Hawai'i County Weekly News (April 14, 2006) at <http://www.Hawai'i-county.com/weeklynewsletter/archives/2006/041406.htm#usar>.

The debris piles were horrendous, huge snares of things washed down with the flood. The size of the debris fields created a serious challenge, even with heavy equipment. After several days, the Coast Guard shifted to a passive search mode, but Urban Search and Rescue teams continued with active search procedures for more than a week after the breach.

The Ka Loko disaster was not the only problem facing the County. The heavy rains placed other areas of the county in jeopardy of floods, ponding, and the like. The rain was also continuing. The Army Corps of Engineers and DLNR began an emergency inspection of the other dams on Kaua'i, as well as the rest of the state.

Mr. Hitch considered trying to divert the waters from Ka Loko Ditch away from the reservoir, to reduce the amount of water flowing into what remained of the reservoir and down to Morita. There was a ditch gate at the point where Ka Loko Ditch flowed into the reservoir that in the past could be closed and the water diverted away from the reservoir into an adjacent stream. It had not been used in years, however, and there was concern about where the diverted waters might then flow. Mr. Hitch later explained:

The day the dam broke I tried to get permission to turn off the Ka Loko Ditch immediately above the reservoir and redirect the ditch water to Kaluamakua stream. This would have lowered the reservoir, reducing any chance of further breaching and stopped any water from overflowing the breach thereby turning off the water to Morita Reservoir which was in serious jeopardy of failing. General Lee, Donald Fujimoto and Lincoln Gayagas all told me not to do that.<sup>229</sup>

Morita dam had overtopped when Ka Loko Dam breached, and the face of Morita dam had been seriously eroded.<sup>230</sup> Based upon advice from the Corps of Engineers and DLNR, the Mayor decided, under his emergency powers, to lower the dam. A private

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<sup>229</sup> Letter of Tom Hitch to James Pflueger of March 29, 2006 (TH 0002).

<sup>230</sup> See, e.g., Dr. Lelio Mehia's Expert Report at Appendix B, and its discussion of the dangers of overtopping of an earthen dam.

contractor was called in after the water level in Morita had been lowered by pumps to cut through the dam, and worked for three days to lower the dam and compact the earth around it.

The breach of Ka Loko Dam was a great human tragedy. Seven people were killed: Aurora Fehring, Alan Dingwall Fehring, their son Rowan, Wayne “Banyan” Rotstein, Tim Noonan, Christina “Sunny” MacNees (8 months pregnant), and Daniel Arroyo.

The breach of Ka Loko Dam was also a great ecological disaster. Many feet of silt have been deposited in the valley. Thousands of albesia trees are beginning to grow in the land that once was covered by Morita reservoir, and many in the community are concerned about that – albesia trees are shallow rooted and brittle, and having so many in what is now the flood plane is considered dangerous. They anticipate that in a flood the trees will uproot or break, go downstream to where the waters pass under the highway, and block the culvert there, potentially endangering travelers and the highway.

The wash of mud and debris into the ocean covered the reef for miles. The impact on the ocean ecology will probably not be known for years to come. An aquatic biologist for DLNR, on a helicopter flight several days after the breach, noted “extensive sediment plume of Kilauea Bay” and “trees in ocean and atop reef flats.”<sup>231</sup> Underwater photographs of the reef in the east end of Kilauea Bay suggest evidence of a huge ecological event: large tree trunks are wedged in the reef and appear to have battered the reef, and a high volume of sediment is evident. In short, the photos show a highly

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<sup>231</sup> Field notes of David Gulko, Aquatic Biologist IV, Coral Reefs Division of Aquatic Resources, DLNR, from March 18, 2006 (DLNR 4006)



degraded and impacted reef. No biological assessment has been done of the reef to date, but the environmental impact of the event appears substantial.

The loss of Morita Reservoir itself will have a significant ecological impact. It acted, in essence, like a settling pond for the waters coming down the watershed before they flowed into the ocean. Because Morita Dam has been breached, the waters will now run unimpeded to the ocean, carrying with them the materials that previously would have settled out into Morita Reservoir. So the loss of that reservoir is a problem for the farmers that depended upon it for water, and also a continuing problem for the ecology of the ocean.

Citizens in the area also report the loss of Hawaiian historical sites along Kilauea Stream, all washed away by the floods.

## ***2.19 Engineering Analysis of the Breach of Ka Loko Dam***

Dr. Lelio H. Mejia has prepared an engineering assessment of the breaching failure of Ka Loko Dam. That assessment is included in the report at Appendix B. This section of the report summarizes and quotes from his assessment.

Because the evidence and time available for this assessment were limited, the mechanism of failure could not be inferred with certainty by Dr. Mejia. Other assessments may provide greater confidence by gathering additional evidence or further analysis. Key evidence may be obtained from recent topographic plans of the embankment before the failure and by comparison of such plans with the USGS measurements of maximum flood stage in the reservoir. Further evidence may also be obtained from topographic plans of the embankment after the breach, geotechnical and geologic studies, additional observation and scrutiny of the physical characteristics and

details of the breach, and detailed modeling and analytical studies of the breach mechanism.

### **2.19.1 Description of Ka Loko Dam and Reservoir**

Ka Loko Dam is an earthfill embankment located at the headwaters of Wailapa stream in the northeast of the Island of Kaua‘i. The dam closes off the natural outlet of a volcanic crater to retain Ka Loko Reservoir. The reservoir had a storage capacity of over 400 million gallons. Dr. Mejia writes that, upon his inspection on November 28, 2006, no emergency spillway “could be seen at the location where a previous spillway is shown in aerial photographs dating to 1965 and in engineering sketches by the Soil Conservation Service (SCS)” as part of the KAWMS study in February 1982. He goes on to observe, the “channel of that previous spillway appeared to have been filled in, and there is no other spillway elsewhere around the reservoir rim.”

Engineering sketches by the SCS show that the dam crest was about 770 feet long and about 15 feet wide. Three cross sections of the embankment, shown in the SCS engineering sketches at distances of 185, 530, and 647 feet from the location of the previous spillway, show the crest elevation to be about 749.6, 749.8, and 750.7 feet above mean sea level, respectively. The crest elevation at a point 245 feet from the previous spillway was only 748.5 (1.5 feet above the spillway crest elevation) and suggests that this was the low point on the dam crest. Those sections also indicate that the embankment had a maximum height of about 40 feet and that the inclination of the downstream slope was about two horizontal to one vertical.

Limited information is available on the design, construction, and performance of the dam. Dr. Mejia states:

Photographs of the dam construction date to the early 1900s. The annual reports of KSPC for the year ending December 1912 indicate that the dam was raised between 1911 and 1912 by 12 feet to the current crest elevation. The photographs of construction indicate that the main body of the dam was built by sluicing, a method of hydraulic filling. The dam materials appear to have been borrowed from local sources immediately north and south of the site, and to have been excavated with the aid of water jets and transported to the site by wooden flumes in a slurry. The materials were discharged at the site by the flumes and spread with the aid of hand labor. The photographs indicate that the upstream face of the dam was finished by compaction with a roller.

Some of the materials he observed at the base of the breach appeared to be compacted embankment fill, suggesting that bottom portions of the embankment were placed by methods other than sluicing. Non-sluiced fill dikes would likely have been used to retain the sluiced materials in between the upstream and downstream edges of the embankment as it was raised. Although the dam could generally be characterized as a homogeneous embankment, the method of construction led to marked horizontal stratification of the embankment that included layers of predominantly coarse-grained soils often juxtaposed with layers of fine-grained soils.

Dr. Mejia also notes that only limited information is available on the past performance of the dam. But it appears that the dam performed acceptably through its 100-year history prior to the failure, while being subjected to normal reservoir loads. Records by Kilauea Sugar Plantation indicate that the reservoir filled to the level of the emergency spillway numerous times: the reservoir reached that elevation every year between January and April from 1946 through 1953 and was continuously full for periods up to one month long. *See Appendix A hereto.*

### **2.19.2 Physical Characteristics of the Breach**

Dr. Mejia visually estimated the breach to be approximately 250 feet wide in between the north and south remnants of the dam crest. The width of the eroded channel

narrows down significantly downstream as the streambed curves slightly to the north. The upstream lip of the breach was estimated to be about 200 feet wide. Based on the aerial photographs, the breach appears to be roughly centered, along the dam axis, at the location of the low point on the dam crest estimated from the SCS sketches.

He notes that the base of the breach channel has three levels, or benches, which step down to the west (i.e. downstream). The top bench exposes embankment fill and native foundation soil, possibly alluvium. Foundation materials and apparent remnants of embankment fill were observed on the surface of the middle bench. He observed the foundation materials are weathered volcanic deposits. The lower bench exposes weathered volcanic rock.

Based on the erosion of the ground surface he observed, it is clear that a substantial volume of water flowed over the ridge on the northwest side of the lower bench, probably beginning prior to exposure of the entire bench by erosion. The appearance of the vegetation on the south bank of the eroded channel facing the lower bench, and of the vegetation inland of the channel, indicates that water flowed over that bank of the channel and over the ridge on the southwest side of the lower bench for some distance inland.

### **2.19.3 Breach Failure Mechanisms**

The mechanism of the breach failure is not known and can only be inferred from available evidence. Generally, possible modes of failure of embankment dams such as Ka Loko Dam include: a) overtopping of the embankment, b) internal erosion and piping, c) structural instability and excessive deformation, and d) variants or combinations of the

above. Most past failures of embankment dams can be classed into one of these modes of failure.

### **2.19.3.1 Embankment Overtopping**

This mode of failure consists of overtopping of the dam by a raised reservoir level and erosion of the embankment by the overtopping flows. Dr. Mejia describes this mechanism of breach failure as follows:

Overtopping begins as the reservoir level rises above the dam crest. As water flows over the crest and downstream slope, it starts to erode the dam face and the foundation materials at the toe, provided they are erodible. Typically (although not necessarily), erosion will begin at or near the downstream toe of the embankment and move up the slope towards the crest. Slope erosion will progress into a series of cascading overfalls leading to a headcut at the downstream crest edge. With continued flow, the headcut will migrate from the downstream to the upstream edge of the crest. Once the headcut reaches the upstream edge, lowering of the crest begins and the rate of embankment and foundation erosion increases rapidly until the breach is fully formed.

The final size and geometry of the breach will depend on numerous factors including: the reservoir volume, the dam height, the characteristics of the embankment and foundation materials, and the geometry of the embankment and downstream channel. Overtopping will occur first at the lowest point on the crest, and the width of overtopping prior to lowering of the crest will depend primarily on the crest profile and the flow discharge (flow volume per unit time) over the crest.

The USGS conducted high water mark measurements shortly after the breach, and the “peak flood stage in Ka Loko Reservoir was determined to be 750.65 feet above mean sea level.”<sup>232</sup> This elevation is about 2.1 feet higher than that of the lowest point on the dam crest as surveyed by the SCS in 1982. It is also about 0.9 feet higher than the crest elevation at two of the sections surveyed by the SCS in the area of the breach. Thus, this

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<sup>232</sup> USGS, “Peak Stage and Discharge Data for Ka Loko Reservoir Flood, Island of Kauai, Hawai‘i, March 2006 (USGS 0001). “This study also measured the peak rate of inflow from the Ka Loko Ditch to be 205 cubic feet per second; the peak inflow rate for Moloa‘a Ditch, which also flows into Ka Loko Reservoir, was not determined.

information would indicate that the dam was overtopped, provided that the dam crest had not been modified and raised since 1982 and that the surveys are accurate to the degree implied by the noted elevation values.

Dr. Mejia observes, “This mode of failure is clearly plausible because the reservoir lacks a spillway and possible inflows into the reservoir would have been sufficient to exceed the likely minimum overflow required to start erosion of the embankment.”<sup>233</sup> It is not clear how the reservoir could have reached the “flood stage elevation determined by the USGS, if the dam crest elevation was as surveyed by the SCS.” He concludes, however, that this failure mechanism is compatible with the observed characteristics of the breach and the estimated location of the low point on the dam crest, as described above, and that the available information “would indicate that the dam likely failed by overtopping.”

### **2.19.3.2 Internal Erosion and Piping**

This mode of failure would involve internal erosion of the embankment or foundation materials by seepage leading to formation of a conduit(s) or pipe(s) through the embankment and/or foundation and eventual collapse of the crest. For a non-erodible foundation, the mechanism of failure is described by Dr. Mejia as follows:

Seepage through the embankment initiates internal erosion by dislodging soil particles into voids within the embankment or at the downstream face. This process leads to increased seepage gradients and upstream migration of the internal erosion towards the reservoir (following a path of least resistance), resulting in the formation of a conduit(s) through the embankment. As the upstream end of the conduit approaches or reaches the reservoir, the gradients through the conduit increase leading to increased flow velocities and rates of

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<sup>233</sup> Dr. Mejia notes, “A minimum height of overtopping is required to cause flows with sufficient power to start erosion of the embankment materials. Such minimum height is related to the type of materials and vegetation cover on the embankment crest, the downstream slope, and the foundation toe, as well as on the height of the embankment and inclination of the slope.”

internal erosion. The increased rates of erosion lead to enlargement of the conduit and eventual unrestricted flow from the reservoir to the downstream face. Typically (although not necessarily), the conduit will continue to enlarge under sustained flows until the embankment collapses into the conduit causing collapse of the crest. Once the crest collapses, release of the reservoir occurs as flow through a weir, with continued erosion of the embankment and enlargement of the breach.

Although this failure mechanism is possible, it does not appear to be consistent with the observed characteristics of the breach. Such a failure mechanism would seem unlikely to have led to the aforementioned erosion pocket located north of the crest remnant. It is also difficult to envisage how a piping failure would have caused large flows over both rock ridges enclosing the lower bench, given the reservoir volume released and the final size of the breach. However, because the actual failure mechanism appears to have been very complex, a piping failure mechanism cannot be dismissed with full confidence without determination of the crest elevation profile prior to the breach, further examination of the breach characteristics, and detailed analytical modeling of the failure.

A variant of a piping mechanism would be one resulting from transverse cracks that might extend across the embankment crest. If the reservoir level were to rise above the bottom of the cracks, internal erosion would be initiated by seepage through the cracks. The cracks would be progressively enlarged by the seepage flows eventually leading to release of the reservoir. Such type of cracks could result from desiccation of the embankment materials under a prolonged period of dry weather. However, this mode of failure seems inconsistent with the past performance of the dam given past recorded episodes of rapid reservoir filling. The failure mechanism would also seem unlikely to have led to the previously noted erosion pocket.

### **2.19.3.3 Structural Instability and Deformation**

This mode of failure begins with structural instability, slumping, or excessive deformation of the embankment resulting in lowering of the crest. If the crest were to be lowered below the level of the reservoir (or the reservoir were to rise above the level of the lowered crest), overtopping would lead to breaching of the embankment.

Alternatively, cracking resulting from the dam deformation could lead to a piping failure.

Dr. Mejia writes, with regard to this type of failure:

The statistics of past dam failures are such that structural instability and excessive deformation under normal loads has been seen less frequently in embankment dams after many years of operation than otherwise. Thus, those statistics would

indicate that on the average, and assuming all other conditions remain constant, the likelihood of structural instability and excessive deformation under normal loads decreases with the age of embankment dams.

In addition, this mode of failure would seem inconsistent with the past performance of the dam. Although, it is possible that it could have been initiated by progressive changes in seepage patterns that would have led to embankment instability. There is no evidence, however, that such changes occurred or were in progress.

He goes on to caution, however, that although not the case in the Ka Loko Dam failure, “structural instability and excessive deformation may be induced by extreme loads such as earthquakes.” He warns that past experience indicates that structural instability and deformation are of particular concern for dams built by hydraulic filling subjected to strong earthquake shaking.

#### **2.19.4 Discussion of Modes of Failure**

Dr. Mejia summarizes the risks and concerns that these various potential modes of failure illustrate:

Although the mechanism of failure cannot be inferred with certainty at this time, recognizing the potential failure modes described above provides guidance for developing recommendations to prevent this type of failure in the future. The potential failure modes illustrate the types of risks that dams in Hawaii face, and an understanding of such modes is helpful in determining the types of future actions that can be taken to minimize those risks.

The evidence discussed above suggests that Ka Loko Dam failed due to overtopping probably as a result of the lack of a spillway in the reservoir. Thus, the dam failure is a harsh reminder of the need to require dam reservoirs to have an adequate spillway capable of passing potential inflows into the reservoir without dam overtopping or other detrimental effects. The circumstances of this incident and the characteristics of the dam also highlight the need to consider other potential failure modes such as internal erosion and piping, and structural instability and deformation, and the need to require actions to prevent such failure modes from developing in other dams in the future.



He then warns again of the risk that hydraulic fill earthen dams may fail due to earthquakes, and the need to consider such types of failures in developing recommendations to improve dam safety in Hawai‘i.

## **2.20 Subsequent Response to the Breach**

The Army Corps of Engineers, in conjunction with DLNR, conducted a visual inspection of Ka Loko Dam on March 18, 2006, after the dam had failed. That inspection noted:

On the date of this limited visual inspection, there appeared to be no further immediate threat to the safety of the dam. No assurance can be made regarding the dam’s condition after this date. Subsequent adverse weather and other factors may affect the dam’s condition.<sup>234</sup>

This report provides five photographs showing the failure of Ka Loko shortly after it occurred. The report notes, “No spillway observed/found”<sup>235</sup> While in draft, Major General Lee inquired whether it should be mentioned that Ka Loko Reservoir has no spillway. In response, staff noted, “no spillway was seen,” but they were unable “to determine that no spillway exists.”<sup>236</sup> The report does not mention how Ka Loko breached. Emails indicate that the Corps’ initial assessment, perhaps based upon Hawai‘i Civil Defense reports, was that “Kaloko Reservoir Dam overtopped and failed.”<sup>237</sup> Later reports from Hawai‘i Civil Defense only mention the breach, and do not indicate overtopping.<sup>238</sup> The FEMA report of March 14 also does not draw such a conclusion,

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<sup>234</sup> ACE Visual Dam Safety Inspection Report (March 19, 2006 (Rev)) at 10 (ACE 10).

<sup>235</sup> *Id.* at 9

<sup>236</sup> Corps emails of April 4, 2006 (ACE 553, 554).

<sup>237</sup> Corps Situation Report No. 9, March 21, 2006 (ACE 240); see also Corps email of March 14, stating Hawai‘i Civil defense reported that Ka Loko Dam overtopped and failed (ACE 504).

<sup>238</sup> See, e.g., Hawai‘i Civil Defense Situation Report # 8 (March 18, 2006) (ACE 742).

noting only that the dam had suffered a breach.<sup>239</sup> Similarly, no such conclusion is in the final report from the Corps.

The report of Morita dam includes six photographs of that dam and reservoir after it had been breached.

After Ka Loko Dam failed, the Corps in coordination with DLNR provided assistance with emergency visual dam inspections under the Emergency Flood Protection Act of 10965 (PL 84-99). Initially, this assistance was limited to dams on the island of Kaua‘i and was for a limited duration following the Ka Loko disaster. The Corps, in conjunction with DLNR and Civil Defense, inspected 54 dams. The Corps provided operations and technical expertise. The report of the emergency visual inspections of the Kaua‘i dams was provided to DLNR on March 31, 2006.<sup>240</sup> That report notes that the inspection teams found at least one of the following detrimental conditions existed on every dam they inspected on Kaua‘i, which if not corrected could lead to future failure:

- 1.1. Detrimental Vegetative Growth
- 1.2. Reduced Spillway Capacity
- 1.3. Spillways without erosion protection
- 1.4. No spillways
- 1.5. Seepage not monitored or documented
- 1.6. Overly steep embankment slopes
- 1.7. Outlet works in need of repair
- 1.8. Outlet works improperly abandoned
- 1.9. Location of outlet works unknown by owner
- 1.10. Unlined outlet tunnels
- 1.11. Erosion

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<sup>239</sup> FEMA Incident Report RIX-HI-06 (March 14, 2006) (ACE 505).

<sup>240</sup> Letter of Lt. Col. David Anderson to Peter Young, DLNR, of March 31, 2006 (ACE 14); see also <http://www.Hawai‘i.gov/dlnr/reports/dam-inspections/>

The report goes on to note that “Many of the dams have lacked basic monitoring and maintenance programs for what appears to be an extended period.”<sup>241</sup> That report’s general recommendations are worth quoting in detail:

**General Recommendations:**

The following recommendations are general in nature. Specific recommendations for each dam considered under the emergency visual inspection are in the individual inspection forms.

- All dams should be inspected by a professional engineering service with experience in design, construction, operation, inspection, and evaluation of dams. The consultant should review this report, previous inspection reports, design and construction documentation, conduct detailed evaluations, and provide detailed recommendations for safe dam operation. Many of the dams are between 80 and more than 100 years old, and therefore not designed and constructed to current safety standards.
- Prepare or update operation plans and emergency action plans.
- Implement a dam safety training program for dam owners and operators.
- Update Hazard Potential Classification of dams in the inventory.
- Institute a program for periodic inspections of dams.
- Install survey monuments and instrumentation for monitoring horizontal and vertical movements and phreatic water levels within the body of the dam embankment, as warranted.

**A. Immediate:**

Clean spillways of vegetation, siltation and other obstructions and keep them cleared at all times to retain full capacity.

**B. For implementation before next rainy season:**

A path or roadway along the groins, the toe and to the outlet discharge point should be cleared and maintained to facilitate periodic inspection, maintenance, monitoring of seepage conditions, and remediation, if required.

Inspect the outlet works and its appurtenances to ensure that gate valves are operable (not frozen in a closed position) and that conduits through the embankment are in satisfactory condition and free of breaks and fractures that could lead to seepage and piping along the periphery of the conduits

Fill in low spots on the crest.

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<sup>241</sup> *Id.* at 3 (ACE 17).

Evaluate spillway capacity for adequacy.

Perform a hydrologic/hydraulic (Hill) evaluation to assess the adequacy of the spillways and the potential for floodwaters to overtop the dam.

Monitor spillways during future high pools and evaluate for possible remediation.

Evaluate the stability of the slopes. If flattening of the slopes is required incorporation of measures to resolve clearing, and potential seepage issues on the downstream slopes may be possible.

Monitor seepage to ensure piping (i.e. internal erosion) does not develop. Install a V-notch weir, Parshall flume, etc., to collect and measure the rate of seepage, if observed, with respect to changes in reservoir pool elevation.

The slopes should be clear and visible for inspection. Clear all underbrush. Trim trees as close to the ground without killing them. The existing trees have been allowed to grow so large in some cases that there is concern that seepage and piping (i.e. internal erosion) along root systems may develop. There is additional concern that cutting and killing the trees will lead to rotten roots and greater potential for such seepage and piping. A more in depth evaluation of the condition must be performed to determine how best to remediate the condition.<sup>242</sup>

On April 10, 2006, Governor Lingle requested that the President declare a major disaster for the State of Hawai‘i as a “result of heavy rains and flooding caused by a unique low pressure trough system beginning Monday, February 20, 2006, through Sunday, April 2, 2006.”<sup>243</sup> The letter goes on to note that for “more than forty days, continued periods of heavy rains and flooding have drenched various communities across Hawai‘i.”<sup>244</sup> The letter also explains the extraordinary steps taken by the State in response to the situation:

In response to the situation, I have taken appropriate action under State law and directed the execution of the State Plan for Emergency Preparedness on Monday, February 20, 2006, in accordance with the laws of the State of Hawai‘i and Section 401 of the Stafford Act. On March 2, 2006, I declared a disaster for the counties of Maui, Kauai, and the City and County of Honolulu, as a result of the

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<sup>242</sup> *Id.* at 4-5 (ACE 18, 19).

<sup>243</sup> Letter from Governor Lingle to the President of April 10, 2006 (ACE 801).

<sup>244</sup> *Id.*

extensive damage in these counties and extensive damage anticipated to be caused through Friday, March 3, 2006. As a result of continued periods of heavy rains and flooding, on March 12, 2006, I issued a supplementary proclamation expanding the declared disaster for the counties of Hawai‘i, Maui, Kauai, and the City and County of Honolulu. As a result of continued periods of heavy rains from Monday, March 13, 2006, through Tuesday, March 14, 2006, Kauai and the City and County of Honolulu were again subjected further to localized flooding, saturated ground conditions, extensive damage, the failure of one darn, the threat of the failure of other dams, the loss of homes, and the loss of life. Because the National Weather Service forecasted continued periods of heavy rains and flooding through Sunday, March 19, 2006, I issued a second supplementary proclamation on March 14, 2006, expanding the declared disaster through Sunday, March 19, 2006. As a result of continuing periods of heavy rains and flooding, I issued a third supplementary proclamation on March 18, 2006, expanding the declared disaster through Sunday, March 26, 2006. I issued a fourth supplementary proclamation on March 28, 2006, expanding the declared disaster through Sunday, April 9, 2006, with authorities to continue all efforts and measures to complete the inspection of all reservoirs in the State in order to identify any reservoir that poses a danger to the public and take appropriate actions to protect the public health and safety. Finally, I requested a U.S Department of Agriculture Secretarial disaster designation for the County of Kauai and City and County Honolulu due to crop damage and losses.<sup>245</sup>

Thereafter, DLNR enlisted the Corps to provide technical assistance with dam inspections on the islands of Maui, O‘ahu, Hawai‘i and Moloka‘i under the Corps’s Interagency and International Service program. These inspections were done on a reimbursable basis with State funds in conjunction with Federal Emergency Management funds. The visual inspections of these dams, and reinspections of four dams on Kaua‘i, were conducted from April 3 through April 8, 2006.<sup>246</sup>

## **2.21 The Continuing Need for Reliance on Hawai‘i’s Water Systems**

Despite the great tragedy of the breach of Ka Loko Dam, the farmers dependent upon the reservoir still needed water to carry on their farming. In March 2006, PUC staff reported:

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<sup>245</sup> *Id.* at 2 (ACE 802).

<sup>246</sup> Final Report, Statewide Dam visual conditions Survey, April 2006.

Kilauea Irrigation Company, Inc. (“KICI”). Due to the breach of the Kaloko Dam, KICI’s reservoir storage, on March 14, 2006, it does not appear that KICI will be providing non-potable irrigation water to its 20-agricultural customers in the future, or if ever. For the most part KICI’s facilities are operable. There is the real possibility that KICI will cease irrigation service if the dam/storage can not be repaired or whether it will be allowed to be repaired and restored. (The customers do have potable water access from the Kauai County Department of Water.) KICI does not have ownership interest in the dam however, it does hold the water license from the state Department of Land and Natural Resources that fills the dam. KICI does have a water rights agreement with the Mary Lucas Trust to draw water from the reservoir. KICI will be providing a status report noting the damage and impact to its customers. Approximately, 200-300 million gallons of water burst from the dam washing away two residences causing the death of two residents – six individuals are still missing and presumed dead.<sup>247</sup>

The report goes on to note:

Contrary to public sentiment to dismantle the dam, staff has received two calls from farmers asking for the Commission’s support to sustain KICI’s operation. An informal meeting of the farmers and legislators has been called for tomorrow in Kilauea to convince legislators for the need of irrigation water and the viability of agriculture on the northshore.<sup>248</sup>

Despite the PUC’s reasonable apprehension, KICI has in fact been able to continue providing water to its customers. How long it can continue to do so is, of course, an open question.

The future of diversified agriculture in Hawai‘i depends in large measure on the continued use of its water systems developed in the plantation era. The most comprehensive study of the status of the plantation era water systems was conducted by the Hawai‘i Department of Agriculture in 2003 and 2004.<sup>249</sup> That study notes the importance of these water systems to diversified agriculture, and observes:

There is an urgent need to develop a comprehensive statewide agricultural water use and development plan to bring an orderly sense to the current transitional period following plantation closures. There is no organized effort by any central

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<sup>247</sup> PUC Staff Report from Kaua‘i for March 2006, at 4 (PUC 825).

<sup>248</sup> *Id.* at 4, n. 3 (PUC 825).

<sup>249</sup> See Department of Agriculture, State of Hawai‘i, “Agricultural Water Use and Development Plan” (Revised: December 2004) <http://www.Hawai‘i.gov/dlnr/cwrm/planning/awudp.htm>.

authority to plan and coordinate the future of the thousands of acres of former sugar and pineapple lands and the complex irrigation systems associated with those lands.<sup>250</sup>

There is need for these water systems for uses in addition to diversified agriculture as well. They may be required by municipal water systems. They may have potential for creation of hydroelectric power.<sup>251</sup> More recently, reliable access to these water resources, and the cost of rehabilitating irrigation systems as part of the water infrastructure necessary to support ethanol production, has become an important consideration in the discussion of the future of biofuels in Hawai‘i.<sup>252</sup>

## **2.22 Natural Forces and Earthen Dams**

Natural forces can place great stress on all water systems, and Hawai‘i’s antique dams are vulnerable to these forces. Earthquakes and weather are of particular concern.

Earthen dams account for more than 95% of dams in Hawai‘i’s Dam Safety Program inventory.<sup>253</sup> Following the October 15, 2006 earthquakes,<sup>254</sup> the Earthquake Engineering Research Institute describes damage to several of these dams:

Most dams in Hawai‘i are old earthen berm reservoirs built during the plantation era for irrigation purposes. At least two dams cracked along their crests, while at least two others showed clear evidence of incipient slope

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<sup>250</sup> *Id.* at 20.

<sup>251</sup> One author notes approximately 20 hydroelectric plants built in conjunction with plantation irrigation systems. Carol Wilcox, “Sugar Water: Hawai‘i’s Plantation Ditches” 168 (1996). A 1981 study by the U.S. Department of Energy estimated that hydroelectric power could generate 28 percent of the combined electricity needs of the Neighbor Islands. U.S.D.O.E., “Hydroelectric Power in Hawai‘i – A Reconnaissance Survey” (February 1981) at 1. See <http://www.Hawai‘i.gov/dbedt/info/energy/publications/>.

<sup>252</sup> Rocky Mountain Institute, “Hawai‘i Biofuels Summit Briefing Book” (August 8, 2006) at 5-6. See <http://www.Hawai‘i.gov/dbedt/info/energy/publications/>.

<sup>253</sup> Department of Land and Natural Resources: Engineering Division, Hawai‘i Flood Management News, 1 (June 2006).

<sup>254</sup> On October 15, 2006, Hawai‘i experienced a 6.7 and 6.0 earthquake, centered on the Big Island. Thereafter, ACE, in conjunction with the Federal Emergency Management Agency (“FEMA”), deployed a team of eight dam safety specialists to the state’s four major islands to provide dam safety inspections in support of FEMA post-earthquake assessments. ACE assisted Hawai‘i civil defense DLNR officials with assessments of 84 high-hazard dams.

failure on their embankments. Two dams located above Waimea were drained after excessive seepage, and “water boils” were observed five days following the earthquakes. The State Department of Land and Natural Resources had in place post-earthquake dam inspection procedures that call for inspections of dams within 75 miles of the source of an earthquake of between magnitude 6 and 7. The U.S. Army Corps of Engineers was undertaking these comprehensive inspections.<sup>255</sup>

Earthen dams are susceptible to liquefaction during an earthquake.<sup>256</sup> “Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Liquefaction and related phenomena have been responsible for tremendous amounts of damage in historical earthquakes around the world.”<sup>257</sup> Sheffield Dam, an earthen dam in California, suffered a flow failure triggered by the Santa Barbara Earthquake in 1925. A 300 ft section (of the 720 feet long dam) moved as much as 100 ft downstream.<sup>258</sup> The disturbance needed to trigger flow liquefaction can, in some instances, be very small.<sup>259</sup>

A number of Hawai‘i’s earthen dams were constructed using the hydraulic fill method. Hydraulic fill dams may be particularly susceptible to liquefaction. As Dr. Mejia warns:

Past experience with the performance of embankment dams during earthquakes indicates that structural instability and deformation are of particular concern for dams built by hydraulic filling (such as Ka Loko Dam) subjected to strong earthquake shaking. . . .

Historical evidence suggests that other dams in Hawaii were built by the same method. Because past experience shows that hydraulic fill dams may fail due to earthquakes, the circumstances of this incident highlight the need to consider such

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<sup>255</sup>Earthquake Engineering Research Institute, “Preliminary Observations on the Hawai‘i Earthquakes of October 15, 2006 (December 2006) at 5. See <http://www.eeri.org/>.

<sup>256</sup> University of Washington, “Soil Liquefaction Web Site” at <http://www.ce.washington.edu/~liquefaction/html/main.html>.

<sup>257</sup> *Id.*

<sup>258</sup> *Id.*

<sup>259</sup> *Id.*



types of failures in developing recommendations to improve dam safety in the State.<sup>260</sup>

Similarly, Hawai‘i’s dams are vulnerable to extreme climactic conditions, such as hurricanes and extraordinary rains. Such conditions may become more common. While this is not certain, engineering of dams should take this possibility into account. Dr.

Hamilton observes:

Just as the El Nino/La Nina cycle in the ocean can affect the occurrence of persistent anomalies in Hawai‘i weather in a given winter, longer period variations in ocean conditions may drive even lower frequency modulation of weather conditions. This means that statistics based even on a 50-year record may not sample the full range of relevant climatological conditions. This problem of representativeness of the existing weather record could be even more acute when the possibility of a long term trend in climate is considered.<sup>261</sup>

He goes on to observe, in the context of future climate change:

Despite [their] limitations, the current models do provide some overall guidance for expected rainfall changes in Hawai‘i. The increase in global temperature predicted by the models is associated with increased global evaporation and with increased precipitation. Thus an overall more intense hydrological cycle in the future is extremely likely. There is also a tendency reported for at least some current models to predict that a warmer global climate will be associated with more intense extremes of the hydrological cycle in individual regions, with longer and more extreme periods of both drought and flood anticipated. It should be emphasized again that no reliable detailed predictions specifically for Hawai‘i are now available. However, the global climate perturbations expected over coming decades will almost certainly have a significant effect on the rainfall in Hawai‘i, and any statistical analysis based mainly on the 20th century experience may become increasingly inaccurate as a guide for future planning.<sup>262</sup>

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<sup>260</sup> See Appendix B, Report of Dr. Mejia at 10-11. Based upon the foregoing, Dr. Mejia recommends further review and consideration of the statutory exemption of owners from liability for damages resulting from natural causes such as earthquakes, hurricanes, or extraordinary rains with recurrence intervals greater than 250 years. He writes, “Such recurrence interval seems inconsistent with intervals considered in dam engineering practice in other states and internationally in developing design loads representing natural events for the safety evaluation of ‘high hazard’ dams. Generally, recurrence intervals longer than 1,000 years would be considered for developing design earthquake loads for such dams, and even longer recurrence intervals would be considered for developing design precipitation and inflow flood loads.” *Id.* at 13.

<sup>261</sup> See Appendix B, Report of Dr. Kevin Hamilton at 3.

<sup>262</sup> *Id.* at 4.

### **3 Comparative Analysis of Dam Safety Programs**

This section briefly summarizes the history of dam safety laws in the United States and Hawai‘i, and provides an analysis of how dam safety programs throughout the United States compare to that of Hawai‘i.

A dam safety statute is not the only source of law relevant to dams; Appendix D provides a summary of several other aspects of the law relevant to dams in Hawai‘i. But dam safety programs have been enacted in 49 of the 50 states to specifically address the legal issues associated with dams. Appendix E provides an extensive review of the dam safety laws and regulations (collectively, a “Dam Safety Program”) of each of the 48 other states with such programs.

This section of the report takes the review set out in Appendix E and analyzes the principal provisions of Hawai‘i’s Dam Safety Program and how it compares with that of other states, in an attempt to identify the best practices for the development of such a program, and to see how Hawai‘i’s program can be improved.<sup>263</sup> The analysis has revealed strengths and weaknesses in the current Hawai‘i Dam Safety Program.

The next section of the report then provides recommendations based upon the factual findings set out in the previous section and the analysis of this section. The final section of the report proposes specific revisions to Hawai‘i’s dam safety statutes and regulations.

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<sup>263</sup> Reference materials were obtained from individual state dam safety programs, the Association of State Dam Safety Officials (ASDSO), and the Federal Emergency Management Agency (FEMA).

### **3.1 Dam Law in the United States and Hawai'i**

#### **3.1.1 Early Federal Legislation**

In 1824 the U.S. Supreme Court interpreted the Commerce Clause to permit the Federal government to finance and construct river improvements for flood control.<sup>264</sup> This led to a series of Flood Control Acts that were specific to the control of the Mississippi River at the end of the 19th century.<sup>265</sup> Federal dam legislation began with the drafting of the Rivers and Harbors Acts of 1890 and 1899, requiring the Army Corps of Engineers to regulate construction of dams built to harness hydroelectric power.

In reaction to the rapid construction of hydroelectric dams during this time, Congress passed the General Dam Act of 1906 and 1910, regulating hydroelectric facilities on navigable waterways. This Act, however, applied only to federal or state-owned obstructions affecting navigable waterways and did not expressly appropriate funds for flood control. Dam safety and protection of human life and property did not become a legislative priority until the passage of the 1936 Flood Control Act.

In March of 1936, several enormous storm systems moved across the northeastern United States killing 107 people. The Flood Control Act of 1936 was enacted in response to these disasters, and provided for flood relief throughout the country.<sup>266</sup> Most of the responsibility for planning and designing federal flood control projects was assigned to the Army Corps of Engineers.

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<sup>264</sup> Arnold, Joseph L., *The Evolution of the 1936 Flood Control Act* pg 4, Office of History, U.S. Army Corps of Engineers; Washington, D.C. (c 1988) <http://www.usace.army.mil/publications/eng-pamphlets>

<sup>265</sup> *Ibid* at 5

<sup>266</sup> *The Evolution of the 1936 Flood Control Act* pg 65

### 3.1.2 The National Dam Inspection Act of 1972

Under the authority of the Flood Control Act of 1936, the Corps developed into the foremost flood control agency in the nation. This legislation gave the Federal Government the ability to create dams and levees to prevent floods. It did not create any sort of controls or regulations for private dams, however. This fact was brought to light by a series of dam failures in the 1970's, most notably the Buffalo Creek Flood of February 26, 1972. The Buffalo Creek devastation prompted the passage of the National Dam Inspection Act of 1972 ("Federal Dam Inspection Act"),<sup>267</sup> which authorized federal regulation of privately owned dams for the first time.

The Federal Dam Inspection Act authorized the Army Corps of Engineers to inventory and inspect privately owned dams in the U.S.<sup>268</sup> Unfortunately, funding for full implementation of the act was not provided until a series of catastrophic dam failures in 1976 and 1977.<sup>269</sup> The Federal Dam Inspection Act provided funding for the Honolulu Army Corps of Engineers and Hawai'i Department of Land and Natural Resources ("DLNR") to complete an inventory of dams in the State of Hawai'i and perform Phase I inspections of 53 high hazard private dams between 1977 and September 1981.<sup>270</sup>

Responsibility for regulation of dams shifted from the federal government to state government in 1986, when Congress passed the Water Resources Development Act of 1986 ("WRDA"). The WRDA granted individual states the power to legislate and

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<sup>267</sup> Public Law 92-367, August 1972

<sup>268</sup> The Federal Role in Water Resources Management, pg 12, Office of History, U.S. Army Corps of Engineers; Washington, D.C. (c 1986) <http://www.usace.army.mil/publications/misc/91-ps-1/c-1.pdf>

<sup>269</sup> 1976 Teton Dam failure which caused \$1 billion in damages and 14 deaths Idaho; another flood in Johnstown Flood in 1977 caused by the failure of the Laurel Run Dam; and the 1977 Toccoa Falls Bible College Dam failure in Georgia that killed 39 Bible college students, citing Gov. Rendell speech concerning the Dam Safety Initiative, July 19, 2004

<sup>270</sup> The Federal Role in Water Resources Management, pg 12, Office of History, U.S. Army Corps of Engineers; Washington, D.C. (c 1986) <http://www.usace.army.mil/publications/misc/91-ps-1/c-1.pdf>

oversee sovereign dam safety programs. The legislation reflected a general agreement that non-federal interests should shoulder most of the financial and management burdens for local water resources, and that environmental considerations are intrinsic to water resources planning.<sup>271</sup> As a result of WRDA, in 1986 the Federal government delegated dam safety to the states. Fourteen years later, a uniform set of guidelines was codified in the National Dam Safety Program Act of 2000.

### **3.1.3 National Dam Safety Program Act of 2000**

The National Dam Safety Program Act of 2000 (“NDSPA”) established general guidelines and criteria for individual state dam safety programs. Under NDSPA, FEMA is responsible for coordinating efforts to secure the safety of dams throughout the United States.

The program makes federal funds available to the states. States are primarily responsible for protecting the public from dam failures of non-federal dams and pursuing initiatives that enhance the safety and security of dams posing the greatest risk to people and property. National performance criteria are used to determine a state’s eligibility. The funds are used for inspecting and monitoring dams, training dam operators, analyzing data, purchasing equipment, and assisting in the preparation of Emergency Action Plans (“EAP”) to be followed in the event of a dam failure. The grants have totaled approximately \$3.5 million per year over the last eight years.<sup>272</sup>

The Act allows states to apply for financial assistance in two ways. Primary assistance is available for states attempting to meet the budgeting requirements and ten

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<sup>271</sup> The Federal Role in Water Resources Management, page 1, Office of History, U.S. Army Corps of Engineers; Washington, D.C. (c 1986) <http://www.usace.army.mil/publications/misc/91-ps-1/c-1.pdf>

<sup>272</sup> FEMA Fact Sheet, published at [https://www.fema.gov/pdf/rebuild/national\\_dam\\_safety\\_program\\_fs\\_july\\_2006.pdf](https://www.fema.gov/pdf/rebuild/national_dam_safety_program_fs_july_2006.pdf), July 2006.

criteria outlined in the National Dam Safety Program Act. Advanced assistance is provided to states that meet the primary assistance requirements and are working toward meeting advanced requirements and standards such as FEMA's Model State Dam Safety Program.<sup>273</sup> The Association of State Dam Safety Officials reports that Hawai'i received \$8,657 in NDSPA grants in 1998; \$17,106 in 1999; and a total of \$92,928 from 2000-2002.<sup>274</sup>

### **3.1.4 National Dam Safety Act of 2006**

Congress recently passed the National Dam Safety Act in December 2006, after the House Committee on Transportation and Infrastructure approved it (HR 4981) on September 20, 2006. The National Dam Safety Act reauthorizes the National Dam Safety Program Act of 2000 for an additional 5 years and increases appropriations for the Program.<sup>275</sup>

### **3.1.5 The Hawai'i Dam Safety Act of 1987**

Concurrently with the above federal developments, and to meet the need for dam safety, Hawai'i adopted the Hawai'i Dam Safety Act of 1987, codified in HRS § 179D. This Act protects the health, safety, and welfare of the citizens of the State of Hawai'i by detailing the inspection and regulation of dams in the state.<sup>276</sup> The law defines what constitutes a dam in Hawai'i, the liability for damages caused by a dam failure, and assigns responsibility for dam regulation to the Hawai'i DLNR.<sup>277</sup>

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<sup>273</sup> Introduction to ASDSO's Model State Dam Safety Program (March 1998), p. iii.

<sup>274</sup> From *Success and Challenges: National Dam Safety Program Act 2002*. A summary can be found on the Association of State Dam Safety Officials website located at <http://www.damsafety.org/documents/pdf/Hawai'i.pdf>.

<sup>275</sup> 109th Congress, 2d Sess., S.2735

<sup>276</sup> HRS § 179D – purpose statement

<sup>277</sup> HRS § 179D-6

Under HRS 179D, the DLNR has several powers and responsibilities including establishing design standards for dams, investigating dam operations and maintenance, and approval of construction permits.<sup>278</sup> These responsibilities are detailed in the Hawai'i Administrative Rules (“HAR”) for dam safety, HAR § 13-190, discussed below.

### **3.2 The ASDSO Model State Dam Safety Program**

The Association of State Dam Safety Officials (“ASDSO”) is a non-profit organization that serves as the preeminent non-governmental authority in the United States on federal and state dam safety, drafting strong and effective programs and policies, and serving as a guide for federal and state dam legislation. ASDSO is comprised of dam safety regulators, dam owners and operators, engineering consultants, manufacturers, academia, contractors and other parties interested in dam safety. It is ASDSO’s mission to improve dam safety by: (1) improving the efficiency and effectiveness of state dam safety programs; (2) fostering public awareness; (3) providing leadership through facilitation of inter-organizational, intergovernmental and interstate cooperation; (4) providing assistance to the dam safety community and providing a forum for the exchange of information; and, (5) providing representation of dam safety interests before state legislatures and before Congress.<sup>279</sup>

In an effort to create a guide for state officials initiating or improving state programs, the ASDSO developed the “Model State Dam Safety Program” in 1987 (amended in 1997) to reflect the experience of state programs. The most recent draft of the ASDSO’s Model State Dam Safety Program was published by FEMA in March 1998

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<sup>278</sup> HRS § 179D-6

<sup>279</sup> See ASDSO's website located at [www.damsafety.org](http://www.damsafety.org).

as FEMA 316.<sup>280</sup> The Model State Dam Safety Program is meant to outline the key components of an effective dam safety program. It does not mirror any particular state program nor does it supplant any state’s existing criteria. It is hoped that it will give guidance in the development of more effective and sustainable state programs that will ultimately eliminate the unnecessary risks created by unsafe dams.

As briefly discussed above, states may receive advanced assistance from the federal government under the National Dam Safety Program for working toward meeting advanced requirements and standards outlined in the ASDSO’s Model State Dam Safety Program. Appendix A of the Model State Dam Safety Program provides a recommended Model Dam Safety Act for states dam safety programs to follow.

Research has suggested that the various state dam safety programs may have been based on a model act, such as the ASDSO’s Model State Dam Safety Act, or on a Federal dam safety program, such as the programs established by the Corps of Engineers or the Bureau of Reclamation. Many aspects of the state dam safety programs are similar, even using similar language in many instances. Of course, each state also has provisions that are unique to the state in order to affect state policies, goals and needs.

### **3.3 Summary of Current Hawai‘i Dam Safety Program**

Under HRS §179D-6, the Board of Land and Natural Resources (“BLNR”) is authorized to establish regulations governing dam safety and to administer the Hawai‘i Dam Safety Program,<sup>281</sup> and has established such regulations.<sup>282</sup> BLNR’s administrative

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<sup>280</sup> FEMA has partnered with the ASDSO in the effort to secure the safety and security of dams. FEMA Fact Sheet, published at [https://www.fema.gov/pdf/rebuild/national\\_dam\\_safety\\_program\\_fs\\_july\\_2006.pdf](https://www.fema.gov/pdf/rebuild/national_dam_safety_program_fs_july_2006.pdf), July 2006.

<sup>281</sup> HRS §179D-6

<sup>282</sup> See, Hawai‘i Administrative Rules (HAR) §13-190-1 *et. seq.*



duties include, but are not limited to: conducting or overseeing dam investigations; entrance upon (private) dam property to perform such investigations and other statutory duties; establishment of an application and approval process for all dam or reservoir projects; and administering filing fees for the application process.<sup>283</sup>

Under the Hawai‘i Dam Safety Program, no person may construct, operate, or remove a dam without Department of Land and Natural Resources (“DLNR”) approval, which is expressly granted only after demonstrating satisfactory compliance with prescribed design and construction standards.<sup>284</sup> Persons who violate these standards or any approved permit conditions, or negligently or willfully fail or refuse to comply with DLNR orders, face civil liability not exceeding \$500 per day, each day constituting a separate offense.<sup>285</sup>

The State, BLNR, DLNR, its officers and employees, are granted certain legal immunities under the Hawai‘i dam safety statutes.<sup>286</sup> Dam or reservoir owners and operators, however, are not relieved of the “legal duties, obligations, or liabilities incident to the ownership or operation of a dam or reservoir; provided that an owner or operator of a dam or reservoir shall not be liable for damages as a result of only natural causes such as earthquakes, hurricanes or extraordinary rains of an average recurrence interval in excess of two hundred fifty years.”<sup>287</sup> Persons aggrieved or adversely affected by an order or action of BLNR are entitled to administrative and judicial review in accordance with State laws.<sup>288</sup>

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<sup>283</sup> HRS §179D-6

<sup>284</sup> HAR §13-190-20

<sup>285</sup> HRS §179D-8; HAR §13-190-4

<sup>286</sup> HRS §179D-4

<sup>287</sup> HRS §179D-4.

<sup>288</sup> HRS §179D-7; HAR §13-190-5.

Hawai‘i dams and reservoirs are governed exclusively by HRS §179D and HAR §13-190, and supplemented by Guidelines and other materials provided by the DLNR. Some states offer a slightly more complex legislative scheme by regulating dams and reservoirs within a larger statutory system or under related provisions found throughout the states' statutes.<sup>289</sup> While such schemes are comprehensive in their applicability and scope, persons unfamiliar with state laws may not be aware of the concurrent provisions in two or more different subchapters or areas of that state’s dam safety laws. In comparison, the present Hawai‘i statutory framework offers a more user-friendly scheme in terms of rule and materials accessibility.

Some states have opted to promulgate only one set of laws, supplemented by state enforcement agency information bulletins and federal guidelines (i.e. FEMA, ASDSO).<sup>290</sup> Apparent benefits to state dam safety programs governed only by one set of laws include streamlining of the dam safety process, increased enforcement agency involvement, and simplified access to compliance laws. Most states parallel Hawai‘i wherein a set of administrative rules follow mandates set forth in the corresponding state statute. This method of law promulgation is effective in that clear objectives and guidelines are established via statute, and complemented by more technical and exhaustive procedural rules and regulations.

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<sup>289</sup> Pennsylvania dams and reservoirs, for example, are regulated by Pennsylvania Statutes (“Dam Safety and Encroachments”) and three (3) areas of the Pennsylvania Code: Chapter 105, “Dam Safety and Waterway Management”, which controls wetlands, dredging, and other activities affecting state waterways; Subchapter B, “Dams and Reservoirs”; and Subchapter K, “Disbursements of Monies from the Dams and Encroachments Fund”. Similarly, New York segregates its dam safety regulations into two separate sections: Use and Protection of Waters; and Dam Safety Regulations.

<sup>290</sup> See, e.g., VT: Vermont Statutes Annotated

In comparison with the other forty-eight (48) state dam safety statutes, rules, and regulations,<sup>291</sup> Hawai‘i’s Dam Safety Program is below average in funding, enforcement provisions and clarity of authority. A critical aspect of this report addresses funding for the Hawai‘i Dam Safety Program. The DLNR’s program budget is approximately \$164,000 per year; all but \$2,000 of that amount is for salary.<sup>292</sup> The staff activities are evenly divided between Dam Safety and Flood Control, meaning the Dam Safety Program has the equivalent of approximately 1.5 full time employees.<sup>293</sup> According to the ASDSO’s Model State Dam Safety Program, there should be 7.9 technical FTEs and 2.4 clerical/administrative FTEs per 200 dams.<sup>294</sup> The ASDSO’s 2005 Dam Safety Program Management Tools (“DSPMT”) Report to the National Dam Safety Review Board reported that Hawai‘i’s Dam Safety Program should have 6.5 FTEs.

Currently, the only source of funding for the Hawai‘i Dam Safety Program outside of the State and Federal government to pay for salaries and department expenses comes from a one-time \$25 application fee to construct or modify a dam or reservoir. Other states charge the owners of dam and reservoirs significant filing fees, annual fees, taxes and interest from loans in order to fund the dam safety program. These state dam safety laws demonstrate that the Hawai‘i Dam Safety Program could similarly be funded in part by revenues collected from dam safety program fees, interest accrued from loans to dam owners, and/or monetary penalties for program noncompliance (enforceable through property liens). These funding mechanisms could provide DLNR sufficient supplemental funds to effectively administer a strengthened State Dam Safety Program.

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<sup>291</sup> All but one state, Alabama, has enacted dam safety laws.

<sup>292</sup> DLNR New Release (March 21, 2006) (DLNR 4032).

<sup>293</sup> *Id.*

<sup>294</sup> See, Model State Dam Safety Program, FEMA 316, March 1998, Appendix I.

The state can contribute financing necessary to subsidize the remainder of program costs through money apportioned by the legislature and federal grants made available for individual state dam safety programs.

Another critical aspect of a successful dam safety program is enforcement, an area which Hawai‘i’s laws appear to be inadequate. Currently, anyone who violates any provision of the Hawai‘i dam safety laws can be charged a civil penalty not exceeding \$500 per day.<sup>295</sup> In addition, if an emergency action needs to be taken and the owner fails to take such action, DLNR may do the work at the owner’s expense.<sup>296</sup> Many states, however, take this a few steps further by specifically allow the agency in charge of the dam safety program to place a lien on the owner’s property for the costs associated for performing the emergency action, and to take control of the dam or reservoir until an emergency has been abated. Some states also have higher limits on the penalties allowed to be charged to a noncompliant owner, and allow the department to institute an action in civil court against the noncompliant owner for monetary penalties and injunctions. Criminal charges can also be asserted against a noncompliant owner, punishable by fine, imprisonment, or both. All of these enforcement mechanisms provide significant incentive for the owner to perform the work. Other aspects of the Hawai‘i dam safety laws and regulations in comparison to other states are discussed below.<sup>297</sup>

### **3.4 Citation and Title**

**HRS** [§179D-1] This chapter shall be known and may be cited as the “Hawai‘i Dam Safety Act of 1987.”

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<sup>295</sup> HRS §179D-8

<sup>296</sup> HAR §13-190-41(a)

<sup>297</sup> Individual states are noted in the footnotes for direct reference. The states listed in the footnotes are intended to provide examples of states implementing the noted provisions and do not necessarily identify all states that have adopted the same or similar provisions.

**HAR** ~ Not addressed.

Hawai‘i’s Dam Safety Program is governed by HRS §179D-1 *et seq.*, otherwise known as the “Hawai‘i Dam Safety Act of 1987.” This title appears to be standard amongst the dam safety programs across the nation, as most state dam safety statutes are titled: [State] Dam Safety Act of [Date of Enactment].<sup>298</sup> The current title does not need modification unless the statutes and rules are materially amended. For example, if substantive amendments impacting the purpose of the Act are authorized for revision, such as the inclusion of a low interest loan program, a title change would be appropriate to the “Hawai‘i Dam Safety Program and Finance Act.”

### **3.5 Jurisdiction/Powers of Department**

**HRS** ~ [§179D-6] The State grants BLNR authority to administer the Dam Safety Program and create rules governing the structural integrity of dams and reservoirs to protect life and property.

**HAR** ~ Not addressed.

**HRS** ~ [§179D-2] Inspection and regulation of construction, operation, and removal of certain dams are a matter of regulation under the police powers of the State.

**Summary** [§179D-5] It is unlawful for any person to construct, operate, or remove a dam or other regulated artificial barrier, unless in compliance with State dam laws.

[§179D-5] This Chapter does not apply to the design and construction of dams, reservoirs, and appurtenant works existing before promulgation of this Chapter (June 6, 1987), but this Chapter shall establish standards consistent with such design and construction for the operation, maintenance, and repair thereof, which shall be applicable to those dams, reservoirs, and appurtenant works existing before June 6, 1987.

[§179D-6.] The board of land and natural resources shall administer the dam safety program established by this chapter. In carrying out this chapter, the board shall cooperate with the United States government or any of its agencies, other state agencies, and the county governments or any of their agencies. . .

**HAR** ~ [§13-190-1(a,b, and c)] Purpose of this chapter is to establish rules governing the design, construction, operation, maintenance, enlargement, alteration, repair, and removal of dams, reservoirs, and appurtenant works.

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<sup>298</sup> Some state rules or acts do vary from this standard, such as the “Rules and Regulations for Dam Safety and Dam Construction” (CO), the “Official Dam Safety Regulations” (AK), “Safety of Dams and Reservoirs Act” (NE), and the “Dam Safety and Encroachment Acts” (PA).

This chapter applies to the operation, maintenance, enlargement, alteration, repair, and removal of dams, reservoirs, and structures built before enactment of HRS § 179D (Hawaii Dam Safety Act), but not to design and construction of such dams or reservoirs. Rules do not apply to artificial barriers less than six (6) feet in height, regardless of storage capacity or to artificial barriers with maximum water storage capacity less than fifteen (15) acre-feet, regardless of height.

[§13-190-3] Other exempt structures include: highways, roadfills not used as dams, dams not within regulated specifications, refuse embankments, structures storing water below lowest point on ground, and dams for which no loss of life is expected and damage will occur only to owner's property upon failure.

The current Hawai'i Dam Safety Act and corresponding regulations apply to all dams and reservoirs located within the State except: (1) those that are owned by the federal government;<sup>299</sup> (2) those which do not meet the definition of a "dam" as defined by HAR §13-190-2 (discussed below); and (3) those expressly exempted under HAR §13-190-3. These exemptions are similar to most other state laws.<sup>300</sup>

Pursuant to Hawai'i statutes, the Board of Land and Natural Resources ("BLNR") is the administrator of the Hawai'i Dam Safety Program. As part of its duties, the BLNR shall cooperate with other State, federal, and county agencies<sup>301</sup> and shall: (1) establish rules, policies, requirements or standards governing the design, construction, operation, maintenance, enlargement, alteration, repair, removal, and inspection of dams, reservoirs, and appurtenant works; (2) conduct investigations and the collection of data; (3) require owners to submit reports; (4) be authorized to enter private land to conduct investigations or inspections; (5) require the owners to apply for, and obtain written approval from BLNR for the construction, enlargement, repair, alteration or removal of any dam or

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<sup>299</sup> Federally owned dams and reservoirs are governed and regulated by federal laws. There is only one federally owned dam in Hawai'i which is operated by the Department of Defense.

<sup>300</sup> Many states also include an exemption for dams licensed by the Federal Energy Regulatory Commission (FERC) under the Federal Power Act, 16 USCS §§ 792 *et seq.*, which regulates the interstate transmission of electricity, natural gas, and oil, and licenses and inspects hydropower projects. This exemption is probably not necessary in Hawai'i due to the absence of any hydropower dams licensed by the federal government.

<sup>301</sup> Other states also grant authority to the lead agency to consult with other departments. See, PA; KS; OK; IA; ID; ME; OK.

reservoir; and (6) require filing fees by rules to accompany each application to construct, enlarge, repair, alter or remove any dam or reservoir.<sup>302</sup>

The BLNR is assisted by DLNR. The DLNR has authority to inspect the construction, enlargement, repair, alteration or removal of a dam or reservoir, to order the dam owner to revise, modify or change its plans and specifications for safety reasons, and to order the cessation of work on a dam or reservoir if the work is not in compliance with the approved plans and specifications.<sup>303</sup> Under present DLNR structure, the State Dam Safety Program is officially operated by two staff members with assistance from the Chief Engineer at DLNR and other DLNR staff: a Flood Control and Dam Safety Section Head, and a Dam Safety Engineer.<sup>304</sup> As these numbers show, present DLNR staffing (or lack thereof) may at times pose challenges regarding complete implementation of the State Dam Safety Program.<sup>305</sup>

The majority of state Dam Safety Programs is administered by a similar department, board, commission or division with similar responsibilities,<sup>306</sup> or by a Chief Engineer, Director or other individual in charge of a department or division.<sup>307</sup> The department, board, commission or division is often related to natural resources or conservation,<sup>308</sup> water resources,<sup>309</sup> or ecology or environment<sup>310</sup>.

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<sup>302</sup> HRS §179D-6

<sup>303</sup> HAR §13-190-30

<sup>304</sup> The ASDSO's 2005 Dam Safety Program Management Tools (DSPMT) Report to the National Dam Safety Review Board reported that Hawai'i's Dam Safety Program should have 6.5 FTEs.

<sup>305</sup> HAR §13-190-22 allows State engineers to be "assisted by other specialists as required" which in theory should alleviate some of the staffing problems faced by DLNR. In practice, however, Hawai'i's dam safety program does not have sufficient funds to retain outside specialists or to hire more staffing. While other states also include a provision allowing the lead agency to consult with other specialists, this investigation has not revealed whether and how it is actually done.

<sup>306</sup> AK; CO; CA; FL; GA; ID; IL; IN; IA; MA; MI; MS; MN; MO; MT; NH; NY; OH; OK; OR; PA; TX; VT; VA; WA; WV

<sup>307</sup> CT; ID; KS; KY; LA; NJ; NM; ND; OH; SD; UT

<sup>308</sup> AK; GA; IL; IN; IA; MI; MN; MO; MT; NY; OH; TX; VT

<sup>309</sup> AZ; CA; CO; ID; NH; OK; OR; SD

In most states, the lead agency or individual is authorized to create rules, make executive decisions (e.g. determining project approval, permit terms, conditions, and restrictions), and issue findings or orders, while also performing technical program duties such as conducting and evaluating inspections. The lead agency or individual may utilize state employed engineers or retain outside registered professional engineers to perform the technical duties set forth by statute or rule.<sup>311</sup>

In a few states, the county Superior Court has jurisdiction on all applications to authorize the building or raising of any dam in such county.<sup>312</sup> There is otherwise no provision in the law for state jurisdiction over dam safety.

In comparison to Hawai‘i’s dam safety laws, some states have clearer directives that specifically grant the lead agency or individual with more power over the administration and enforcement of the dam safety program. For example, some state statutes grant authority to the lead agency to issue administrative orders requiring the dam owner to make repairs or modifications, to draw down water in the reservoir, to breach the dam and/or to take whatever steps necessary to protect life and property.<sup>313</sup> The lead agency may also enter land and make necessary repairs at the owner’s expense when the owner is unavailable or refuses or fails to make repairs.<sup>314</sup> Hawai‘i’s statutes do not specifically grant this authority to BLNR or DLNR, leaving some ambiguity as to whether they have the authority to do so.

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<sup>310</sup> CT; FL; GA; MA; MS; PA; WA

<sup>311</sup> AK; CT; DE; GA; KS; ME; MO; NH; NJ; NM; NC; OR; RI

<sup>312</sup> DE

<sup>313</sup> AK; AR; CT; FL; GA; IL; IN; KS; KY; ME; MD; MA; MI; MT; NE; NV; NH; NM; NY; ND; OH; OK; OR; RI; SD; TN; TX; VA; WV; WI; WY

<sup>314</sup> GA; ID; KS; KY; MO; MT; NV; OH; SD; TN; WA; WY



Some states also allow the lead agency to suspend, revoke or modify any certificate or approval to maintain, construct, alter or repair a dam or reservoir.<sup>315</sup> Other states have inserted eminent domain<sup>316</sup> or temporary taking<sup>317</sup> provisions within their statutes, creating a powerful enforcement tool currently unavailable under Hawai‘i dam law.<sup>318</sup> While BLNR and DLNR are granted authority to enter onto private property to conduct any investigation or inspection, or initiate any emergency actions deemed necessary, BLNR and DLNR are not explicitly authorized to seize discretionary control over structures owned or operated by negligent or non-compliant persons.<sup>319</sup> The power to “temporary take” a dam or reservoir has been empowered to some states until it has been determined that any threats to life and property posed by the suspect dam or reservoir have been abated.<sup>320</sup> One state even allows a permanent taking of the dam or reservoir if, after two years from state finding that the dam is in disrepair, the municipality desires to take such property.<sup>321</sup>

The above provisions are not clearly spelled out in Hawai‘i’s dam safety statutes and regulations, which makes it questionable whether BLNR and DLNR have these necessary administrative and enforcement powers. The proposed legislation included with this report incorporates most of these provisions in order to make the dam safety laws more clear regarding BLNR and DLNR powers.

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<sup>315</sup> IA; KY; FL; GA; MT; NJ; TN; WV; WY

<sup>316</sup> CO; IA; MS; TX

<sup>317</sup> AK; CA; CT; KS; LA; OK; PA; SC

<sup>318</sup> See, CO; VT.

<sup>319</sup> In case of an emergency, HAR §13-190-41 allows the DLNR through its authorized agent to take any action on the dam that are immediately necessary to safeguard life and property at the owner's expense if the owner fails to do so, but it does not say anything about seizing control over the dam or reservoir.

<sup>320</sup> SC

<sup>321</sup> See, NH (An extensive compensation, public notice, and property description process is required, when applicable.)

### **3.6 Liability and Immunity**

**HRS (Summary)** ~ [§179D-4] Nothing in HRS 179D constitutes a waiver of State immunity, and no action or failure to act under this Chapter shall be construed to create any liability in the State, BLNR, DLNR, or its officers or employees, for the recovery of damages caused by such action or failure to act.

No State action or inaction shall be construed to relieve an owner or operator of a dam or reservoir of the legal duties, obligations, or liabilities incident to the ownership or operation of a dam or reservoir, however, an owner or operator of a dam or reservoir shall not be liable for damages as a result of only natural causes such as earthquakes, hurricanes or extraordinary rains of an average recurrence interval in excess of two hundred fifty (250) years.

[HRS §179D-6(4)] Upon entry onto private property to conduct inspection or investigation, BLNR or its agents are liable for their willful or negligent acts.

**HAR** ~ Not addressed.

Under HRS §179D-4, the State, BLNR, DLNR, and its officers and employees, are immune from liability for acting or failing to act under the dam safety laws. The statute, however, appears to establish that the DLNR, or its agents, are liable for their willful or negligent acts committed while on a private landowner's property to conduct an inspection. The laws might be interpreted to include conducting negligent inspections or willfully or negligently harming the property or persons on the property, but it may not be entirely clear.

These provisions regarding state immunity and exemption from liability are similar to other state statutes. Some states, however, are more specific with regard to their state immunity provisions, by disallowing all actions against the state or its agents and employees for the recovery of damages caused by the partial or total failure of a dam or reservoir, or by the operation of a dam or reservoir, or by an act or omission in connection with approval of construction, issuance of enforcement orders relating to

maintenance or operation of the dam or reservoir, or control or regulation of the dam or reservoir.<sup>322</sup> Hawai‘i’s legislation should also contain this more specific language.

As for the liability of dam owners, Hawai‘i dam statutes provide that land owners bear the burden of maintaining water impoundment structures on their property or under their control. Dam owners are only relieved of liability incident to the ownership of a dam if an injury was the result of natural causes such as earthquakes, hurricanes or extraordinary rains of an average recurrence interval in excess of 250 years.

Most states do not relieve the owner or operator of a dam from the legal duties, obligations and liabilities arising from such ownership or operation, regardless of earthquakes, hurricanes or a 250 year storm.<sup>323</sup> One state, however, exempts dam owners from liability for damages caused by dam failure or reservoir overflow unless such dam failure or overflow was the proximate cause of the dam owner’s negligence.<sup>324</sup> This provision is not recommended for inclusion into any modification of current Hawai‘i dam laws as it tends to decrease owner responsibility for dam failures resulting in decreased incentive to inspect and maintain dams.

Another provision one state has adopted that tends to decrease owner incentive to inspect and maintain dams is an exemption for all stockholders, officers, or board members of a company from liability if the company has valid insurance coverage for damages caused by their dams or reservoirs, such as a breach.<sup>325</sup> This provision, while not recommended for adoption, warrants some consideration of a law that requires all dam owners and operators to purchase and maintain insurance for their dams. Having suitable

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<sup>322</sup> AK; AZ; CA; CT; DE; FL; GA; ID; IL; IN; LA; ME; MA; NJ; NC; OK; SD; WI

<sup>323</sup> AK; AZ; CO; CT; DE; GA; ID; IL; MA; MN; MI; MO; NE; NM; NC; OK; PA; RI; SC; TN; TX; VT; VA; WV

<sup>324</sup> CO

<sup>325</sup> CO

insurance coverage is not specifically required by Hawai‘i statute or regulation, and is certainly not required of current dam owners that already own a dam. The Legislature should consider whether dam owners should be required to maintain insurance and/or show that they are financially capable to own a dam or reservoir.

### **3.7 Definitions**

**HRS** ~ [§179D-3] Defines: Appurtenant Works, Board (BLNR), Dam, Department (DLNR) Owner (any individual, firm, association, organization, partnership, estate, trust, corporation, company or governmental unit who owns, controls, operates, maintains, manages, or proposes to construct a dam or reservoir), Person (any individual, partnership, corporation, company, association, organization, or State department, agency, or political subdivision), and Reservoir.

**HAR** ~ [§13-190-2] Defines: Alteration, Appurtenant Works, Board, Dam, Day, Department, Design Water Level, Engineer, Enlargement, High, Moderate, and Low Hazard, Maximum Water Storage Elevation, Owner, Person, Repair, Reservoir, Spillway Crest, and Storage Capacity.

- “Dam”: any artificial barrier, including appurtenant works that is: (1) twenty-five (25) feet or more in height from natural streambed measured at downstream toe of barrier; or (2) capable of impounding fifty (50) acre-feet or more of water.
- Hazard Classifications (3):
  1. High Hazard: dam failure most probably results in loss of lives and extensive property damage
  2. Moderate Hazard: dam failure possibly results in loss of lives and appreciable property damage
  3. Low Hazard: dam failure would result in only minimal property damage

The Hawai‘i statute and administrative rules define some important terms used in the dam safety laws and regulations, but omit some terms that are integral to dam safety and design, and are too ambiguous with others. Upon revision of current laws, inclusion of additional definitions is highly recommended. This nationwide assessment has shown that proper administration of the dam safety regulations requires technical engineering acumen beyond that of a layperson; therefore, a comprehensive set of definitions is necessary to ensure that the general public will be better able to understand the law.

### 3.7.1 Dams

Under current Hawai‘i law, “dams” are defined as any artificial barrier, including appurtenant works that is: (1) twenty-five (25) feet or more in height from the natural streambed measured at downstream toe of the barrier; or (2) capable of impounding fifty (50) acre-feet or more of water.<sup>326</sup> Excluded from this definition are barriers less than six (6) feet in height regardless of storage capacity, and reservoirs with maximum storage capacity less than fifteen (15) acre-feet regardless of height.<sup>327</sup> Most states provide similar exemptions in their laws.<sup>328</sup> There is the potential for owner abuse, however, when there are exemptions for dams that do not meet certain minimum criteria. For example, a person wanting to build a dam may intentionally design and construct a dam or multiple individual dams that are less than six feet in height, or that have a maximum storage capacity less than 15 acre-feet, in order to avoid regulation by the State. In this situation, even if the dam could be a high hazard potential dam by classification, it cannot be regulated under the dam laws because it is not dam by definition. This situation could pose a great danger to public safety if the state cannot regulate the dam and require the owner to make modifications. A similar situation can arise if the State happens to find an old dam that is not currently listed in the National Inventory of Dams that is less than 6 feet in height or has a maximum storage capacity less than 15 acre-feet. If the dam needs to be repaired in order to avoid a catastrophe, the State cannot order the repairs because it is exempted from regulation by law.

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<sup>326</sup> HRS §179D-3; HAR §13-190-2

<sup>327</sup> *Id.*

<sup>328</sup> PA also exempts from permitting under the dam safety provisions “Maintenance of field drainage systems constructed and continued to be used for crop production”. NY has included a provision exempting some impoundment structures utilized to hold waste storage, treatments, disposal or containment of other materials other than water. Such structures are apparently regulated under other state laws governing waste storage facilities.

As the above examples show, there is a need to modify the exemption provisions so that the State can still regulate a dam should it pose a danger to human life or property. At the same time, any modification needs to achieve some balance so that the State is not regulating every water-impounding structure such as residential swimming pools.

One way some states have structured their dam safety statutes is to only allow an exemption for dams or reservoirs determined solely by the state to not have significant effect on public or environmental health or property.<sup>329</sup> This provision is not advisable because there is the potential for development downstream of the dam to occur in the future that may make an exempt dam potentially harmful to life or property. If the dam is exempt, and thus unregulated, there is a greater chance the dam will be forgotten about and its hazard classification will not be updated to account for the downstream development.

A better way that some states have handled this is by exempting dams that do not meet certain criteria, provided that they are not high hazard classification dams.<sup>330</sup> Such a provision ensures that any dams capable of causing loss of life and/or significant property damage upon failure are properly regulated, regardless of size and storage capacity. Due to the large number of earthen dams in the State that may near “exempt” status because of their small size or limited storage capacity – yet still pose a threat to human life or property –the current definition should be modified so that the State may still regulate a dam that is “high hazard” despite its height and/or storage capacity. The definition should also include “Moderate Hazard” dams since they may also threaten human life and cause

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<sup>329</sup> AK

<sup>330</sup> CT; MN; MA; PA; OH; WA (Dam not exempted if high or moderate hazard).

significant property damage, warranting close regulation.<sup>331</sup> The State may not yet have identified all high hazard or moderate hazard dams; however, including such a provision will allow the State to regulate such dams once they are found, even if the height of the dam is less than 6 feet or its maximum storage capacity is less than 15 acre-ft. An example of this modified definition for “dam” can be found in the proposed legislation below.

### **3.7.2 Engineer**

The current definition for “engineer” is very broad and includes all registered professional engineers licensed with the State of Hawai‘i, even those engineers without any experience with dam construction, alteration, removal, inspection, maintenance or operation.<sup>332</sup> This could be disastrous if an unqualified and/or inexperienced engineer (although licensed by the State) inspects and approves a dam when the engineer does not know what to look for to determine the dam’s strength and stability. In addition to requiring an “engineer” to be a licensed professional engineer, many states require that licensed professional engineer have experience or expertise in the field of dam or reservoir safety or management;<sup>333</sup> some states even establish a minimum experience level of 3 to 5 years in the field of dams and reservoirs.<sup>334</sup> In keeping in line with this common sense nationwide policy, a similar definition should be adopted by the Hawai‘i statutes and regulations. A recommended definition is: “engineer’ means a qualified professional engineer. The term ‘qualified professional engineer’ as used in this law is intended to mean an individual who has a background in civil engineering and; (a) Is a licensed

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<sup>331</sup> WA

<sup>332</sup> HAR §13-190-2

<sup>333</sup> AK; AZ; CO; GA; IL; MA; MS; MO; NH; NM; NC; OH; PA; VT

<sup>334</sup> NH

engineer; (b) Is competent in areas related to dam investigation, design, construction, and operation for the type of dam being investigated, designed, constructed or operated; (c) Has at least five (5) years of relevant experience in areas such as investigation, design, construction, reconstruction, enlargement, repair, alteration, maintenance, operation, breach, removal or abandonment of dams; (d) Understands adverse dam incidents, failures and the potential causes and consequences of failures; and (e) Continues with necessary training to keep abreast of the state of the practice in dam safety engineering.”<sup>335</sup> This definition is provided in the proposed legislation.

So that the public knows which engineers qualify for dam or reservoir work under state restrictions, some states require the agency in charge of dam regulation to maintain a list, and to only allow inspections and the like to be performed by the engineers on the list.<sup>336</sup> It is recognized, however, that Hawai‘i may not have an appropriate number of engineers that meet these requirements. To mitigate any potential for shortage of qualified engineers, many states explicitly authorize their lead dam safety agencies to seek and employ outside consultation when necessary.<sup>337</sup> HAR §§13-190-22, 30 and 40 provide BLNR and DLNR with that authority.

### **3.7.3 Hazard Potential**

The current Hawai‘i statutes and regulations omit the definition for “hazard potential.” It is appropriate to include this definition in order for the public to understand that a dam’s hazard potential is not an indication of a dam’s structural stability, but rather an indication of the results that could occur from the breach. Other states do define this

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<sup>335</sup> See, ASDSO Model State Dam Safety Act §1014 (modified section (c) to 5 years experience instead of 10).

<sup>336</sup> KS; UT

<sup>337</sup> AK; CT; DE; GA; KS; ME; MO; NH; NJ; NM; NC; OR; RI; UT



term.<sup>338</sup> An appropriate definition is: “Hazard Potential means the possible adverse incremental consequences that result from the release of water or stored contents due to failure of the dam or mis-operation of the dam or appurtenances. The hazard potential classification of a dam does not reflect in any way on the current condition of the dam and its appurtenant structures (e.g., safety, structural integrity, flood routing capacity).”<sup>339</sup>

### **3.7.4 High hazard**

The current definition under the Hawai‘i regulations states, “High hazard means a dam’s failure would most probably result in the loss of lives and extensive property damage.”<sup>340</sup> Note that “lives” is plural, meaning more than one life. The definition should be modified so that any probable loss of human life, even that of only one person, would result in a high hazard classification for the dam. This would be more in line with the definition used by most other states.<sup>341</sup> A modified definition for “high hazard” is provided in the proposed Administrative Rules.

### **3.7.5 Moderate hazard**

If the current definition for “high hazard” is changed in accordance with the above, the definition for “moderate hazard” should also be changed to account for the change to the definition for “high hazard.” In other words, if a “high hazard” dam is a dam whose failure will probably result in the loss of life, a “moderate hazard” dam cannot also be a dam whose failure will probably result in the loss of life as the current definition reads. A more modern definition for “moderate hazard” is a dam whose failure

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<sup>338</sup> AZ; CT; IN; ME; MA; MI; NC

<sup>339</sup> ME; NC; WA. See also, ASDSO Model State Dam Safety Act §1016

<sup>340</sup> HAR §13-190-2.

<sup>341</sup> AK; AZ; AR; CO; CT; DE; GA; ID; IL; IN; IA; KS; KY; MD; MA; MI; MN; MS; MT; NE; NV; NJ; NM; NY; NC; OH; OK; SC; SD; TX; VA; WV. See also, ASDSO Model State Dam Safety Act §1015.

will not result in the loss of human life, but will result in major economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.<sup>342</sup> This definition can be found in the proposed Administrative Rules.

### **3.7.6 Low hazard**

The definition for “low hazard” should also be changed to reflect modern standards. In many states, the failure of a “low hazard” dam results in no probable loss of life and low economic and environmental losses other than to the owner’s property.<sup>343</sup> A suggested definition for “low hazard” can also be found in the proposed Administrative Rules.

### **3.7.7 Owner**

The current definition under the Hawai‘i laws and regulations states, “‘Owner’ means any person who owns, controls, operates, maintains, manages, or proposes to construct a dam or reservoir.”<sup>344</sup> This definition could include people that do not legally own the land upon which the dam or appurtenant works is located, which appears to be too broad. A person that does not have a legal interest in the land could not build a dam on the land or otherwise make changes to the land via construction, so they should not be encompassed by the definition for “owner.” Any orders by BLNR or DLNR to perform remedial work on the dam to someone other than the legal owner of the land, but is technically an “owner” by definition, is worthless since that person cannot legally make changes to the land. Accordingly, the true “owner”, and the one the order should go to, is the person that has legal title to the land. Other states make this definition more specific

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<sup>342</sup> *Id.* See also, ASDSO Model State Dam Safety Act §1024

<sup>343</sup> *Id.* See also, ASDSO Model State Dam Safety Act §1017

<sup>344</sup> HRS §179D-3; HAR §13-190-2

by limiting the definition to “any legal entity of any kind holding legal title to the dam”<sup>345</sup> or to any person that has a “right, title or interest in or to the property upon which the dam or appurtenant works is located.”<sup>346</sup> A similar definition is recommended for adoption by Hawai‘i dam safety laws so that only those people who have a legal interest in the land or the dam are owners. This more specific definition could make it easier to identify who is responsible for maintaining the dam and to determine who is liable for the State’s costs that are chargeable to the dam “owner.”

### **3.7.8 Person**

The current definition for “person” may not encompass all possible entities and legal authorities that exist, such as municipalities, trusts, LLCs, LLPs, trustees, and receivers, which could be interpreted to exclude such entities and authorities from regulation, liability and/or responsibility. Some states make the definition more broad by including the catch-all phrase “or other legal or commercial entity.”<sup>347</sup> This way, there is no doubt that municipalities, trusts, LLCs, LLPs, trustees, and receivers are included.

A recommended modified definition is: “‘Person’ includes any natural person, partnership, firm, association, organization, corporation, municipality, municipal authority, trust, receiver or trustee, LLC, LLP, or company, or any State department, agency, or political subdivision, or any other commercial or legal entity.”<sup>348</sup> Whenever used in a section prescribing and imposing a penalty or sanction, the term ‘person’ shall include the members of an association or organization, and the officers of a corporation, company, municipality or municipal authority.”

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<sup>345</sup> CT; MA

<sup>346</sup> IN; NV; ND; OK

<sup>347</sup> ME; MD; MS; NH; ND; OK; TN; VT (legal or commercial entity); WV; WA (other entity whatsoever)

<sup>348</sup> AK; CT; PA

### 3.7.9 Spillway

The current definitions define a “spillway crest” but do not include a definition for “spillway,” which should be included for clarity and completeness.<sup>349</sup> A suggested definition is: “a device which safely diverts the flood of a dam without endangering its safety or integrity.”

## 3.8 Program Funding, Fees, and Costs

**HRS (Summary)** ~ [§179D-6(7)] Appropriate filing fees must accompany each application, as required under HRS and HAR.

**HAR** ~ [§13-190-20(d), §13-190-21(c)] A non-refundable filing fee of \$25.00 shall accompany each application for construction, enlargement, alteration, repair, or removal; provided that no fee is required of any federal, state, or county agency. Owners pay engineering inspection costs during dam or reservoir construction, alteration, or removal. [§13-190-30] The State, at its own expense, may conduct periodic inspections to determine compliance with approved plans and specifications.

[§13-190-40] (a) Owners shall provide for the adequate and timely maintenance, operation, and inspection of their dams and reservoirs and shall be responsible for any engineering and geologic investigations which may be required to insure public safety. (c) [DLNR], from time to time, but not less than once every five years, either with its own engineers or by consulting engineers of its selection, shall make inspections of dams and reservoirs at State expense...

[§13-190-41] Upon declaration of emergency by DLNR, owners shall take actions necessary to protect life and property, or DLNR shall through its authorized agents – at the owner’s expense.

Hawai‘i’s dam safety program is funded by moneys set aside by the State Legislature from the general tax fund and by federal grants collected through the National Dam Safety Program Act of 2000 (discussed above). The DLNR’s program budget appropriated by the Hawai‘i Legislature is approximately \$164,000 per year; all but \$2,000 of that amount is for salary.<sup>350</sup> Current Hawai‘i dam legislation explicitly provides that the State shall pay for any periodic, routine dam inspections during construction and “from time to time” afterwards, for the purpose of ascertaining compliance with approved

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<sup>349</sup> See, AZ; CO; GA; LA; MA; MI; MO; NM; NV; NJ; OR; PA; SD; WA; WV

<sup>350</sup> DLNR New Release (March 21, 2006),(DLNR 4031).

plans and specifications.<sup>351</sup> Accordingly, the remaining \$2,000 that is not used for salaries must be used to pay for DLNR costs necessary for program administration, such as travel, consultation and equipment. Under the current Hawai‘i dam safety program, the only funding from sources other than the government, comes from a one-time \$25 application filing fee from dam or reservoir owners for a permit to conduct regulated dam work. No other fees are charged to the dam owner. The \$25 application fee may have been an appropriate amount when the original Hawai‘i Dam Safety Act was enacted in 1987, but with inflation, rising costs and expenses, it is now probably considered a relatively low figure.

To ensure that the dam safety program is sufficiently funded, a few states’ laws require the legislature to set aside a minimum amount for the program each year.<sup>352</sup> Many states also impose upon dam owners much higher or more frequent fees incident to dam ownership, such as one-time dam or reservoir registration fees,<sup>353</sup> application filing fees for permits to construct, enlarge, modify, repair or remove a dam or reservoir,<sup>354</sup> and annual fees to maintain or operate a dam or reservoir;<sup>355</sup> Fees are often dependent on the reservoir storage or impoundment capacity<sup>356</sup>, dam height<sup>357</sup>, hazard classification<sup>358</sup>, or an

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<sup>351</sup> HRS §13-190-30(a), and HRS §13-190-40(c).

<sup>352</sup> AZ; CA; NJ

<sup>353</sup> CT; MA

<sup>354</sup> AK; AZ; AR; CA (fee is based on construction costs: for the first \$300,000, a fee of 3%, for the next \$700,000, a fee of 2%, for the next \$1,000,000, a fee of 1 ½%, for the next \$1,000,000, a fee of 1 ¼%, for the next \$2,000,000, a fee of 1%, for the next \$2,000,000, a fee of ¾%, and for all costs in excess of \$7,000,000, a fee of ½%); CO; DE; ID; IN; KS (\$100 - \$1,000 per application); MA; MI; MN; NH; NM; NC; OH; OK; PA; WA; WV; WI

<sup>355</sup> KS; PA; CA; AK; MT; NH; OH; WV

<sup>356</sup> A fee is assessed per acre-foot or other volume-based measurement of the reservoir. See, TX (\$1 per acre-foot for non-irrigation uses and 50 cents per acre-feet of storage); AR; ID; NV

<sup>357</sup> See, NE (\$200 for dams <25 feet, \$300 for dams 25 ft. to 50 ft., and \$400 for dams > 50 ft.); AZ; CT; CA; MI; OH

<sup>358</sup> In Pennsylvania, a dam classified as “high hazard” requires an application for permit fee of \$3,000, plus an additional fee of \$350 for a bridge, culvert or other structure in excess of 100 feet in length upstream to downstream which encloses a regulated water of the state; CT; NH; OH; WV

estimate of total project costs (including construction costs, engineering costs, and costs for investigations and testing)<sup>359</sup>. If the actual costs exceed the estimate by a certain percentage, a penalty is assessed<sup>360</sup>.

Some states even adjust their fees according to the state's fiscal growth factor<sup>361</sup>, or depending on the revenue generated by the program and the cost of program administration during the previous fiscal year,<sup>362</sup> and cost-of-living increases<sup>363</sup>. One state requires that any fees charged to the owner must reflect the true costs of the state agency to administer the dam safety program.<sup>364</sup> Some states offer returns when a permit application is denied, which is appropriate when application fees are of significant value.<sup>365</sup>

In addition to the collection of fees to help fund the dam safety program, some states charge dam owners the state's costs to conduct dam inspections,<sup>366</sup> dam, water, or reservoir taxes,<sup>367</sup> fines and penalties for noncompliance with laws, regulations and

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<sup>359</sup> AK; CA; OK; NM; OH (Filing fees are based on detailed cost estimates for the proposed work: for the first \$100,000, a fee of 4%, for the next \$400,000, a fee of 3%, for the next \$500,000, a fee of 2%, and for all costs in excess of \$1,000,000, a fee of ½%); CO (\$3 fee for every \$1,000 of project cost estimate); AZ (The department shall collect a reasonable filing fee which shall be based on the estimated cost of the dam); AR; MA; NC; VT; WI

<sup>360</sup> *Id.*

<sup>361</sup> WA

<sup>362</sup> CA (The program director is authorized to adjust fees based on the state agency's determination of whether or not sufficient revenue was generated to operate the program); NC (fees are adjusted to stay within statutory limitations).

<sup>363</sup> CA (Fee adjustments, however, must typically be submitted to the state legislature for approval before the modified fees can take effect in the following fiscal year).

<sup>364</sup> WA

<sup>365</sup> TX

<sup>366</sup> KS; VT; CO; OK; NM (The State Engineer assesses fees for filing forms, reviewing plans, and construction inspections. Initial filing fee: \$25.00; for each review of construction costs: \$2 per \$1,000 of the estimated construction cost; dam inspections: \$100/8-hour day and actual and necessary traveling expenses; for filing a proof of completion of works: \$25.00; and there are others for change of ownership, copies of dam safety records.); AZ; CT; IN; MA; MT; ND; WA; NJ

<sup>367</sup> NY (The state's costs and expenses to administer the dam safety program for a particular dam are submitted to the local taxing authority, which then assesses a charge against the real property on which the dam or reservoir is located.)

orders,<sup>368</sup> and interest collected on money loaned to dam owners to construct, repair or remove a dam or reservoir.<sup>369</sup>

While it is not clear if Hawai‘i’s non-refundable \$25 fee goes into the dam safety program or whether it goes into the state’s general fund for expenditure for other programs, many state laws create a revolving, non-expiring dam fund to which fees, taxes, interest and penalties are deposited, and from which program administration expenses are withdrawn.<sup>370</sup> In addition to funding their dam safety program, some states create such funds to provide the dam safety program an account from which owners may take out a low-interest loan for necessary dam or reservoir improvements or repairs.<sup>371</sup> Interest accrued from the loans goes back into the special fund for use by the dam safety program. As these state fund models demonstrate, a “dam safety program fund” is a viable method of financing an effective state program, ensuring that moneys collected from the program stay within the program.<sup>372</sup> Staffing must be available to administer the fund if such a fund is considered.

State laws demonstrate that there are a variety of ways to obtain funding for the dam safety program other than from moneys set aside by the state legislature or from the federal government<sup>373</sup>, and that the financial structure can be complex or very simplistic.

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<sup>368</sup> CO; KS; OH

<sup>369</sup> AZ; AR; NJ

<sup>370</sup> NE; ME; NC; OH; KS; PA; CO; CA; AR; NJ; ID; NH; VT; WV

<sup>371</sup> AZ; MN; ME; NJ

<sup>372</sup> Rather than creating a separate fund, some states opt for collected fees to be remitted to the State Treasurer for management and allocation only for the dam safety program. See TX; AR (fees are deposited directly into the Arkansas Water Development Fund to be used by the commission as provided by law, and shall not be paid to the State Treasury).

<sup>373</sup> As discussed above, federal funds are also available for state dam safety programs through the National Dam Safety Program Act of 2000. Relying on federal funds as a major source of funding, however, is not recommended since federal money may dry up at some point in the future leaving the dam safety program severely underfunded. This may have been what happened to Hawai‘i’s current dam safety program after it was enacted in 1987. The lesson here is that federal funds should never be considered as part of the program’s budget, since that money can be taken away at anytime. It is recommended instead that a dam

However a dam safety program is funded, the ultimate goal is to be able to accomplish all requirements set forth by statute and regulation, particularly during times of emergency where large amounts of staffing and revenue may be required in a short period of time to perform remedial actions in order to protect life and property. There is room in the current Hawai‘i legislation to improve the funding mechanisms so that money can be contributed to the dam safety program from sources other than the State and federal government. The funding provisions in the current Hawai‘i dam safety legislation should be modified accordingly. Proposed legislation for funding a new dam safety program can be found in Section 5 below.

### **3.9 Permit/Approval Process**

Under existing Hawai‘i laws, an owner must obtain approval of construction plans and specifications from BLNR prior to constructing, enlarging, repairing or removing a dam or reservoir. HAR §13-190 has one set of requirements to obtain approval for dam “Construction and Enlargement” and a different set of requirements to obtain approval for dam “Removal, Repair, or Alteration.” A more detailed application must be submitted to obtain approval for “Construction and Enlargement.” Some states also make this distinction<sup>374</sup> while others require the same information for all types of proposed work on a dam or reservoir.<sup>375</sup> While the information submitted with the application may be different for “Construction and Enlargement” in comparison to “Removal, Repair or Alteration”, the review and approval process is usually the same. Accordingly, the discussion regarding the review and approval process for “Construction or Enlargement”

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safety program be able to fund itself through the collection of taxes, fees and reimbursements, with federal funds set aside for emergencies.

<sup>374</sup> CA; CO; DE; FL; GA; OH

<sup>375</sup> CT; IL; IN; MD; SC; WV



is applicable to “Removal, Repair or Alteration” and will not be repeated in the “Removal, Repair or Alteration” section.

### **3.9.1 Permit for Dam Construction or Enlargement**

**HRS (Summary)** ~ [§ 179D-6(5)] Dam owners are required to apply for and obtain written BLNR approval of plans and specifications to construct or enlarge any dam or reservoir.

**HAR** ~ [§13-190-20] No person shall construct or enlarge any dam or reservoir until an application for such work – made on forms furnished by DLNR – has been filed and written approval of construction plans and specifications is obtained from BLNR. A separate application shall be filed for each dam or reservoir and shall contain: name and address of applicant and owners or owners of subject land; legal land description; site location; dam, reservoir, and appurtenant works size and type; reservoir storage capacity and surface areas; plans for any permanent instrumentation installations in dam; area of the drainage basin, rainfall, and streamflow records, and floodflow estimates (accurate as attainable); relevant construction drawings, plans, and specifications; proposed commencement and completion times; name and address of person who prepared the plans and specifications; name and address of person who will conduct the proposed works; and other information deemed necessary for BLNR to determine project merits, including any hazards to public health, safety, or welfare, and desirability of permit issuance.

[§13-190-23] BLNR approval shall consider: project cost and magnitude; engineering and physical features involved; existing conditions; and public interest affected. Incomplete applications shall be returned to the applicant, and returned to BLNR within sixty (60) days or such further time granted by BLNR in order to retain application validity. Applications not returned by applicant within specified periods shall be deemed automatically rejected. Construction, alteration, or repair shall commence within five (5) years of BLNR approval date, or such approval is deemed automatically void. Approval can be voided or revoked for reasons outlined under this Appendix (*14. Owner Non-Compliance, Violations, Penalties; and 11. Inspection Process*).

[§13-190-24] Approval for any construction, enlargement, alteration, repair, or removal of a dam or reservoir or its appurtenant works may be revoked in whole or in part for any: material false statement on the application or in any required report; violation of this chapter (§ 190); or violation of the approved plans and specifications. In any revocation proceeding, BLNR shall give prior written notice to the affected owner of the facts or conditions which warrant revocation and provide the owner opportunity for hearing.

[§13-190-31] Upon completion of a new or enlarged dam or reservoir, owner shall provide “written notification” to DLNR signed by the responsible engineer, certifying the project was completed according to approved plans and specifications, accompanied by supplementary drawings or a description showing the dam or reservoir as actually constructed, including: all geological boreholes and grout holes and grouting; permanent location points, benchmarks, and instruments embedded in the structure; tests of concrete and other materials used in structure construction; seepage flows and embedded instrument readings after a year of operation; and, construction problems encountered and

solutions implemented. Drawings or descriptions for dam or reservoir enlargement shall only apply to new construction not already shown in the original plans on file.

To obtain a permit for construction or enlargement of a dam or reservoir in Hawai'i, a dam owner must submit an application that lists/describes: (1) the name and address of the applicant; (2) the owners of the subject land and the legal description of the land; (3) the location, type, size and height of the proposed dam; (4) storage capacity and reservoir surface areas for maximum water storage elevation and design water level; (5) plans for any permanent instrument installations in the dam; (6) area of the drainage basin, rainfall and streamflow records, and flood-flow records and estimates; (7) construction drawings, plans and specifications for the dam; (8) proposed times of commencement and completion of the construction or work; (9) name and address of the person who prepared the plans and specifications; (10) name and address of the person who will construct or enlarge the proposed dam; (11) other information as may be necessary for the board to determine the merits of the proposed construction or enlargement of the dam, including any hazards to the public health, safety, or welfare, and the desirability of issuing a permit.<sup>376</sup> A non-refundable \$25 application fee must be submitted with the application.<sup>377</sup>

HAR §13-190-23(b) provides that failure to submit all of this information results in the application being returned to the applicant, who has 60 days to make any corrections and return it to BLNR or else the application is deemed rejected. BLNR approval of the application is contingent upon the project cost and magnitude, the engineering and physical features involved, the existing conditions, and the public

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<sup>376</sup> HAR §13-190-20(c)

<sup>377</sup> HAR §13-190-20(d)

interest affected.<sup>378</sup> DLNR must be notified within ninety (90) days of project completion, noting any changes to originally approved plans<sup>379</sup>, and at least one week prior to reservoir filling so that State agency representatives may be on-site during initial reservoir filling.

All state dam safety programs require similar information and written approval from the lead agency in charge of the dam safety program in order to construct or enlarge a dam. However, in addition to the information required by Hawai‘i’s dam safety regulations, some states require: (1) the purpose of the dam;<sup>380</sup> (2) the estimated cost of the construction or enlargement<sup>381</sup>; (3) construction plans and specification signed and sealed by the engineer or the certification of a qualified engineer;<sup>382</sup> (4) the applicant to show proof of financial responsibility or security assuring proper construction, operation, maintenance, and termination of projects<sup>383</sup>. Some states also provide the lead agency with the option/discretion to require: (1) geotechnical investigations;<sup>384</sup> (2) subsurface investigations;<sup>385</sup> (3) soil analysis;<sup>386</sup> (4) maps and flood routing information;<sup>387</sup> and, (5) Emergency Preparedness Plans.<sup>388</sup>

In addition to obtaining a permit/approval to construct, enlarge, alter, repair or remove a dam or reservoir, some states require the owner to obtain a separate permit or

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<sup>378</sup> HAR §13-190-23

<sup>379</sup> Any changes to plans or specifications that may affect the structural integrity of the project must be first authorized by the agency.

<sup>380</sup> DE; ME; MD; OH

<sup>381</sup> CA; CO; MD; OH; WI

<sup>382</sup> DE; GA; IA; KY; LA; ME; MA; MT; NM; NC; WA

<sup>383</sup> Examples of such proof are bonds, certificates and insurance. See, AK; PA; WI; CT; MN; AZ; IL; MD; MT; OH

<sup>384</sup> ME; MA; MT; NM; WA; WV

<sup>385</sup> KY; WA

<sup>386</sup> KY; NM; WA

<sup>387</sup> KY; ME; MS; NJ; NY; ND

<sup>388</sup> CO; FL; KS; ND; VA; DE; MA; MT; NJ; NM; OH; VA

approval to impound water.<sup>389</sup> Such permits are issued upon a showing by the dam or reservoir owner that the dam or reservoir is safe to impound water. The dam or reservoir owner cannot impound water without the permit.

Once permits are issued, the applicant must begin the approved work within a certain period of time. Some states prefer to apply a universal expiration period for all permits, often in the range of one to two years,<sup>390</sup> while other states set an expiration period in the permit which depends on the particular dam or reservoir.<sup>391</sup> Owners are required to notify the lead agency prior to commencement of the approved work so that the agency, who is overseeing the construction process, is aware construction has begun and can inspect the work when desired.<sup>392</sup>

In some states, once the application to construct, enlarge, alter, repair or remove is approved the lead agency posts public notices of the approval and allows for a public hearing if requested.<sup>393</sup> This allows the community to voice its concerns regarding the issuance of the permit to an applicant and gives the lead agency some insight as to whether restrictions on the permit should be made.

Some or all of these provisions warrant consideration for adoption by the Hawai‘i Dam Safety Act and/or the Administrative Rules. At a minimum, any proposed changes to the current Hawai‘i Dam Safety Act or Administrative Rules should require an owner to show financial responsibility in order to obtain approval from BLNR to construct, enlarge, repair, alter, maintain or operate a dam or reservoir. This ensures that dam owners can afford to finish construction of the dam and to maintain the dam once it is

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<sup>389</sup> AZ; CA; ID; KY; MS; MO; NV; NM; OK; WI

<sup>390</sup> One year: AZ; ID; MO; MT; NJ; NC. Two years: IN; MA; MI; NH; OH

<sup>391</sup> See, AK (approval valid only during time specified on certificate); MN

<sup>392</sup> PA; AZ (ten days prior)

<sup>393</sup> AR; IL; IA; LA; MI; NM; NY; ND; PA; VT; TX; WV

built. Showing financial responsibility should also be required of an owner purchasing the property on which a dam is located. The new owner should be able to comply with all permit conditions and application requirements. One way states are able to make sure the new owner can comply is by disallowing the transfer of permits/approvals and requiring the new owner to file for a new permit/approval,<sup>394</sup> or by only allowing a transfer of a permit upon approval by the lead agency.<sup>395</sup>

Under current Hawai‘i dam safety laws, projects must be started within five (5) years of permit approval or else the approval is deemed automatically void. This period may need to be shortened or lengthened according to the particular project, since each project is unique. Some projects may have the potential for downstream development to occur within a few years after the approval is given, while others may not have that potential. Thus, in some situations five years may be too long of a period to lapse before the approval becomes void, while in other situations it may be okay.

The proposed legislation and rules in Section 5 demonstrate how many of these provisions could be adopted by the Hawai‘i Dam Safety Act and Administrative Rules.

### **3.9.2 Removal, Repair or Alteration**

**HRS (Summary)** ~ [§179D-6(6)] Dam owners are required to apply for and obtain written BLNR approval of plans and specifications to remove, repair, or alter any dam or reservoir. This includes alteration or removal so that the structure no longer constitutes a dam or reservoir.

**HAR** ~ [§13-190-21] No person shall remove, repair, or alter (defined as “a change to an existing dam or reservoir from the originally approved construction plans and specifications or current condition”) any dam or reservoir until an application for such work – made on forms furnished by DLNR – has been filed and written approval of plans and specifications is obtained from BLNR; provided that owners proposing routine maintenance not affecting the safety of the structure are exempted from this requirement.

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<sup>394</sup> CO

<sup>395</sup> See, GA; IL (No transfer of permits or approvals of the lead agency. The new owner is required to file new application); MN; MO (Transfers only allowed with the lead agency’s approval)

A separate application shall be filed for each dam or reservoir and shall contain such pertinent information and data concerning the dam, reservoir, or appurtenant works as may be required by BLNR, as follows: name and address of applicant and contractor; relevant construction plans and specifications; changes which the work is proposed to effect, with appropriate references to the existing dam or reservoir; proposed commencement and completion times; and other information deemed necessary for BLNR to determine project safety (requirements of this application process may be waived where appropriate).

BLNR approval and revocation processes are identical to those under this Appendix (9. *Dam Construction or Enlargement Permit/Approval Process*).

[§13-190-32] Upon completion of dam or reservoir alteration or repair, owner shall provide “notice of completion” to DLNR signed by the responsible engineer and shall thereafter file with DLNR a completion report, attesting the project was completed according to approved plans and specifications, accompanied by supplementary drawings or a description showing the dam or reservoir as actually repaired or altered, together with all applicable maps, data, records, and information required by DLNR.

[§13-190-33] Upon completion of dam or reservoir removal, owner shall file with DLNR a “report” regarding the manner in which the work was performed and the conditions existing after dam removal. The report shall show a significant portion of the dam was removed to permit safe passage of water down the watercourse across which the dam was situated and that adequate provisions have been made by the owner to prevent downstream damage from remaining portions of the dam due to subsequent flooding. No filing shall be required for routine rundown of reservoirs for normal operations and maintenance not affecting safety of the structure.

Under Hawai‘i law, any owner proposing to repair, alter or remove a dam or reservoir must obtain written authorization from BLNR prior to conducting the work. An application for authorization must include: (1) proposed times of commencement and completion of remedial construction; (2) names and addresses of applicant and contractor; (3) changes which the work covered in the application is proposed to effect, with appropriate references to the existing dam or reservoir; (4) relevant construction plans and specifications; and (5) other information appropriate for a thorough consideration of the safety of such work as may be required by BLNR, unless these requirements are waived by BLNR.<sup>396</sup> This application process may be less comprehensive than the permit process for dam construction or enlargement, discussed in

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<sup>396</sup> HAR §13-190-21

the section above, because there are typically less unknown variables that need to be considered by BLNR since the dam or reservoir already exists on the property.

Like the requirements for obtaining a permit for construction or enlargement of a dam, Hawai‘i’s dam safety laws are not clear whether the designs and specifications need to be signed and sealed by the design engineer. There is also no requirement that the dam owner show financial responsibility to obtain BLNR approval.

As discussed above, the applicant, at a minimum, should be required to show financial responsibility so that BLNR is assured that the proposed work can be completed and properly maintained.<sup>397</sup> Another recommendation is to allow BLNR to set permit expiration periods depending on the particular project, instead of having a universal 5-year period for the approval to expire. Discussions of other recommended provisions regarding the repair, alteration or removal of a dam or reservoir can be found in the subsection above.

### **3.10 Inspection Process**

**HRS (Summary)** ~ [§ 179D-6(2 and 3)] BLNR is authorized to conduct investigations as may be needed for the proper review of a dam, reservoir, and appurtenant works. Such investigations may include data collection, watershed investigations, evaluation of developments affecting stream run-off, review of technological advances in dam safety, submittal of reports from owners, and other studies necessary to facilitate BLNR decisions.

**HAR** ~ [§13-190-40] (a) Owners shall provide for the adequate and timely inspection of their dams and reservoirs. (c) Upon reasonable notice to dam or reservoir owners, DLNR, “from time to time, but not less than once every five years, either with its own engineers or by consulting engineers of its selection, shall make inspections of dams and reservoirs at State expense for the purpose of determining their safety”, but shall require owners, at their own expense, to work reasonably to disclose information sufficient to enable DLNR to determine conditions of dams and reservoirs in regard to their safety, including installation, maintenance, and monitoring of necessary instrumentation.

[§13-190-30] DLNR may make, through its own engineers or by consulting engineers of its selection, periodic inspections at State expense to ascertain compliance with approved

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<sup>397</sup> See subsection 3.8.1 above regarding the financial responsibility of owners.

plans and specifications. At any time as the work progresses, or at any time prior to completion of the project, DLNR may order the owner to modify or revise its plans and specifications for safety reasons; provided the owner may request a hearing before BLNR to review the order. If conditions reveal construction of a safe dam or reservoir cannot be accomplished, approval for construction shall be revoked.

[§13-190-30] An engineer (registered professional engineer, licensed by State of Hawai‘i) shall be in charge of inspections during all construction, enlargement, alteration, repair, or removal of dams or reservoirs. During such activities, the owner shall: perform, at its own expense, work or tests necessary to insure proper compliance with approved plans and specifications; provide adequate supervision by an engineer during construction; and provide any information requested by BLNR to determine conformity with approved plans and specifications.

Hawai‘i’s dam safety regulations provide that owners shall conduct “timely inspection of their dams and reservoirs and shall be responsible for any engineering and geologic investigations which may be required to insure public safety.”<sup>398</sup> Dam owners are also required to notify DLNR if any alarming conditions arise which may adversely affect the safety of the dam or reservoir.<sup>399</sup>

HAR§13-190-40(a) requires the dam owner to “report to the department their maintenance, operation and engineering activities, including piezometric data collection and geologic investigations.” These requirements and objectives for owner required reports appear to be broad and ambiguous in comparison with other state laws.<sup>400</sup> In other states, inspections shall note: (1) physical description of the dam or reservoir; (2) observed deficiencies; (3) analysis of capacity and spillway works; (4) observed changes since last inspection; (5) assessment of hazard classification including engineer opinion; and (6) other relevant information. Some states publish guidelines and require the inspection report to follow those guidelines.<sup>401</sup> This allows the lead agency to make

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<sup>398</sup> HAR §13-190-40(a)

<sup>399</sup> HAR§13-190-40(b)

<sup>400</sup> HAR§13-190-40(a) requires the owner to “report to the department their maintenance, operation and engineering activities, including piezometric data collection and geologic investigations.”

<sup>401</sup> AK; NJ



changes to the inspection process so that they are in accordance with current inspection procedures without the necessity to modify the dam safety legislation.

About half the states are owner inspected programs and the other half are state inspected programs. For the owner inspected programs, the laws usually require the owner to retain and pay for an engineer to conduct the inspection and submit a report to the lead dam safety agency, setting deadlines for submittal of the report.<sup>402</sup> The state agency may accept dam owner inspection reports only when such inspections are conducted by qualified engineers licensed in the state, and experienced in dam safety. In some states, if the owner fails to submit a timely inspection report, the lead agency can conduct an inspection at the owner's expense,<sup>403</sup> or the lead agency can order the reservoir to be drained.<sup>404</sup>

For the state inspected states, the state conducts the inspections and either pays for all the inspection costs through money collected from the program and from government appropriations, or bills the dam owners for reimbursement of the inspection costs<sup>405</sup>. It is illegal to interfere with an inspection or investigation.<sup>406</sup> To mitigate any staffing issues faced by the lead agency, the lead agency can retain outside registered professional engineers to perform inspections and bill the owner for those costs.<sup>407</sup> In some state inspected programs, the owner has the option to retain a qualified engineer to conduct an inspection and submit a report to the lead agency in lieu of state inspections and

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<sup>402</sup> PA, KS; IL; IN; IA; MA; MI; MO; MT; NJ; ND; OH; OK; PA; VA; WA; WV; WY

<sup>403</sup> KS; OH

<sup>404</sup> NJ

<sup>405</sup> AK, KS; CO; WA (Dam owners pay for routine inspections while the state pays for non-routine inspections, unless the state finds that the dam owner has not complied with an order or finds a violation of the dam safety laws.)

<sup>406</sup> DE; GA; NC

<sup>407</sup> AK; CT; DE; GA; ME; MO; NH; NJ; NM; NC; OR; RI

reimbursement.<sup>408</sup> State conducted inspections probably give more control to the state in terms of timing of the inspections and quality of the inspection report; however, it demands more staff time to be spent on the inspections when it could be spent performing other administrative duties, particularly when the available staff is already small in number (such as in Hawai‘i).

Regardless of whether the program is state inspected or owner inspected, many states set a minimum frequency upon which a dam must be inspected, which often depends on the dam hazard classification.<sup>409</sup> For example, some states require that “high hazard” dams be inspected at least once every three (3) years, “moderate hazard” dams be inspected once every (5) years, with no particular inspection requirement for “low hazard” dams.<sup>410</sup> Other states require an inspection of “high hazard” dams once every two (2) years, “moderate hazard” dams once every four (4) years, with “low hazard” dams inspected as needed.<sup>411</sup> One state goes so far as to require owners to conduct inspections of “high hazard” dams at least once every three months, with “low and moderate hazard” structures mandating annual inspections.<sup>412</sup> Some states allow the lead agency/engineer in charge of the state dam safety program to determine inspection schedules,<sup>413</sup> even allowing the lead agency to order more frequent inspections when a previous inspection reveals problems with the dam.<sup>414</sup> The more frequent inspection schedule can be ordered until the dam is rendered safe or is removed.

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<sup>408</sup> AZ; CO; CT; NM; OK

<sup>409</sup> AK; AZ; NV; AR; IN; CO; ID; IA; KS; ME; MA; MI; MN; NH; NJ; NM; NY; NC; OK; PA; SC; VT; WA; WV; CT

<sup>410</sup> KS

<sup>411</sup> NY

<sup>412</sup> PA (An inspection report is only required once a year, however)

<sup>413</sup> CO; OK

<sup>414</sup> KS; MA

In addition to setting minimum inspection periods, some states require all dams to be inventoried by the lead agency once every five (5) years.<sup>415</sup> This allows for periodic updates to the dam hazard classifications in the event of downstream development.

It is unclear whether Hawai‘i has a state inspected program or an owner inspected program because while owners must submit reports to the DLNR, there is no deadline for the report to be filed. At the same time, DLNR is also charged with inspecting dams “from time to time, but not less than once every five years.”<sup>416</sup> Accordingly, there does not appear to be an orderly inspection process whereby dam owners and DLNR coordinate and cooperate in the inspections. There is also no requirement that “high hazard” classified dams be inspected more frequently than “moderate hazard” and “low hazard” classified dams. The ambiguity of this statute allows for potential lapses and inconsistencies of State dam inspections.

Revised legislation should include a State inspection program whereby owners reimburse the State for the costs of the inspections. This will provide DLNR with control over the timing and quality of the inspections and the inspection report, and will help to take some of the financial burden to administer the program off of the State. If DLNR does not have staffing available to conduct the inspections, it can retain outside engineers to assist with the inspections. DLNR can also update the hazard classification of the dam during the inspection. It is also recommended that an inspection schedule be set depending on the dam’s hazard classification. The attached legislation contains language adopting these recommendations.

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<sup>415</sup> GA

<sup>416</sup> HAR §13-190-40(c)

### 3.11 *Right of Entry*

**HRS (Summary)** ~ [179D-6(4)] BLNR is authorized to enter upon the private property of a dam or reservoir owner to conduct necessary investigations or inspections under these rules. Such entry does not constitute a cause of action by the owner, except for damages resulting from willful or negligent acts by BLNR or its agents.

**HAR** ~ [§13-190-40] Upon reasonable notice to the owners of dams and reservoirs, DLNR shall make inspections of dams and reservoirs.

Under Hawai‘i dam safety laws, the State is authorized to enter upon private land to conduct necessary investigations or inspections upon reasonable notice to the owners. These “right of entry” rules are somewhat weak in comparison to other state programs where notice isn’t required.<sup>417</sup> In some states, the state is authorized at all reasonable times to enter and examine any property, facility, operation, or activity upon presentation of identification and purpose of inspection,<sup>418</sup> while in other states entry is allowed at all times.<sup>419</sup> Some states, however, limit entry without notice only in emergency situations.<sup>420</sup>

Hawai‘i legislation should be modified so that notice isn’t required prior to entry, regardless of whether the situation is emergent or non-emergent. When notice is required, owners are given a heads-up on when DLNR will be inspecting the dam or reservoir, which gives the owner time to cover-up any illegal work previously done to the dam or reservoir. If DLNR can inspect without prior notice, owners may be less inclined to perform any illegal work on the dam or reservoir for fear that DLNR may come at anytime to inspect. The proposed legislation and Administrative Rules in Section 5 below provides one example of how these provisions can be adopted.

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<sup>417</sup> KS, WI, PA; GA; MA

<sup>418</sup> AZ; AR; DE; MI; MN; MO; NC; PA

<sup>419</sup> CT

<sup>420</sup> AK; MO; ND

### 3.12 Dam Operation and Maintenance

**HRS (Summary)** ~ [§179D-6(6)] Routine maintenance not affecting the safety of the dam or reservoir do not mandate owners to apply for and obtain written BLNR approval.

**HAR** ~ [§13-190-40] Owners shall provide for adequate and timely maintenance, operation, and inspection of their dams or reservoirs and are responsible for any engineering and geologic investigations which may be required to ensure public safety. Owners or their agents shall keep available and in good order records of original construction and any modifications, and shall report to DLNR their maintenance, operation and engineering activities, including piezometric (water pressure) data collection and geologic investigations.

[§13-190-2] “Repair” is defined as “construction to an existing dam that does not significantly change reservoir’s storage capacity.” Repair shall not apply to routine maintenance not affecting the safety of the structure.

In Hawai‘i, dam owners have a duty to adequately and timely maintain, operate and inspect their dams and to conduct any engineering and geologic investigations that may be required to ensure public safety. Inspection and maintenance records must be kept current and available for the State’s review upon request.

Some state laws are more specific as to what is required to properly maintain, operate and inspect a dam. For example, a few state laws provide that dam owners shall not permit the growth of trees and other woody vegetation and shall remove any such vegetation from the slopes and crest of embankments and the emergency spillway area, and within a distance of 25 feet from the toe of the embankment and abutments of the dam.<sup>421</sup> Upkeep of an operation and maintenance plan are sometimes required by law,<sup>422</sup> with the obligation to submit such plan to the agency for approval.<sup>423</sup> A few state laws permit the agency to instruct dam owners to install monitoring devices and to submit monitoring reports to the state agency annually or as required.<sup>424</sup>

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<sup>421</sup> VA; CO

<sup>422</sup> CO; PA; WA; DE; IL; IA; MO; MT; NH; NJ; NM; ND; OH; WV

<sup>423</sup> UT; AL

<sup>424</sup> CO; ND; NC; ND; PA

In most states, the owner is allowed to make repairs that don't impair the safety of the dam or reservoir, such as by removing brush or tall weeds, cutting trees, exterminating rodents, repairing erosion gullies, grading the surface on top of the dam embankment, placing additional riprap and bedding on the upstream slope, painting, caulking or lubricating metal structures, removing debris, patching to prevent deterioration, replacing worn or damaged parts, and repairing or replacing fences.<sup>425</sup> In other states, the dam owner is required to make such repairs,<sup>426</sup> and must report any incidents that could jeopardize the safety of the dam to the lead agency.<sup>427</sup>

Some states require dam owners to obtain permits or certificates of approval to impound water. The permit is issued upon a finding by the lead dam safety agency that the dam or reservoir is safe to impound water.<sup>428</sup> Permits are typically granted upon completion of construction on the dam or reservoir in accordance with the approved plans and specifications. The permit may be modified or revoked by the lead agency upon breach, violation or nonuse of the permit,<sup>429</sup> which the lead agency can determine through inspections.

Permits/certificates to impound can be an effective tool to encourage dam owners to keep current with inspections and maintenance of their dams, and to construct their dams in accordance with approved plans and specifications. It can also be used by the lead agency to keep track of the dams and reservoirs that have been deemed safe, and those that have not.

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<sup>425</sup> AZ; CO; MT

<sup>426</sup> AR; GA; ID; OK; PA

<sup>427</sup> AK; NV; NJ; OK

<sup>428</sup> IA; ID; MO; PA; TN; WA; WV; VA

<sup>429</sup> FL; GA; ID; IA; KS; MD; MN; NJ; OK; OR; WY

Hawai‘i should adopt a similar permitting/approval process to impound water, so that DLNR has a further mechanism to ensure that owners properly maintain and operate their dams. The proposed legislation and Administrative Rules provide examples of how such permitting procedure works.

### **3.13 Emergencies/Emergency Action Plans**

**HAR** ~ [§13-190-40(b)] Dam or reservoir owners or their agents shall fully and promptly advise DLNR of any sudden or unprecedented flood or unusual or alarming circumstance or occurrence existing or anticipated which may adversely affect the dam or reservoir. Unsafe conditions found by DLNR during inspection may warrant dam or reservoir breaching and/or removal.

[§13-190-41] In case of emergency where DLNR declares that repairs, dam breaching, or other actions are immediately necessary to safeguard life and property, the work shall be initiated by the owner, or by DLNR through its authorized agents at the owner’s expense if the owner fails to so act. DLNR shall be notified at once of any emergency repairs or other work instituted by the owner. Where appropriate, dam or reservoir repairs, breaching, or other emergency work shall conform to an order issued by DLNR. The following emergency actions not impairing dam safety may be taken by owner without prior DLNR notification or approval: stockpiling materials; lowering reservoir level, provided that lowering water levels by excavating the spillway or embankment is prohibited unless failure is imminent, in which case DLNR shall be notified as soon as reasonably possible of any existing emergency conditions and emergency action taken; armoring eroded areas; plugging leakage entrances on upstream slope; increasing freeboard (i.e. the distance from water level to dam crest) by placing sandbags or earthfill atop the dam; diverting floodwaters to prevent entry into the reservoir; constructing training berms; placing sandbag ring dikes around boils at downstream toe to prevent back pressure; and, removing obstructions from outlet or spillway flow areas.

[§13-190-42] Owners of high hazard dams shall prepare, maintain, and implement an emergency preparedness plan (EPP) for each dam or reservoir for immediate defensive action to alert and evacuate affected populations and to mitigate property damage. The EPP shall contain: identification of equipment, labor, and material for plan implementation; notification procedure to inform DLNR and the civil defense office of the affected county; a dam failure inundation map; a procedure for warning affected populations if dam failure is imminent. Owners shall submit a copy of this EPP to the affected county civil defense office and other emergency coordinators involved in the plan for review. Owners must annually review and update the EPP as necessary.

In Hawai‘i, an owner of a high hazard dam must prepare an emergency preparedness plan (EPP) which at a minimum must contain the following: (1) the identification of equipment, labor, and material available for implementation of the plan;

(2) a notification procedure for informing the department and the civil defense office of the affected county; (3) a dam failure inundation map; and, (4) a procedure for warning the affected population if failure of the dam is imminent.<sup>430</sup> The owner must submit a copy of the emergency preparedness plan to the affected county civil defense office and other emergency coordinators involved in the plan for review, and shall annually review and update the emergency preparedness plan as necessary.<sup>431</sup>

Some states impose stricter requirements on the owner, such as requiring the EPP to be updated annually rather than “as necessary”,<sup>432</sup> and also requiring owners of moderate hazard dams to submit EPPs.<sup>433</sup> Some states also require dam owners to post notices in public places that may be affected by dam failure, whether by disruption of public water or sewage service, or potential risk to human life and property.<sup>434</sup> Examples of such places include the city hall, police department, fire station and tax collector’s office.

In order to force dam owners to draft an EPP earlier rather than later, many states require the owner to attach an EPP to the application to construct, modify or repair in order to obtain a permit.<sup>435</sup> This could further help to save lives and property, and make the implementation of the EPP more efficient.

Existing Hawai‘i dam legislation reflects common nationwide policy that dam owners are required to notify the state agency upon recognition of potential emergency circumstances.<sup>436</sup> In cases of emergency, DLNR may order the owners of potentially

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<sup>430</sup> HAR §13-190-42(a)

<sup>431</sup> HAR §13-190-42(b) & (c)

<sup>432</sup> AK; CO; CT; MI; WA

<sup>433</sup> AK; CO; CT; MA; NH; NJ

<sup>434</sup> PA

<sup>435</sup> CO; FL; KS; ND; VA; DE; MA; MT; NJ; NM; OH; VA

<sup>436</sup> HAR §13-190-40(b). Compare with CA; CO; MI; MT; NJ



hazardous dams and reservoirs to take steps necessary to protect life and property.<sup>437</sup> If the owner fails or is unable to take appropriate action, DLNR can act to mitigate imminent threats to life and property at the owner's expense.<sup>438</sup> Similarly in other states, the lead agency can employ any remedial actions to protect life and property,<sup>439</sup> and recover its costs from the owner.<sup>440</sup> Some states even authorize the lead agency to take control of the dam or reservoir, over the owner's objection, until the emergency conditions have subsided.<sup>441</sup>

While Hawai'i dam safety law authorizes DLNR to take remedial actions during emergency situations, it is not clear as to whether DLNR can order a dam owner to make repairs or modifications to a dam in non-emergent situations where the dam does not pose an imminent threat to life or property, yet requires remedial work to make the dam safe. Some states have specifically addressed this situation by allowing the lead agency to issue an order requiring recommended action within a certain timeframe.<sup>442</sup> Required actions include, but are not limited to, corrections, construction, modification, reconditioning, dam removal or breaching, monitoring, emergency planning or warning system implementation.

EPPs should be required for high hazard and moderate hazard classification dams, and be submitted with the application to construct, enlarge, alter or repair a dam or reservoir. Also, the Hawai'i Dam Safety Act should authorize DLNR or BLNR to take control of a dam or reservoir during emergencies to conduct any necessary remedial work

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<sup>437</sup> HAR §13-190-41(a)

<sup>438</sup> *Id.*

<sup>439</sup> AK; CA; CO; FL; GA; ID; KS; LA; MA; MN; MO; MT; NC; OK; SC; SD; TN; VT; VA; WA; WY

<sup>440</sup> GA; ID; KS; KY; MO; MT; NV; OH; SD; TN; VA; WA; WY

<sup>441</sup> AK; CA; CT; KS; LA; OK; PA; SC

<sup>442</sup> CT; FL; GA; ID; IL; KS; KY; LA; MD; MI; MO; NJ; NC; OK; OR; PA; RI; SC; SD; TN; VT; VA; WA

when the owner fails or is unavailable to conduct such work. Language that specifically authorizes BLNR or DLNR to take these necessary actions is included in the proposed legislation in Section 5 below.

### **3.14 Owner Non-Compliance, Violations, and Penalties**

**HRS (Summary)** ~ [§179D-5] It is unlawful for any person to construct, operate, or remove a dam or other regulated artificial barrier, unless in compliance with State dam laws.

[§179D-8] Persons in violation of State dam laws or those who willfully or negligently fail to comply with BLNR orders are liable for civil penalty not exceeding \$500 for each day in violation.

**HAR** ~ [§13-190-4] Persons violating this chapter are liable for civil penalty not to exceed \$500 for each day during which said violation continues.

[§13-190-30(c, d, and e)] If, at any time while the work is underway, DLNR finds (via owner or DLNR inspection) the work is not being done according the approval, it shall give the owner written notice thereof, stating the specific violations and ordering the immediate compliance with approved plans and specifications. DLNR may order that no further work be done until such compliance has been effected and confirmed by DLNR. Upon an owner's failure to comply with approved plans and specifications, DLNR shall take action to revoke its approval and compel the owner to remove the structure to sufficiently eliminate the hazard to life or property.

In Hawai'i, DLNR is authorized to issue orders affecting the safety of dams or reservoirs if the construction, enlargement, repair or alteration of a dam or reservoir is not being done in accordance with the approved plans and specifications. Orders shall list the violations and corrective actions and take effect upon notice. The DLNR may revoke its approval to construct, enlarge, modify or repair if the dam is not being built according to specifications. Dam owners are required to pay for any repairs to the dam or reservoir ordered by DLNR during emergency situations. A non-compliant dam owner can be fined up to \$500 per day for each day of the violation.

These enforcement provisions are weak in comparison to other state statutes, rules, and regulations. For example, in addition to allowing the lead agency to order the owner to make repairs or modifications if the construction, enlargement, alteration or

repair is not in accordance with approved plans and specification, many states allow the lead agency to issue orders to make repairs if the owner is not properly maintaining or operating the dam or reservoir after the construction is finished.<sup>443</sup> The lead agency may also seek judicial enforcement or an injunction if the owner does not comply with the order,<sup>444</sup> and may modify or revoke a permit if the lead agency determines that the completed dam or reservoir is a danger to public safety or if the owner does not comply with an order.<sup>445</sup> The lead agency may also order that the dam be removed if corrective measures are not taken within a specified amount of time after issuance of an order.<sup>446</sup>

In one state, the lead agency may secure a search warrant if the owner refuses a state inspection.<sup>447</sup> Subpoenas may also be used to obtain records and other documents from a noncompliant owner.<sup>448</sup> Some states even make it a misdemeanor to intentionally, willfully, or knowingly violate any state dam safety provisions or obtain permit by misrepresentation, perjury, falsification, or incomplete disclosure,<sup>449</sup> and impose lofty civil penalties<sup>450</sup> as well as criminal penalties punishable by fine, imprisonment, or both.<sup>451</sup> Anyone with knowledge of a violation and fails to notify the lead agency or obstructs the agency from enforcing the laws can also be found guilty.<sup>452</sup> Some state laws specifically

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<sup>443</sup> CT; FL; GA; ID; IL; KS; KY; LA; MD; MI; MO; NJ; NC; OK; OR; PA; RI; SC; SD; TN; VT; VA; WA

<sup>444</sup> CT; IL; GA; IN; AK; AZ; CA; IA; ME; MO; NJ; ND; OK; OR; RI; TN; TX; VT; VA; WA

<sup>445</sup> FL; GA; ID; IA; KS; MD; MN; NJ; OK; OR; WY

<sup>446</sup> KS; LA; MS; ND

<sup>447</sup> AK

<sup>448</sup> *Id.*

<sup>449</sup> AL; ID; KS; ND; SC; TN; MD; NY; OH; PA; VA; WI; AK; AZ; IN; LA; MS; MO; NE; NH; NM; ND; OK; WV

<sup>450</sup> AR (\$10,000); CT; DE (\$2,000); GA; ME (\$5,000); MS (\$25,000 for willful violations); MT; NH; NJ; NY (\$5,000); TN; TX (\$1,000 for refusing to take appropriate remedial action, and \$5,000 for taking, diverting, or appropriating water without complying with requirements of the law).

<sup>451</sup> AR (\$10,000 and/or 6 months imprisonment); CA (\$2,000 and/or 6 months imprisonment); DE; KS; LA; MD; MO (\$500-\$10,000 and/or 1 year imprisonment); NM; NY; NC; SC; WV

<sup>452</sup> CA

allow the lead agency to seek the assistance of the Attorney General in enforcing an administrative order or other law.<sup>453</sup>

States are also allowed to recuperate its costs in performing remedial work or inspections when the owner has failed to do so as required by law.<sup>454</sup> Other states also allow for the recovery of legal fees and costs in instituting a civil action to enforce an order or to otherwise enforce the dam safety rules.<sup>455</sup> It is also a practice in some states to place liens upon the delinquent owner's property when they do not pay their fees or reimburse the state for expenses chargeable to the owner.<sup>456</sup> States can also declare a dam or reservoir a public nuisance, and can institute an appropriate action to enjoin or abate the nuisance.<sup>457</sup> Some states even provide for the lead agency to take control of privately owned dams and reservoirs in instances where such owner refuses to commence appropriate repairs or is unable to be found or contacted.<sup>458</sup>

Hawai'i's dam safety legislation should be modified to give BLNR and DLNR more enforcement power to administer the dam safety program. With stronger enforcement provisions, BLNR and DLNR would have more leverage to require dam owners to comply with the dam safety laws and BLNR/DLNR orders. The proposed legislation attached to this report has suggested enforcement language that may be considered for adoption.

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<sup>453</sup> AK; CT; MO; NJ; OR; RI; TX; VA; WA

<sup>454</sup> GA; ID; KS; KY; MO; MT; NV; OH; SD; TN; VA; WA; WY

<sup>455</sup> CO; IA; PA

<sup>456</sup> AZ; KY; NV; NJ (any expenditures by the lead agency constitute, in each instance, a debt to the state, placing a lien on the property superseding, but not invalidating, all other claims or liens against the property); OH; PA; SD; VA

<sup>457</sup> IA; MO; PA; TN; WI; FL; OR; WA

<sup>458</sup> AK; CA; CT; KS; LA; OK; PA; SC

### 3.15 Recordkeeping

**HAR** ~ [§13-190-40(a)] Owners or their agents shall keep available and in good order records of original construction and any modifications, and shall report to DLNR their maintenance, operation and engineering activities, including piezometric (i.e. water pressure) data collection and geologic investigations.

[§13-190-20 and 21] An application for dam construction, enlargement, alteration, repair, or removal – made on forms furnished by DLNR – must be filed, and written approval of construction plans and specifications obtained from BLNR. A separate application shall be filed for each dam or reservoir.

[§13-190-31] “Written notification of completion” must be provided by the owner, and signed by the responsible engineer, upon completion of dam construction or enlargement. This notification must include the required supplementary drawings or descriptions.

[§13-190-32] Notice of completion – or a “completion report” – signed by the responsible engineer, must be submitted by the owner to DLNR after any dam repair or alteration. This report must include required supplementary drawings or descriptions.

[§13-190-33] Upon completion of dam or reservoir removal, owner shall file with DLNR a “report” regarding the manner in which the work was performed and the conditions existing after dam removal. No filing shall be required for routine rundown of reservoirs for normal operations and maintenance not affecting safety of the structure.

[§13-190-42] (b) Owners shall submit a copy of their emergency preparedness plan (EPP) to the affected county civil defense office and other emergency coordinators involved in the plan for review. (c) Owners must annually review and update the EPP as necessary.

Under Hawai‘i dam safety law, owners must keep records of construction and modification of the dam or reservoir, and must report their maintenance, operation and engineering activities to DLNR. Dam owners are also required to submit written notification upon the completion of construction. While these laws could provide BLNR and DLNR with information necessary to monitor and track a dam or reservoir’s status, they do not specifically allow BLNR or DLNR to review the records at any time BLNR or DLNR considers it necessary or upon request from the owner as provided in other state laws.<sup>459</sup>

In addition to requiring dam owners to keep records, some states require the lead agency to provide annual<sup>460</sup> or intermittent<sup>461</sup> reports regarding the administration of the

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<sup>459</sup> AK; ID; MA; MS; MO; OK; RI

<sup>460</sup> CO; GA; IA; MA; RI

dam safety program to a general assembly, board chairperson, governor or other supervising authority. These records report on the overall effectiveness of dam inspections, regulations and the administration of the dam safety program, which should provide some perspective to the supervising authority on whether the laws need to be amended. There are no similar requirements for BLNR or DLNR which could make it difficult for anyone outside of the Department, such as the Legislature, to know whether the laws in place are effective in enforcing dam safety or whether new laws need to be adopted. New legislation for Hawai'i's dam safety program should include a provision requiring an annual report to be submitted to the Legislature so that the Legislature is aware of any problems with the administration of the program and can make changes to the law as necessary. Also, the law should specifically allow BLNR and DLNR to review a dam owner's records at anytime deemed necessary for public safety or upon request. The proposed legislation contains language to this effect.

### **3.16 Oversight**

**HRS (Summary)** ~ [§179D-7] Persons aggrieved or adversely affected by BLNR action or order are entitled to administrative and judicial review in accordance with HRS §91-1 *et seq.*

**HAR** ~ [§13-190-5] Persons aggrieved or adversely affected by BLNR action or order are entitled to administrative and judicial review in accordance with HRS §91-1 *et seq.*

Under Hawai'i dam safety laws, aggrieved dam owners may petition the BLNR for a declaratory order as to the applicability of any order of BLNR or DLNR, or submit a request for a contested case hearing for a final order.<sup>462</sup> If the final order is unfavorable to the dam owner, the dam owner may appeal to the circuit court.<sup>463</sup> A dam owner may also

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<sup>461</sup> CA; NY

<sup>462</sup> HRS §179D-7; HAR §13-190-5; HRS §91-8 & 9

<sup>463</sup> HRS §91-14

obtain a judicial declaration as to the validity of the administrative rules promulgated by BLNR by bringing an action against BLNR in the circuit court of the county in which the dam owner resides or has a principal place of business.<sup>464</sup>

Most states have established an internal agency review process allowing for aggrieved parties to take their claims within a prescribed timeframe of the agency order to a supervisory board,<sup>465</sup> while other states allow an appeal directly to the courts.<sup>466</sup> In one state, the supervisory board may grant relief to petitioner or may preclude state agency enforcement upon showing that the petitioner or other interested parties suffer irreparable harm or a likelihood of success on the merits, or that overturning the decision will not irreparably harm the state.<sup>467</sup> Some states allow a further appeal of the supervisory boards' decision to the courts.<sup>468</sup> Judicial review can be accelerated on the court's calendar and determined immediately.<sup>469</sup> In some states, the agency order remains in effect until modified or set aside on appeal,<sup>470</sup> while in other states the filing of an appeal stays the order.<sup>471</sup> Allowing the order to be stayed, however, could allow for time to pass without the dam owner having to take any action on the dam, particularly if the dam requires critical repairs to be made. A revised Hawai'i dam safety law should not stay an order of BLNR or DLNR pending appeal, and should instead have the order remain in effect. The proposed Hawai'i legislation includes such a provision.

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<sup>464</sup> HRS §91-7

<sup>465</sup> AK; AZ; AR; CT; FL; GA; IN; IA; KS; LA; MS; MD; MI; MO; PA; NJ; NM; NC; SC; TX; VT; VA; WA; WY

<sup>466</sup> CA; CO; ID; KY; ME; MN; MS; ND; OR

<sup>467</sup> PA

<sup>468</sup> NY; CT; MO; NM; NY; TX; VT; VA; WY

<sup>469</sup> CO

<sup>470</sup> NH; OH

<sup>471</sup> OR; VA

## **3.17 Miscellaneous**

### **3.17.1 Complaints of Unsafe Conditions**

**HRS** ~ Not addressed by HRS.

**HAR** ~ [§13-190-34] Upon receipt of written complaint alleging that person or property is endangered by dam or reservoir construction, enlargement, alteration, repair, maintenance, or operation, DLNR shall contact the owner and conduct an inspection unless the data, records, and inspection reports on file with DLNR are sufficiently adequate to determine whether the complaint is valid. To determine whether a structure constitutes a danger to life or property, DLNR shall evaluate if the possibility that the dam is endangered by overtopping, seepage, settlement, erosion, cracking, earth movement, earthquakes, and failure of bulkheads, flashboard, gates, and conduits which exist or might occur in the vicinity of the dam or reservoir. If an unsafe condition exists, DLNR shall notify the owner to take action necessary to render the condition safe, including breaching or removal of dams found beyond repair.

Under Hawai'i laws, DLNR is in charge of investigating and/or inspecting allegedly unsafe dams when it receives a written complaint.<sup>472</sup> Other states have similar provisions, although one state allows the lead agency to order the dam owner to investigate the allegedly dangerous condition and report the results of the investigation to the lead state agency.<sup>473</sup> Relying on the dam owner to investigate, however, is not recommended as the dam owner could be performing illegal work on the dam or reservoir that creates the dangerous condition; in this situation, the dam owner would have every reason to submit an inaccurate report.

Some state laws provide that state expenses for investigating frivolous or bad faith complaints are recoverable from the complainant.<sup>474</sup> This provision could have the effect of discouraging people from filing complaints for fear of being accused of filing a frivolous or bad faith claim.

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<sup>472</sup> HAR §13-190-34

<sup>473</sup> PA

<sup>474</sup> CO; MT



One state takes a slightly different approach regarding inspections initiated after a complaint. Upon receipt of a written complaint alleging danger from construction, maintenance or operation of a dam or reservoir, the lead agency must inspect unless the facts on record show that the complaint is without merit. If the complainant insists on an inspection and deposits money with the lead agency to make the inspection, the lead agency must inspect the dam or reservoir, regardless if the facts on record show that the complaint is without merit. If the lead agency finds through the inspection that the claim was without merit, the money deposited goes into the state treasury. If, on the other hand, the inspection reveals a dangerous condition the money deposited gets returned to the complainant and the dam owner is charged with agency inspection costs.<sup>475</sup> This approach could also be dangerous in that it may end up being the lead agency's practice not to inspect unless someone makes a deposit. In the situation where the complaint is legitimate but the complainant has no money for a deposit, the dam may not end up being inspected and a catastrophe might ensue.

The proposed legislation does not modify current legislation as it appears to be sufficient in this area. It is not recommended to add provisions that allow the State to recover the inspection costs from the complainant, or to otherwise punish people monetarily for making complaints. The dam safety laws should not discourage people from making complaints, particularly when there is the potential for the loss of life.

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<sup>475</sup> CA

### 3.17.2 Environmental Impact

**HRS** ~ Not addressed.

**HAR** ~ Not addressed.

There is no requirement in the current Hawai‘i dam safety law for environmental, ecological or water quality protection. Constructing, modifying or removing a dam or reservoir can have drastic effects on the environment. Accordingly, it makes sense to have provisions in a dam safety statute or regulation requiring consideration of the environmental, ecological or water quality effects the construction, modification or removal will have on the surrounding area. An environmental protection provision could cause dam owners to take into account such impact before commencing dam or reservoir construction, conducting any significant dam alterations, or removal. Hawai‘i’s dam safety laws may be void of these provisions because it might be addressed by other state laws.

Other states have recognized the environmental and ecological impact dams and reservoirs have on the surrounding areas, and have required the lead agency to consider the environmental impact in determining whether to grant a permit to construct, modify or remove a dam or reservoir.<sup>476</sup> Some states require the submittal of an environmental impact statement as part of the application process; and, if the lead agency is unsatisfied with the environmental impact study, the applicant may be required to conduct further studies.

A negative environmental impact does not always preclude continuance of a project in some states.<sup>477</sup> Where adverse environmental impact is inevitable, state agencies may be required to balance such effects with project benefits, factoring: amount and type

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<sup>476</sup> CT; KS; PA; NY; WI

<sup>477</sup> See, KS; PA

of degradation; public health and safety with or without the project; natural resource impact; benefits of project approval; or any other social, economic, cultural or other impact potentially had by the project. Many states also provide for the protection and preservation of wetlands, which must be replaced at a ratio of 1:1 if adversely impacted. Other states require consideration of hydrologic management of the watershed impact upon water quality, and environmental effects,<sup>478</sup> while others emphasize the outcome water impoundment will have on state fish and wildlife,<sup>479</sup> and require the effects of any water development project to be considered and assessed before project approval. These provisions appear to be unique to the states' unique industry, landscape and policies.

If an environmental impact provision is added, it is important to defer to existing environmental review or impact processes otherwise provided by law. No provisions requiring consideration of environmental impacts that construction, enlargement, alteration, repair or removal of a dam or reservoir will have on the surrounding areas are included in the proposed legislation, because of the possibility that other Hawai'i laws already address this topic.

### **3.17.3 Severability**

**HRS** ~ Not addressed.

**HAR** ~ Not addressed.

Hawai'i's dam safety laws do not specify what happens if any provision is found to be unconstitutional, invalid or in conflict with other federal or state laws. Accordingly, it is ambiguous as to whether the dam safety program remains in effect if a court of law finds one provision unconstitutional. Some states include severability provisions which

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<sup>478</sup> NY; PA

<sup>479</sup> NV; OK; NC (intended to preserve minimum streamflow for the protection of affected aquatic species).

resolve any doubts about whether the rest of the provisions remain in full force and effect.<sup>480</sup> Hawai‘i should also include a severability provision so that the statute is clear. A provision for severability is included in the proposed legislation and Administrative Rules.

### **3.17.4 Supplemental Reference Materials**

**HRS** ~ Not addressed.

**HAR** ~ Not addressed.

DLNR has created guidelines for the inspection of dams and reservoirs<sup>481</sup> to help educate the public about dam safety and inspections. Most states also publish guidelines for the same purpose, some even incorporating by reference supplemental materials in their statutes, rules, or regulations.<sup>482</sup> Further guidelines should be published by DLNR, and that existing guidelines should be updated as necessary. In particular, guidelines for safety inspection of dams should be reviewed with a view to develop more streamlined dam inspection procedures that are consistent with the budgetary constraints of the State Dam Safety Program. Guidelines should also reflect the latest inspection procedures and safety measures. The more the public and state and county inspectors are educated about dam safety, the safer Hawai‘i’s dams should be.

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<sup>480</sup> KS; CO; NM; OH; VT

<sup>481</sup> Department of Land and Natural Resources, State of Hawai‘i, “Guidelines for Safety Inspection of Dams,” Report R92, December 1992.

<sup>482</sup> AK; CO

## **4 Recommendations**

One primary goal of the investigation was to “recommend legislation or government actions that could help prevent another tragedy” like the Ka Loko Dam breach, and report such “other recommendations and relevant considerations” believed to be appropriate. The purpose of this section is to integrate the insights from the factual findings and the best practices learned from the analysis of the Dam Safety Programs of other states and to make appropriate recommendations. There are general recommendations and also specific recommendations for a potential modification of the current Hawai‘i Dam Safety Act and related regulations.

Specific proposed statutory language for amendments to the Hawai‘i Dam Safety Act, as well as proposed amendments to the Administrative Rules, is included in Section 5 below. The proposed language is intended to reflect general concepts discussed in this section. The particular language used in the proposed legislation is not essential, and there may be good reason to choose to use other language instead. Most, if not all of the concepts, have been borrowed from other state laws. In many instances, the actual language is also the same or is substantially similar to that of other state laws.

### **4.1 General Recommendations**

There are certain clear lessons from the facts surrounding the tragic breach of Ka Loko Dam:

- Dam safety inspections must be conducted regularly.
- The safety inspection program must be adequately funded.
- The classification of dams must be reviewed regularly

- Education of other State and County inspectors regarding dam safety could be helpful.

Each of these points is discussed below. Each of these points is also reflected in the analysis and recommendations of Dr. Lelio Mejia.

In his engineering assessment of the breaching failure of Ka Loko Dam, Dr. Mejia emphasizes the importance of safety inspections:

In my opinion, it is likely that a visual safety inspection of [Ka Loko] dam and its appurtenant facilities by qualified persons would have identified the lack of a spillway in the reservoir. Furthermore, because of the limited discharge capacity of the outlet works and the need for human intervention to operate them, it is likely that the lack of a spillway would have been recognized as a safety deficiency. It also seems that such recognition could have triggered action on the part of the State to require the owner to implement modifications to the dam and reservoir facilities or to implement other actions that may well have prevented the failure.<sup>483</sup>

He also notes that visual inspections alone are not sufficient. And he acknowledges the budgetary constraints on Hawai‘i’s dam safety program at the time. “The lack of funding has apparently led to difficulties in management of the program and in implementation and enforcement of the program’s requirements.” But he concludes:

Notwithstanding the above questions, in my opinion, a more aggressive program of dam inspections under HRS 179D that would have included regular safety inspections of Ka Loko Dam, would probably have allowed for early identification of the potential for failure of the dam and allowed correction of the deficiencies leading to such failure.<sup>484</sup>

With regard to the issue of educating other State and County inspectors to identify basic issues of dam safety, Dr. Mejia observes the following:

It is noteworthy that government representatives had visited the area of the reservoir several days before the failure and at other times in connection with grading and/or environmental violations in the area immediately east of the reservoir. However, the records reviewed indicate that the persons conducting those visits either did not observe the reservoir and the area of the dam, or did not

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<sup>483</sup> See Appendix B, Report of Dr. Mejia at 11

<sup>484</sup> *Id.*

note the lack of a spillway, or did not raise the absence of a spillway as a safety issue. Thus, those circumstances indicate that, to be effective as a safety management tool, visual inspections of dams must focus specifically on dam safety issues and must be conducted by qualified persons with proper dam safety training.<sup>485</sup>

Dr. Mejia also expressed his concern regarding the hazard classification of

Hawai‘i’s dams:

One aspect of the program that does not seem to have received an adequate level of attention is that of maintaining an updated State dam inventory including an up-to-date hazard classification of each dam. Between 1978 and 1981, the ACE conducted inspections of “high hazard” category dams throughout the State, in accordance with the National Dam Inspection Act of 1972. The dam was not inspected at that time because it was not considered to be a “high hazard” dam, and the dam’s classification appears to have remained in that status thereafter. However, in view of the loss of life and considerable property damage caused by the dam failure, it may be surmised that the dam’s classification should have been higher at the time of the failure, and thus, should have been revised beforehand. This situation highlights the need for the program to allow for timely updating of the State’s dam inventory including dam hazard classifications. The process for updating of the inventory should include periodic review of a dam’s hazard classification, possibly as part of each safety inspection, to account for changes in downstream land use and economic development.

He then concludes:

Thus, it appears that the main issue associated with the State’s dam safety program is the lack of funding necessary to facilitate implementation and enforcement of the program’s requirements. In addition, funding appears to be required to increase efforts in education of dam owners on their responsibilities regarding public safety.

One technical aspect of the dam safety statute, HRS 179D-4(b), that merits further review and consideration is the apparent exemption of owners from liability for damages resulting from natural causes such as earthquakes, hurricanes, or extraordinary rains with recurrence intervals greater than 250 years. Such recurrence interval seems inconsistent with intervals considered in dam engineering practice in other states and internationally in developing design loads representing natural events for the safety evaluation of “high hazard” dams. Generally, recurrence intervals longer than 1,000 years would be considered for developing design earthquake loads for such dams, and even longer recurrence intervals would be considered for developing design precipitation and inflow flood loads.

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<sup>485</sup> *Id.*

Another aspect of the program that merits review and further consideration is the requirement in HAR 13-190-40 to conduct dam inspections not less than once every five years. That required frequency of inspections seems reasonable for comprehensive safety reviews including assessment of possible failure modes. However, it does not seem adequate for visual inspections, particularly of high hazard dams. In view of Hawaii's climatic conditions (which promote rapid vegetation growth and are associated with a high potential for hurricanes, episodes of intense precipitation, high rates of erosion, and weathering of man-made materials), significant and high hazard dams should be visually inspected at least once every two years. Additional funding for the program is likely to be required to increase the frequency of dam visual inspections and for updating of the State's dam inventory on a periodic basis.

Based upon the foregoing analysis, Dr. Mejia has the following specific recommendations:

- The level of funding for the State's dam safety program should be increased to allow for effective implementation and enforcement of the program's requirements including regular dam safety inspections and periodic updating of the State's dam inventory to accommodate changes in the hazard classification of dams. Funding should also allow for increased efforts in education of dam owners regarding their responsibilities to public safety.
- The process for updating of the State's dam inventory should allow for periodic review of the hazard classification of dams and for timely updating of such classification to reflect changes in a dam's physical and ambient conditions. Changes in physical and ambient conditions to be considered include physical changes to the dam and reservoir facilities, watershed and climatic changes affecting potential reservoir inflows, changes in downstream conditions affecting the extent of potential inundation areas, and changes in downstream land use and economic development. To allow efficient evaluation of possible changes in downstream conditions, inundation maps will be required for all dams within the State's jurisdiction. Such maps are required as part of the emergency preparedness plan required of dam owners by HAR 13-190-42.
- Dam safety inspections should include comprehensive safety reviews and visual inspections. Comprehensive safety reviews should consider design, construction, operations, and maintenance aspects of dam safety, and should include thorough assessments of potential failure modes. Visual inspections of dams should focus on dam safety issues and should be conducted by qualified personnel with adequate dam safety training. Visual inspections of "significant and high hazard" dams should be conducted at least once every two years. Comprehensive safety reviews of "significant and high hazard" dams should be conducted once every five years.



- The guidelines for safety inspection of dams published by DLNR in 1992 are a suitable general reference for dam safety inspections in the State. Nonetheless, it is recommended that those guidelines be reviewed with a view to develop more streamlined dam inspection procedures that are better fit to the budgetary constraints of the State's dam safety program. Such procedures should allow for periodic comprehensive safety reviews and visual inspections, as discussed above, within the framework of dam safety inspections called for by HAR 13-190.
- It is recommended that consideration be given to developing guidelines for instrumentation monitoring of "high hazard", and perhaps "significant hazard", dams. Instrumentation monitoring should be required to the extent needed for comprehensive safety review and assessment of potential failure modes of such dams.
- The dam safety statute, HRS 179D-4(b), should be reviewed to re-consider the recurrence interval of natural events for which owners are exempt from liability for damages resulting thereof. Such recurrence interval, currently stated as 250 years, seems inconsistent with intervals considered in dam engineering practice elsewhere for developing design loads used to represent natural events for the safety evaluation of "high hazard" dams.

In addition, the factual findings would suggest the following:

- All State and County inspectors should receive proper basic dam safety training, as should all dam owners.

These recommendations are incorporated in the discussion below, and in the proposed amendments to the Hawai'i Dam Safety Act and Administrative Rules that follow. In addition, the analysis of the Dam Safety Programs of other states has suggested certain other recommended changes to Hawai'i's Dam Safety Program, and they are also incorporated in the proposed changes below.

In addition to the foregoing, the review of the Dam Safety Programs of other states to determine the best practices to follow suggests there are three critical areas where Hawai'i's dam safety laws and regulations could be improved. The three areas are:

- Tougher enforcement provisions, including stricter penalties for non-compliance with the law.
- A specific funding mechanism to provide funds necessary to administer the program, some collected from dam or reservoir owners to help cover BLNR and DLNR's costs.

- More thorough provisions that specifically grant BLNR and DLNR certain authority to administer the dam safety program.

Each of these three areas of concern is discussed in more detail below.

## **4.2 Proposed Changes to Hawai'i Dam Safety Statute**

Hawai'i's current Dam Safety Act lacks a tough enforcement mechanism that provides BLNR and DLNR with authority to levy heavy fines and other penalties in the event someone does not comply with an administrative order or fails to obey the dam safety laws. Currently, anyone who violates a provision of the Hawai'i dam safety laws can be charged a civil penalty not exceeding \$500 per day, which is a small penalty in comparison with other State laws. Some states set the maximum at \$25,000. In addition, many states make it a criminal offense to intentionally or knowingly violate any provision of the dam safety laws, punishable by fines of up to \$10,000 or 1-year imprisonment, or both.

The current Hawai'i dam safety laws do not make it a criminal offense to knowingly or intentionally violate a provision of the dam safety laws. It is highly recommended that the law include increased civil penalties as well as criminal offenses so that the enforcement provisions have more bite. Unpaid fines should constitute a lien against the owner's property, giving more leverage to the State to be able to collect the penalties. Increasing the civil penalties alone, however, may not be enough to deter someone from violating the law, particularly if the violator is wealthy and can afford to pay the civil penalties. Therefore, criminal offenses, and the possibility of jail time, need to be included so that potential violators, even those with money, would think twice about violating the law.

Provisions authorizing BLNR or DLNR to seek injunctions and subpoenas are also recommended, particularly when an owner fails to comply with an administrative order, fails to provide records regarding the maintenance and operation of the dam or reservoir, or fails to provide access to private property to allow the State to conduct an inspection or investigation of the dam or reservoir. There is otherwise no provision in the current legislation granting this authority to the State.

This investigation has also revealed that the level of funding for the State's dam safety program needs to be increased. Currently, Hawai'i's dam safety program is funded by appropriations from the Hawai'i Legislature (\$164,000 in 2005), and from federal grants through FEMA (total of \$92,928 from 2000-2002). This money is principally used to employ 1.5 FTEs, with \$2,000 left over for costs and expenses. According to the ASDSO, Hawai'i requires 6.5 FTEs to effectively administer its dam safety program. The current appropriations are insufficient to employ 6.5 FTEs or even 1.5 FTEs, and is certainly not enough to pay for equipment and other expenses and costs.

To help rectify this problem, some states set a minimum amount by statute that the legislature must appropriate for the state dam safety program. A revised Hawai'i Dam Safety Act should include such a provision so that the dam safety program has a minimum amount of funds every year that it can depend on to cover its administration costs and expenses. The funds required by statute, however, must be substantially greater than the amount appropriated to the program in 2005. The funds set aside must be sufficient to pay for administrative costs and expenses, additional staffing and equipment, training for State and County inspectors, with some additional funds available for periodic updates of the State's inventory of dams and for emergencies.

Another area that is deficient in the current dam safety act is an internal funding mechanism whereby BLNR and/or DLNR can recover from dam and reservoir owners some or all of its costs and expenses in administering the dam safety program. An internal funding mechanism could be particularly useful if the Legislature ever decreases the program's budget and/or federal money (through FEMA) is no longer available, which is what appears to have happened over the years prior to the Kaloko disaster.

The only money the program collects from dam or reservoir owners under the current laws and regulations is a one-time \$25 application fee that is submitted with an application to construct, enlarge, alter, repair or remove a dam or reservoir. There are no annual fees and no other fees to maintain, operate or inspect a dam. Accordingly, if no one submits an application to construct, enlarge, alter, repair or remove a dam or reservoir, no money is collected by the program from sources other than the state and federal governments.

Many states collect higher application fees to construct, enlarge, alter, repair or remove a dam or reservoir, plus annual fees to maintain and operate a dam or reservoir, fees to conduct inspections, and penalties for non-compliance with the rules and regulations. These funds help to cover the lead agency's costs in administering the dam safety program, particularly with respect to conducting inspections. If the lead agency does not have staffing to conduct an inspection, the lead agency can retain outside engineers to assist with the inspection and then bill the dam or reservoir owner for those costs. It is highly recommended that new dam safety legislation revamp the current funding scheme so that at the very least, inspection costs can be charged to the dam or reservoir owner. It is also preferable to include higher filing fees, annual fees and civil

penalties to maintain or operate a dam or reservoir so that the program has additional funds to pay for equipment, cover its costs to periodically update the State's inventory of dams particularly with respect to changes in the hazard classification of dams (discussed below), and to pay for other costs necessary to administer the dam safety program such as training for State and County inspectors.

Another recommendation is to set up a revolving, non-expiring dam safety fund to which government appropriations, filing fees, annual fees, inspection fees and penalties are deposited for use only by the dam safety program. Money that is not used in any given fiscal year stays in the fund to be used for emergencies and costs such as updating the State's inventory of dams. Money in the fund can also be loaned to dam or reservoir owners to help them afford necessary repairs. Interest collected from the loans goes back into the fund to pay for emergencies and program costs or to make further loans.

The current Hawai'i Dam Safety Act can also be improved by adding more specific provisions. One area that can be narrowed is the owner's requirement to conduct inspections. Currently, there is no specific frequency that owners must inspect their dams, only that owners must conduct "timely inspections." There is also no requirement that owners submit inspection reports to DLNR. A revised Hawai'i Dam Safety Act should require annual or periodic inspections of dams depending on the hazard classification. Having a minimum frequency that owners must inspect their dams leaves no room for doubt as to how often owners must inspect their dams. The State could conduct the inspections and bill the owner for its costs in conducting the inspections and writing a report, or the State can require the owner to retain a qualified engineer authorized by DLNR to conduct the inspection and submit a report to DLNR.

If the State conducts the inspection it has more control over the quality and timing of the inspection and the content of the report. If the owner is required to retain a qualified engineer, it frees up valuable time that DLNR employees can use for other administrative duties. Of course, if the State conducted the inspections DLNR could retain engineers if it did not have time for the inspections and bill the owner for those costs.

A requirement of the inspection should be to update the dam's hazard classification. Accordingly, the revised Hawai'i Dam Safety Act should include a provision requiring the State to periodically update its inventory of dams (and provide funding to do so) particularly with respect to the hazard classification of the dams. One of the problems that this investigation revealed was that no periodic updates were made to the State's inventory of dams, so dams originally classified as "low hazard" retained that classification even though land development may have occurred downstream over the years to make the dam now a "high hazard" or "moderate hazard" dam. Because of DLNR's budget and staffing limitations mentioned above, they could only focus on dams that were classified as "high hazard" according to the inventory of dams. With a current inventory of dams, there is a better chance for a dam that should be classified as "high hazard" to be looked at more closely.

Another area of Hawai'i's current Dam Safety Act that needs clarification is BLNR and/or DLNR's authority to order or take remedial action to an existing dam or reservoir during emergent and non-emergent situations. There is currently no provision specifically addressing BLNR or DLNR's authority to do so after a dam or reservoir has already been constructed and approved. Instead, HRS §179D-6 grants broad authority to

BLNR to “require the owners to apply for, and obtain from the board written approval of plans and specifications on the construction of any new dam or reservoir or the enlargement of any dam or reservoir prior to commencement of any work,” to “enter upon such private property of the dam or reservoir as may be necessary in making any investigation or inspection required or authorized by this chapter,” and to “establish by rules adopted under chapter 91, such policies, requirements, or standards governing the design, construction, operation, maintenance, enlargement, alteration, repair, removal, and inspection of dams, reservoirs, and appurtenant works for the protection of life and property from structural failure of dams and reservoirs.” It is not entirely clear, however, what actions BLNR is authorized to take on private property, or whether BLNR can order repairs or removal in emergent and non-emergent situations other than during construction.

Provisions should be added to the Hawai‘i Dam Safety Act specifically authorizing BLNR and/or DLNR to order or take any and all remedial actions necessary, at the owner’s expense, to avoid a disaster both during emergent and non-emergent situations. Provisions requiring owners to seek the approval of BLNR to impound water after the reservoir has been constructed should be included. This gives BLNR more authority to require owners to make needed repairs to the dam or reservoir; if the owner fails to do so, BLNR can revoke or suspend the approval to impound water, which then requires the owner to drain the reservoir or else pay heavy civil penalties for illegally impounding water.

Finally, certain terms defined in the current legislation be modified and added so that the laws are more comprehensive and complete. The definition of “dam” should be

modified so that artificial barriers “less than six feet in height regardless of storage capacity or which has a storage capacity at maximum water storage elevation less than fifteen acre-feet regardless of height” as distinguished by HRS §179D-3, are not excluded from regulation if it is a “high hazard” or “moderate hazard” classified dam. The concern here is that there may be dams that the State has not yet found that could pose a danger to life or property but which are less than 6 feet in height or have a storage capacity less than 15 acre-feet. Under the current definition of “dam,” the state, once it found such a dam, could not regulate that dam and order necessary remedial work because it is excluded from the definition of a “dam.” Accordingly, the definition of “dam” should be modified so that even if a dam’s dimensions fall below the minimum dimensions, the State can regulate the dam if it is appropriately classified a “high hazard” or “moderate hazard” dam despite its small size.

A definition for “engineer” needs to be added to the statute. Currently, only the Administrative Rules define “engineer.” The definition, however, is broad and does not require the “engineer” to have any experience in dams. Many states require an “engineer” to have at least some minimum experience in dam investigation, construction, design and operation. A definition for “engineer” should be added to the legislation that requires at least some level of experience with dams. This way, the engineer will have some idea of what to look for during inspection and/or construction of a dam, and should be able to determine flaws in the dam that need repairs. If an engineer with no experience in dams is allowed to conduct inspections and/or oversee the construction of a dam, there could be things that the engineer does not catch that could lead to a disaster.



Other definitions that are recommended for inclusion or modification are: “Emergency”, “Enlargement”, “High Hazard”, “Moderate Hazard”, “Low Hazard”, “Owner”, “Person”, “Probable” and “Removal”, and “Application Approval.” Definitions for “Certificate of Approval to Impound”, and “Dam Rehabilitation Loan Program” should also be added if a new permitting process will be adopted in order to impound water, or if a loan program will be established to allow owner’s to take out low-interest loans for necessary repairs.

The recommendations discussed in this section are incorporated in the proposed legislation.

#### ***4.3 Proposed Changes to Hawai‘i Dam and Reservoirs Administrative Rules***

The Board of Land and Natural Resources is charged with the responsibility of drafting the Administrative Rules regarding dam safety, and such rules can only be adopted pursuant to the HRS Chapter 91. Accordingly, the proposed Dams and Reservoirs Administrative Rules are included for purposes of demonstrating how a new set of Administrative Rules could be drafted based upon the proposed legislation.

The proposed Dams and Reservoirs Administrative Rules incorporate many of the same conceptual changes discussed in the section above, but are more detailed in some areas. For example, the proposed statute grants the authority to BLNR to collect fees in order to cover some or all of BLNR’s costs in administering the dam safety program. The proposed statute does not detail what those fees are, so the proposed Rules provide a detailed fee schedule as an example of one way fees can be collected.

These and other changes can be seen in the proposed Dams and Reservoirs Administrative Rules.

#### **4.4 Other Recommendations**

This investigation has revealed that other State and County inspectors, and the public as a whole, may lack education concerning dam safety. Accordingly, the State should provide funding to educate the public, particularly dam owners, operators and State employees, with the latest information and techniques regarding dam safety. A related recommendation is to have the guidelines for safety inspection of dams published by DLNR in 1992<sup>486</sup> periodically reviewed and updated as necessary so that the public has the most recent information concerning inspections of dams and reservoirs.

Creating and developing guidelines for instrumentation monitoring of dams should be considered. Instrumentation monitoring should be required to the extent needed for comprehensive safety review and assessment of potential failure modes of dams. The costs of the instrumentation should be borne by the dam owner considering the amount it costs to maintain these systems.

The USGS currently estimates its costs to monitor a single reservoir's water level to be about \$6,410.00 a year. The USGS gets a limited amount of discretionary funding every year to use on projects like the monitoring of the reservoirs on Hawai'i. This funding ended on Sept 30, 2006. The USGS is only allowed to match funds provided by a local agency, so even if there is funding available, the local government would need to provide about \$3,205 for the monitoring of each reservoir.

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<sup>486</sup> Department of Land and Natural Resources, State of Hawai'i, "Guidelines for Safety Inspection of Dams," Report R92, December 1992.

There are 122 regulated dams in Hawai‘i according to the National Inventory of Dams data base. To monitor all of the dams in Hawai‘i would cost about \$788,430 a year, using the USGS cost estimates. If this could be split between the State and USGS, the State of Hawai‘i would pay about \$394,215 a year, while the USGS would pay about \$394,215 a year, provided that this much funding is available from the USGS. It is unlikely, however, the USGS would be able to pay this much into one state’s dam monitoring system. Assuming the full burden of such monitoring, roughly \$750,000 a year to monitor private dams, may be beyond what the State can afford.

Requiring the counties pay for instrumentation and monitoring would be burdensome. Kaua‘i would likely have the largest burden and may be least able to afford it.<sup>487</sup> An alternative would be to only monitor the high hazard classified dams. The projected cost to monitor the 53 high hazard classified dams in the State of Hawai‘i would be about \$339,370. Again, this would be expensive, and forcing the Counties to pay for it will place a larger burden on Kaua‘i and Maui.<sup>488</sup> In order to decrease the financial burden on the State and the various Counties, an alternative solution would be to require dam owners to pay the costs of dam monitoring. The dam owners could pay the costs into a State fund administered by the Hawai‘i DLNR. DLNR, partnering with the USGS, could supply the water level monitors, and maintain the data base to record and observe water levels.

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<sup>487</sup> Hawai‘i County has 12 total regulated dams which would cost \$76,920 to monitor water levels on its own, \$38,460 with USGS assistance. Honolulu County has 15 dams which would cost \$96,150 on its own, or \$48,075 with USGS assistance. Kaua‘i County has 51 dams which would cost \$333,320 on its own, or \$166,660 with USGS assistance. Maui County has 44 dams which would cost \$282,040 on its own, or \$141,020 with the USGS assistance.

<sup>488</sup> Hawai‘i County has 7 High hazard dams for a total cost of \$44,870 a year. Honolulu County has 5 High hazard dams, for a total cost of \$32,050 a year. Kaua‘i County has 21 High hazard dams for a total cost of \$134,610 a year. Maui County has 20 High hazard dams for a total cost of \$128,200 a year.



## 5 Proposed Legislation and Administrative Rules

These proposed amendments to the Hawai'i Dam Safety Act, and suggested amendments to the Administrative Rules that follow, are respectfully submitted for the Legislature's consideration. The intent is to incorporate the concepts underlying the recommendations set out above and not to advocate strongly the particular language suggested below. Most, if not all of the concepts have been taken from other state laws.

### 5.1 Proposed Legislation

§179D-1 Short title. This chapter shall be known and may be cited as the "Hawai'i Dam Safety Act of 2007[~~1987~~"].

§179D-2 Declaration of purpose. The purpose of this chapter is to provide for the inspection and regulation of construction, operation, and removal of all[~~certain~~] dams and reservoirs in order to protect the health, safety, and welfare of the citizens of the State by reducing the risk of failure of such dams. The legislature finds and declares that the inspection and regulation of construction, operation, and removal of all[~~certain~~] dams and reservoirs are properly a matter of regulation under the police powers of the State.

§179D-3 Definitions. The following terms, whenever used and referred to in this chapter, shall have the following respective meanings, unless a different meaning clearly appears in the context:

"Appurtenant works" means any structure, such as spillways, either in the dam or separate therefrom, the reservoir and its rim, low level outlet works, and water conduits, such as tunnels, pipelines, or penstocks, either through the dam or its abutment.

"Application Approval" means authorization in writing issued by the Board to an owner who has applied to the Board for permission to construct, enlarge, repair, alter, remove, maintain or operate a dam and which specifies the

conditions or limitations under which work is to be performed by the owner or under which approval is granted.

"Board" means the board of land and natural resources.

"Certificate of Approval to Impound" means authorization in writing issued by the board to an owner who has completed construction, enlargement, repair, or alteration of a dam and which specifies the conditions or limitations under which the dam and reservoir are to be maintained and operated.

"Dam" means any artificial barrier, including appurtenant works, which impounds or diverts water, and which:

(1) Is twenty-five feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier, or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse to a maximum water storage elevation; or

(2) Has an impounding capacity at maximum water storage elevation of fifty acre-feet or more. This chapter does not apply to any artificial barrier which is less than six feet in height regardless of storage capacity or which has a storage capacity at maximum water storage elevation less than fifteen acre-feet regardless of height, unless such a barrier, due to its location or other physical characteristics, is a high hazard or moderate hazard potential dam.

"Dam Rehabilitation Loan Program" means a low interest revolving dam rehabilitation loan program, created through this chapter.

"Department" means the department of land and natural resources.

"Emergency" includes, but is not limited to, breaches and all conditions leading to or causing a breach, overtopping, or any other condition in a dam and its appurtenant structures that may be construed as unsafe or threatening to life or property.

"Enlargement" means any change in or addition to an existing dam or reservoir that raises or may raise the water storage elevation of the water impounded by the dam.

"Owner" means any person who ~~[owns, controls, operates, maintains, manages, or proposes to construct a dam or reservoir]~~has a right, title, or interest in or to the dam or to the property upon which the dam or appurtenant works is located or proposed to be located.

"Person" includes any natural person, partnership, firm, association, organization, corporation, municipality, municipal authority, trust, receiver or trustee, LLC, LLP, or company, or any State department, agency, or political subdivision, or any other commercial or legal entity. Whenever used in a section prescribing and imposing a penalty or sanction, the term "person" shall include the members of an association or organization, and the officers of a corporation, company, municipality or municipal authority~~[means any individual, partnership, corporation, company, association, organization, the State and its departments and agencies, and the political subdivisions of the State].~~

"Probable" means more likely than not to occur; reasonably expected; realistic.

"Removal" means complete elimination of the dam embankment or structure to restore the approximate original topographic contours of the valley.

"Reservoir" means any basin which contains or will contain water impounded by a dam.

§179D-4 Liability for damages. (a) Nothing contained in this chapter shall be construed to constitute a waiver of any immunity of the State and no action or failure to act under this chapter shall be construed to create any liability in the State, board, department, or its officers or employees, for the recovery of damages caused by such action or failure to act.

(b) No action shall be brought against the state, the board or the department, or any employee of the state, the board or the department for damages sustained through the partial or total failure of any dam or reservoir dealt with

in this chapter or its maintenance or operation by reason of any supervision or other action taken or not taken pursuant to this chapter.

(d) [(b)] Nothing in this chapter and no order, action, or advice of the State, board, department, or any representative thereof, shall be construed to relieve an owner or operator of a dam or reservoir of the legal duties, obligations, or liabilities incident to the ownership or operation of a dam or reservoir; provided that an owner or operator of a dam or reservoir shall not be liable for damages as a result of only natural causes such as earthquakes of an average recurrence interval of 1,000 years, hurricanes or extraordinary rains of an average recurrence interval in excess of two hundred fifty years.

§179D-5 Unlawful conduct. (a) It shall be unlawful for any person to construct, enlarge, repair, alter, operate, or remove a dam or other artificial barrier covered by this chapter, except in such a manner as to conform to and comply with the provisions of this chapter and with all rules, orders, and permits established under this chapter.

(b) Any person who engages in any action made unlawful by this chapter shall be guilty of a misdemeanor. Each day of continued violation after conviction shall constitute a separate offense.

(b) The owner of a dam or reservoir that was constructed before February 1, 2007 shall, under regulations adopted by the board, file an application with the board for the approval of the dam or reservoir. [The rules and orders adopted under this chapter shall not apply to the design and construction of dams, reservoirs, and appurtenant works existing on June 6, 1987, but the rules and orders shall establish standards consistent with such design and construction for the operation, maintenance, and repair thereof, and those rules and orders then shall be applicable to those dams, reservoirs and appurtenant works which were existing on June 6, 1987.]

§179D-6 General powers and duties of the board of land and natural resources. (a) All dams and reservoirs in the state shall be under the jurisdiction of the board of



land and natural resources. The board of land and natural resources shall administer the dam safety program established by this chapter. In carrying out this chapter, the board shall cooperate, advise, consult, contract, and enter into cooperative agreements with the United States government or any of its agencies, other state agencies, and the county governments or any of their agencies. In the performance of its duties the board shall:

(1) Establish by rules adopted under chapter 91, such policies, requirements, or standards governing the design, construction, operation, maintenance, enlargement, alteration, repair, removal, and inspection of dams, reservoirs, and appurtenant works for the protection of life and property from structural failure of dams and reservoirs;

(2) Conduct investigations and the collection of data, including technological advances made in safety practices elsewhere, as may be needed for the proper review and study of the various features of the design, construction, repair, removal, and enlargement of dams, reservoirs, and appurtenant works. The board may require submittal of reports of investigations from all owners;

(3) Conduct investigations and require reports from all owners to be made from time to time, such as watershed investigations and studies, as may be necessary to keep abreast of developments affecting stream runoff and as required to facilitate its decisions;

(4) Be authorized to enter upon such private property of the dam or reservoir as may be necessary in making, at the owner's expense, any investigation or inspection required or authorized by this chapter. The entry shall not constitute a cause of action in favor of the owner of the land, except for damages resulting from wilful acts or negligence by the board or its agents;

(5) Require the owners to apply for, and obtain from the board written approval of plans and specifications on the construction of any new dam or reservoir or the enlargement of any dam or reservoir prior to commencement of any work;

(6) Require the owners to file an application and secure the written approval of the board before commencing

the repair, alteration or removal of a dam or reservoir, including the alteration or removal of a dam so that it no longer constitutes a dam or reservoir as defined in this chapter. Repairs shall not be deemed to apply to routine maintenance not affecting the safety of the structure;

(7) Require owners to secure the written approval of the board to impound water;

(8) ~~(7)~~ Require ~~[filing]~~ fees ~~[by rules to accompany each application as required under the provisions of this chapter]~~ to cover the board's costs in carrying out the supervision of dam safety.

(9) Examine and approve or disapprove applications for approval of construction, enlargement, repair, alteration or removal of a dam or reservoir, and applications for certificates of approval to impound;

(10) Order the suspension or revocation, or both, of any application approval or certificate of approval to impound for any act for failure to comply with any of the provisions of this chapter or with any rules, regulations or orders adopted pursuant to this chapter, or with any of the conditions contained in or attached to the application approval or certificate of approval to impound;

(11) Issue orders requiring the adoption by an owner of remedial measures necessary for the safety of life or public or private property or for carrying out the provisions of this chapter or rules and regulations issued under this chapter;

(12) Order the immediate cessation of any act that is started or continued without an application approval or certificate of approval to impound as required by the provisions of this chapter;

(13) Enter private property and immediately take actions necessary to provide protection to life or property at the owner's expense, including removal of the dam. The entry shall not constitute a cause of action in favor of the owner of the land, except for damages resulting from wilful acts or negligence by the board or its agents.

(14) Recover from the owner, in the name of the State, the expenses incurred in taking any action required by the

owner of the dam in the same manner debts are recoverable by law;

(15) Assess civil and criminal penalties for violation of any provision of this chapter or any rule, regulation, standard adopted or order issued by the board pursuant to this chapter;

(16) Be authorized to place liens on the owner's property, to be collected as delinquent taxes against the lands and property are collected, if the owner neglects to pay any costs, expenses or penalties chargeable to the owner under any rule, regulation, order, condition or other provision of this chapter;

(17) With the assistance of the attorney general, institute and prosecute all court actions as may be necessary to obtain the enforcement of any order issued by the board in carrying out the provisions of this chapter; and

(18) Take such other actions as may be necessary to carry out this part.

§179D- Certificate of approval. Each dam owner must hold a valid certificate of approval to impound in order to legally impound water under the laws of this State.

§179D-7 Administrative and judicial review.

(a) The findings and orders of the board, and the board's approval or disapproval of an application issued by the state are final, conclusive and binding upon all owners, state agencies, and other government agencies, regulatory or otherwise, as to the safety of design, construction, enlargement, repair, alteration, removal, maintenance, and operation of any dam or reservoir. The board's approval of an application or a certificate of approval to impound will not be considered final if it can be demonstrated to the board that the board's approval of the relevant application or certificate of approval was based on one or more misrepresentations.

(b) Any person who is aggrieved or adversely affected by an order or action of the board shall be entitled to administrative and judicial review in accordance with

chapter 91, provided however, that the order or action shall remain in force until modified or set aside on appeal.

~~§179D-8 Violations; penalties. [Any person violating any provision of this chapter or any permit condition or limitation established pursuant to this chapter or negligently or wilfully failing or refusing to comply with any final order of the board issued as provided herein, shall be liable for a civil penalty not to exceed \$500 for each day during which said violation continues.]~~

(a) Any person who violates any rule, regulation, order, condition or other provision of this chapter shall be subject, upon order of a court, to a civil penalty not to exceed \$10,000 per day of such violation, and each day during which the violation continues shall constitute an additional, separate, and distinct offense.

(b) Any person who intentionally, knowingly, or after written notice to comply, violates any rule, regulation, order, condition or provision of this chapter, or knowingly obstructs, hinders, or prevents the department's agents or employees from performing duties under this chapter, shall be guilty, upon conviction, of a misdemeanor and shall be subject to a fine of not less than \$2,500 nor more than \$25,000 per day of violation. A second or subsequent offense under this subsection shall subject the violator to a fine to the contrary, of not less than \$5,000 nor more than \$50,000 per day of violation.

(c) With the assistance of the attorney general, the board may seek an injunction and damages in the enforcement of this chapter.

(d) All penalties collected pursuant to this section or sums collected pursuant to this Act shall be deposited in the "Dam Safety Fund," established pursuant to this Act.

§179D-9 Enactment of rules. (a) The department shall adopt the necessary rules not later than one and one-half years after February 1, 2007~~[June 6, 1987]~~.

(b) All laws and parts of law in conflict with this Act are hereby repealed.

(c) A declaration that certain parts of this Act are unconstitutional shall not affect the constitutionality of other parts of this Act.

§179D-10 Entry upon property. (a) The department shall have the right to direct and conduct such investigations as it may reasonably deem necessary to carry out its duties as prescribed in this part. For this purpose, the agents or employees of the department or any authorized representatives shall have the right to enter at reasonable times, without prior notice, on any property, public or private, for the purpose of investigating the condition, construction, or operation of any dam or other artificial barrier dealt with in this part. If the owner of the property refuses to allow the inspection, the department may seek a search warrant to allow the inspection. If the department has been refused inspection of drawings, operational records, or other information concerning a dam or reservoir, the department may seek an administrative subpoena compelling production of the drawings, operational records, or other information.

(b) It shall be unlawful for any person to refuse entry or access to any authorized representative of the department who requests entry for purposes of inspection and who presents appropriate credentials. It shall also be unlawful to obstruct, hamper, or interfere with any such representative while in the process of carrying out his official duties.

§179D-11 Injunctive relief. Whenever in the judgment of the department any person has engaged in or is about to engage in any act or practice which constitutes or will constitute an unlawful action under this part, he may make application to the circuit court of the county in which the unlawful act or practice has been or is about to be engaged in, or in which jurisdiction is appropriate, for an order enjoining such act or practice, or for an order requiring compliance with this part. Upon a showing by the department that such person has engaged in or is about to engage in any such act or practice, a permanent or temporary injunction, restraining order, or other order shall be granted without the necessity of showing lack of an adequate remedy at law.

§179D-12 Emergency actions. (a) If, in the opinion of the department, conditions of any dam or reservoir are so dangerous to the health and safety of life or property as not to permit time for issuance and enforcement of an order relative to construction, modification, maintenance, or repair, or the dam is threatened by any large flood, the department may immediately employ remedial measures necessary to protect such life and property.

(b) The department shall maintain complete control of any such dam or reservoir which, pursuant to subsection (a) of this section, has been determined to be dangerous to life or property until such dam or reservoir is deemed safe, or until any emergency conditions which precipitated the department taking control of any such dam or reservoir, pursuant to subsection (a) of this section, have abated. The department is hereby empowered to determine the proper time at which to relinquish control of any such dam or reservoir.

(c) Any necessary and reasonable costs and expenses incurred by the department in fulfilling the duties mandated by subsections (a) and (b) of this section in connection with a remedial or emergency action shall be recoverable by the department from the owner of any such dangerous or threatened dam or reservoir.

(d) Any owner failing or refusing, after written notice has been given, to pay the reasonable costs and expenses incurred by the department pursuant to subsection (c) of this section shall be, upon complaint by the department to the attorney general, subject to reasonable attorney fees incurred in the recovery of such costs and expenses.

(e) All moneys collected by the department pursuant to subsection (c) of this section shall be credited to the Dam Safety Fund created in section 179D-13.

§179D-13 Establishment of Dam Safety Fund. (a) All fees, penalties, interest, fines, or charges collected by the board under this chapter shall be deposited in the Dam Safety Fund, which is hereby established in the State Treasury. The money in that fund shall be available to the

board, upon appropriation by the Legislature, for the administration of the dam safety program.

(b) The Dam Safety Fund shall also be funded through monies appropriated by the legislature and monies collected by the board in full or partial satisfaction of liens created by Subsection (c) (2). Monies in the fund may be used to employ remedial measures necessary to protect life and property in accordance with the provisions of this Section and Section 179D-11. The board shall administer the fund. On notice from the board, the state treasurer shall invest and divest monies in the fund and monies earned from investment shall be credited to the fund. Monies in the Dam Safety Fund are exempt from lapsing.

(c) The board may spend monies from the Dam Safety Fund established by this section with the following provisions:

(1) The board shall remain in full charge and control of the dam, reservoir and appurtenances until they have been rendered safe or the emergency has terminated;

(2) The costs and expenses of the control, regulation, abatement and inspection provided by this section, including costs of construction, enlargement, repair, alteration or removal work done to render the dam, reservoir, or appurtenances safe, shall constitute a statutory lien against all property of the owner. The lien shall be considered prior and superior to all other mortgages, liens or encumbrances of record even if those other mortgages, liens, or encumbrances were filed before the lien becomes due.

(3) The lien referred to in Subsection (c) (2) may be perfected and foreclosed in advance of construction, enlargement, repair, alteration or removal or after completion of the construction, enlargement, repair, alteration or removal. If perfected in advance, the lien shall be perfected by the filing of an affidavit of the board setting forth the estimate of the costs of construction, enlargement, repair, alteration or removal within the county in which the dam is located in the same manner as prescribed for mechanic's liens. When the affidavit is filed, the amount set forth in the affidavit shall be a lien in such amount against all property of the owner. If the actual cost of construction, enlargement,

repair, alteration or removal exceeds the estimated cost, the board may amend the affidavit setting forth the additional estimated cost. If the estimated cost exceeds the actual costs of construction, enlargement, repair, alteration or removal at completion, the board shall file an amended affidavit at completion. If a lien is perfected in advance and the construction, enlargement, repair, alteration or removal is not commenced within two years from the date of perfection, the lien shall be void. The board shall file a satisfaction of lien upon payment of the costs of construction, enlargement, repair, alteration or removal by the owner;

(4) Monies collected in full or partial satisfaction of a lien created pursuant to Subsection (c)(2) of this section shall be deposited in the Dam Safety Fund established by Subsection (a).

§179D-14. Dam Rehabilitation Loan Program. (a) The board shall create a Dam Rehabilitation Loan Program, or may partner with other public or private agencies or organizations to create a Dam Rehabilitation Loan Program. The program shall initially be funded with \$2 Million through monies appropriated by the legislature and deposited into the Dam Safety Fund.

(b) The State Legislature may authorize required funding to expand the financial size of the Dam Rehabilitation Loan Program.

(c) The Program shall be subsequently funded through additional monies appropriated by the legislature and through fees, penalties, interest, fines, or charges collected by the board under this chapter, and all interest earned on the investment of monies in the Dam Safety Fund by the state treasurer.

(d) The Dam Rehabilitation Loan Program may obtain funds through partnerships with any private or public, bonding or loaning, agency or organization.

(e) State funding to the Dam Rehabilitation Loan Program cannot be reduced because of federal funds provided for a rehabilitation loan program.



(f) Monies in the Dam Safety Fund and collected for the Dam Rehabilitation Loan Program do not revert to the State general fund. Monies in the fund are exempt from lapsing.

(g) The board may grant loans from the Dam Safety Fund to dam owners to defray the costs of repairing dams which the board determines to be dangerous to the safety of life and property but which are not in an emergency condition. Loans shall be granted on such terms and conditions as may be imposed by the board. The following provisions apply:

(1) The board shall adopt administrative rules that are required to administer this statute.

(2) The board may take any administrative or legal action necessary for the administration of this statute.

(3) If the balance of the Dam Safety Fund exceeds one million dollars, no single loan shall be made for more than twenty percent of the monies available in the fund. No loan shall be made to any dam owner that, at the time of the loan application, has more than twenty percent of the outstanding loans of the fund;

(4) The loans granted by the board shall be for a term of not more than twenty years; and the loans shall bear interest at rates set by the board in the regulations;

(5) Each loan shall be evidenced by a contract between the dam owner and the board, acting on behalf of this state. The contract shall provide for the loan by this state of a stated amount to defray some or all of the costs of repairing the dam. The contract shall provide for equal annual payments of principal and interest for the term of the loan. Eligible cost provisions include:

(i) Any costs directly related to rehabilitating safety deficiencies of a dam shall be eligible to be funded through the Dam Rehabilitation Loan Program.

(ii) Fees for analysis, feasibility work, alternative evaluation, and engineering design, are only eligible retroactively after construction has been initiated, or at the point that analysis has shown a dam to be in compliance.

(iii) Up to 100% of rehabilitation costs for a dam may be loaned.

(iv) Dam owners may use multiple programs or sources to fund the rehabilitation costs for a dam, up to 100% of rehabilitation costs.

(v) Rehabilitation cost for any dam is eligible, except for dams owned by the federal government.

(vi) Any costs directly related to compliance with other laws and regulations, above the State's minimum dam safety requirements are eligible as part of an overall rehabilitation project.

(vii) Any costs for State agency required fish passage is eligible if it is part of an overall rehabilitation project; but such costs are not eligible if they are not part of an overall rehabilitation project.

(6) The board may take whatever security interest it deems necessary in the dam owner's property in exchange for the loan. If the board chooses to take a security interest in the dam owner's property, the board shall perfect that security interest by filing appropriate documentation with the proper authorities.

(7) The attorney general or the board's legal counsel may, with the consent of the board, commence whatever actions are necessary to enforce the contract and achieve repayment of loans provided by the board pursuant to this section.

(h) Owners' responsibilities include:

(1) Once a loan has been granted under this statute, the owner of a dam must have an operation and maintenance plan with written, regularly scheduled reports, so as to maintain and keep the structure and its appurtenant works in the state of repair and operating condition required by the exercise of prudence; due regard for life or property; the application of sound and accepted engineering principles; the provisions of rules, guidelines, or policies.

(2) As part of any rehabilitation project utilizing funds from this program the owner must have an emergency action plan developed (if one doesn't currently exist).

(3) Cooperate with the Agency's agents, engineers, and other employees in the conduct of the statute.

(4) Facilitate access to the structure or appurtenance.

(5) Furnish upon request the plans, specifications, operating and maintenance data, or other information that is pertinent to the structure, appurtenance, and loan.

(i) The following general loan guidelines shall apply:

(1) Owners of dams without taxing authority should be allowed to participate in the Dam Rehabilitation Loan Program.

(2) Complete rehabilitations are to be encouraged, but phased projects can be funded.

(3) Removal of dams as a rehabilitation alternative should be allowed.

(4) As part of the application process, owners should demonstrate the ability to appropriately operate and maintain the dam after rehabilitation is complete.

(5) Owners are allowed to partner with an individual, local agency, or organization, for purposes of the loan, and for purposes of operation and maintenance.

(6) Rehabilitation projects that are in compliance with State statute and rules, and are permitted, accepted, and approved by the board are eligible to be funded through the Dam Rehabilitation Loan Program.

(7) If a dam is exempt from State regulation, to obtain funding through the Dam Rehabilitation Loan Program, the project must adhere to State standards that relate to design, construction and provisions of this Act.

(8) Costs for lake enhancement projects such as, lake dredging, sediment removal projects, or boat ramps, which

do not enhance the safety of the dam, are not eligible to be funded through the Dam Rehabilitation Loan Pro-gram.

(9) The board and its agents, engineers, and other employees may, for the purposes of this Act, enter upon any land or water in the State without a search warrant or liability for trespass.

(10) The State Legislature authorizes staff positions, required funding, and organizational structure, to administer the Dam Rehabilitation Loan Program.

(11) This statute does not create a liability for damages against the board, its officers, agents, and employees caused by or arising out of any of the following:

(i) The construction, maintenance, operation, or failure of a dam, or appurtenant works.

(ii) The issuance and enforcement of an order or a rule issued by the board to carry out the board's duties.

(12) The State does not assume ownership obligations, responsibilities, or liabilities if an owner defaults on a loan.

§179D-15. Dams and Reservoirs Completed Prior to Effective Date of this Act. (a) Every owner of a dam that falls within the definition of a dam in this Act and completed prior to the effective date of this Act shall file with the board a separate application for a certificate of approval to impound and any other supporting information as required by the board for each of these dams. Each application shall also be accompanied by applicable application fees as required by the board.

(b) The board shall give notice to file an application for certificate of approval to impound to owners of such dams or reservoirs who have failed to file such applications as required by this article.

(c) The notice provided for in this section shall be delivered by certified mail to the owner at his last address of record in the office of the county tax assessor in which the dam is located. Such mailing shall constitute service.

(d) The board shall make inspections of such dams and reservoirs, unless the data, records, and inspection reports on file with it are found adequate to enable a determination whether or not the certificate of approval to impound should be issued.

(e) The board shall require owners of such dams and reservoirs to perform at their expense such work or tests as may reasonably be required to disclose information sufficient to enable the board to determine whether to issue certificates of approval to impound, or to issue orders directing further work at the owner's expense necessary to safeguard life and property. For this purpose, the board may require an owner to lower the water level of, or to drain, the reservoir.

(f) If, upon inspection or upon completion to the satisfaction of the board of all work that may be ordered, the board finds that the dam and reservoir are safe to impound water, a certificate of approval to impound shall be issued. The board may find that the dam or reservoir will not safely impound water and may refuse to issue a certificate of approval to impound. Upon finding the dam and reservoir are unsafe to impound water, the board shall issue a written notice to the owner, whereupon the owner shall cause the dam and reservoir to no longer impound water after receipt of the notice.

§179D-16. Dams and Reservoirs Under Construction, Enlargement, Repair, Alteration or Removal Before Effective Date of this Act. (a) Any dam or reservoir that falls within the definition of a dam and reservoir in this Act and which the board finds was under construction, enlargement, repair, alteration or removal and based on its findings not 90 percent constructed, enlarged, repaired, altered or removed on the effective date of this Act shall, except as provided in Subsection (b), be subject to the same provisions in this Act as a dam or reservoir commenced after that date. Every owner of such a dam and reservoir shall file an application with the board for the board's written application approval of the plans and specifications.

(b) Construction, enlargement, repair, alteration or removal work on such a dam and reservoir may proceed, provided an application for approval of the plans and

specifications is filed, until an application approval is received by the owner approving the dam and reservoir or an order is received by the owner specifying how the construction, enlargement, repair, alteration or removal must be performed to render the dam or reservoir safe. After receipt of an application approval or order specifying how construction, enlargement, repair, alteration or removal of the dam or reservoir must be performed, work thereafter must be in accordance with the application approval or order.

§179D-17. Annual report. The department shall submit an annual report to the legislature by January 5 of each year concerning the activities of the department relating to this chapter for the preceding fiscal year. A copy of such report shall be provided to each of the following: The governor and the chairmen of the committees of the senate and the house of representatives dealing with dam safety legislation. Such report shall include but not be limited to information on the following: Approvals of plans and specifications for construction of dams and reservoirs and for alterations, modifications, repairs, and enlargements; number of safety inspections made and the results thereof; use of appropriated funds; receipts generated for inspections of dams and reservoirs; rules and regulations adopted or amended; enforcement orders and proceedings; dam failures and reasons therefor; and other available data regarding the effectiveness of the state's dam and reservoir safety program.

## 5.2 Proposed Administrative Rules

### SUBCHAPTER 1 GENERAL PROVISIONS

§13-190-1 Purpose and applicability.

(a) The purpose of this chapter is to establish rules governing the design, construction, operation, maintenance, enlargement, alteration, repair, and removal of dams, reservoirs, and appurtenant works in the State.

(b) This chapter shall not apply to the design and construction of dams, reservoirs, and appurtenant works which already existed on [~~June 6, 1987~~] February 1, 2007, but shall apply to their operation, maintenance, enlargement, alteration, repair, and removal.

(c) This chapter does not apply to any artificial barrier which is less than six feet in height regardless of storage capacity or which has a storage capacity at maximum water storage elevation less than fifteen acre-feet regardless of height, unless such a barrier, due to its location or other physical characteristics, is a high hazard or moderate hazard potential dam.

§13-190-2 Definitions.

As used in this chapter unless otherwise provided:

"Alteration" means a change to an existing dam or reservoir from the originally approved construction plans and specifications or current condition.

"Application Approval" means authorization in writing issued by the Board to an owner who has applied to the Board for permission to construct, enlarge, repair, alter, remove, maintain or operate a dam and which specifies the conditions or limitations under which work is to be performed by the owner or under which approval is granted.

"Appurtenant works" means the ancillary features of a dam, such as the spillway, reservoir and its rim, powerhouse outlet, tunnel, pipeline, and penstock.

"Authorization" means written acknowledgement from the department to proceed with proposed actions.

"Board" means the board of land and natural resources.

"Certificate of Approval to Impound" means authorization in writing issued by the board to an owner who has completed construction, enlargement, repair, or alteration of a dam and which specifies the conditions or limitations under which the dam and reservoir are to be maintained and operated.

"Dam" means any artificial barrier, including appurtenant works, which impounds or diverts water, and which:

(1) Is twenty-five feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier, or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse, to a maximum water storage elevation; or

(2) Has an impounding capacity at maximum water storage elevation of fifty acre-feet or more. This chapter does not apply to any artificial barrier which is less than six feet in height regardless of storage capacity or which has a storage capacity at maximum water storage elevation less than fifteen acre-feet regardless of height, unless such a barrier, due to its location or other physical characteristics, is a high hazard potential dam.

"Dam Rehabilitation Loan Program" means a low interest revolving dam rehabilitation loan program, created through HRS §179D.

"Day" means calendar days including Saturdays, Sundays and holidays.

"Department" means the department of land and natural resources.

"Design water level" means the maximum water elevation, including the flood surcharge, that a dam is designed to withstand.

"Emergency" includes, but is not limited to, breaches and all conditions leading to or causing a breach, overtopping, or any other condition in a dam and its appurtenant



structures that may be construed as unsafe or threatening to life or property.

"Engineer" means a qualified professional engineer. The term 'qualified professional engineer' as used in this law is intended to mean an individual who has a background in civil engineering and; (a) Is a licensed engineer; (b) Is competent in areas related to dam investigation, design, construction, and operation for the type of dam being investigated, designed, constructed or operated; (c) Has at least five (5) years of relevant experience in areas such as investigation, design, construction, enlargement, repair, alteration, maintenance, operation or removal of dams; (d) Understands adverse dam incidents, failures and the potential causes and consequences of failures; and (e) Continues with necessary training to keep abreast of the state of the practice in dam safety engineering."~~[a registered professional engineer, licensed by the State of Hawaii.]~~

"Enlargement" means any change in or addition to an existing dam or reservoir which raises or may raise the maximum water storage elevation of the reservoir.

"Hazard Potential means the possible adverse incremental consequences that result from the release of water or stored contents due to failure of the dam or mis-operation of the dam or appurtenances. The hazard potential classification of a dam does not reflect in any way on the current condition of the dam and its appurtenant structures (e.g., safety, structural integrity, flood routing capacity).

"High hazard" means a dam's failure ~~[would most]~~will probably ~~[result in the]~~cause loss of human life~~[lives and extensive property damage]~~.

"Low hazard" means a dam's failure ~~[would]~~will result in no probable loss of human life and low economic and/or environmental losses. Economic losses are principally limited to the owner's property. ~~[only minimal property damage]~~.

"Maximum water storage elevation" means the maximum water surface elevation of the reservoir at the crest of the spillway or, if no spillway exists, at the crest of the dam.

"Moderate hazard" means a dam's failure will result in no probable loss of human life but can cause major economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. Moderate hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure~~[would possibly result in the loss of life and appreciable property damage]~~.

"Owner" means any person who ~~[owns, controls, operates, maintains, manages, or proposes to construct a dam or reservoir]~~has a right, title, or interest in or to the dam or to the property upon which the dam or appurtenant works is located or proposed to be located.

"Probable" means more likely than not to occur; reasonably expected; realistic.

"Person" includes any natural person, partnership, firm, association, organization, corporation, municipality, municipal authority, trust, receiver or trustee, LLC, LLP, or company, or any State department, agency, or political subdivision, or any other commercial or legal entity. Whenever used in a section prescribing and imposing a penalty or sanction, the term "person" shall include the members of an association or organization, and the officers of a corporation, company, municipality or municipal authority~~[means any individual, firm, association, organization, partnership, estate, trust, corporation, company, or any governmental unit]~~.

"Removal" means complete elimination of the dam embankment or structure to restore the approximate original topographic contours of the valley.

"Repair" means construction to an existing dam that does not significantly change the reservoir's storage capacity. Repair shall not be deemed to apply to routine maintenance not affecting the safety of the structure.

"Reservoir" means any basin which contains or will contain water impounded by a dam.

"Spillway" means a device which safely diverts the flood of a dam without endangering its safety or integrity.

"Spillway crest" means the lowest level at which water can flow over or through the spillway.

"Storage capacity" means the total reservoir storage in acre-feet at the maximum water storage elevation.

§13-190-3 Exempt structures.

Structures exempt from these rules include:

(1) Highways and roadfills (except those designed or modified with the purpose of impounding water for uses other than flood detention);

(2) Dams smaller than those defined in section 13-190-2.

(3) Dams for which no loss of human life is expected and damage will occur only to the owner's property in the event of failure of the dam;

(4) Refuse embankments (e.g., solid waste disposal facilities); and

(5) Structures that store water only below the lowest point of the natural ground, unless an outlet works is constructed to develop water.

§13-190-4 Violations; penalties.

(a) Any person who violating any provision of this chapter shall be liable for a civil penalty not to exceed \$10,000 per day of such violation, and each day during which the violation continues shall constitute an additional, separate, and distinct offense.

(b) Any person who intentionally, knowingly, or after written notice to comply, violates any rule, regulation, order, condition or provision of this chapter, or knowingly obstructs, hinders, or prevents the department's agents or employees from performing duties under this chapter, shall be guilty of a misdemeanor and shall be subject to a fine of not less than \$2,500 nor more than \$25,000 per day of violation, . A second or subsequent offense under this subsection shall subject the violator to a fine to the

contrary, of not less than \$5,000 nor more than \$50,000 per day of violation.

~~[Any person violating any provision of this chapter shall be liable for a civil penalty not to exceed \$500 for each day during which said violation continues].~~

§13-190-5 Administrative and judicial review.

(a) The findings and orders of the board, and the board's approval or disapproval of an application issued by the state are final, conclusive and binding upon all owners, state agencies, and other government agencies, regulatory or otherwise, as to the safety of design, construction, enlargement, repair, alteration, removal, maintenance, and operation of any dam or reservoir. The board's approval of an application or a certificate of approval to impound will not be considered final if it can be demonstrated to the board that the board's approval of the relevant application or certificate of approval was based on one or more misrepresentations.

(b) Any person aggrieved or adversely affected by an order or action of the board is entitled to administrative and judicial review in accordance with chapter 91, HRS, provided however, that the order or action shall remain in force until modified or set aside on appeal.

§13-190-6 Severability.

If any portion of these Rules and Regulations is found to be invalid, the remaining portion of the Rules and Regulations shall remain in force.

## SUBCHAPTER 2

### CONSTRUCTION, ENLARGEMENT, REPAIR, ALTERATION, OR REMOVAL OF DAMS AND RESERVOIRS

§13-190-20 Construction or enlargement of dam or reservoir.

(a) No person shall construct any dam or reservoir or enlarge any dam or reservoir until an application to undertake the work has been filed and written approval of the construction plans and specifications is obtained from the board.

(b) A separate application shall be filed with the board for each reservoir and dam.

(c) Each application shall be made on forms furnished by the department and shall include the following:

(1) Name and address of the applicant

(2) Name and address of the owner or owners of the land upon which the works are to be constructed or enlarged, and a legal description of the land;

(3) Description of the location, type, size, purpose and height of the proposed dam and reservoir and appurtenant works;

(4) Storage capacity and reservoir surface areas for maximum water storage elevation and design water level;

(5) Plans for any permanent instrument installations in the dam;

(6) Area of the drainage basin, rainfall and streamflow records, and flood-flow records and estimates (as accurately as may be readily obtained);

(7) Relevant construction drawings, plans, and specifications signed and sealed by the design engineer;

(8) Proposed times of commencement and completion of the proposed activity;

(9) Name and address of the person who prepared the plans and specifications;

(10) Name and address of the person who will construct or enlarge the proposed dam or reservoir and appurtenant works;

(11) A listing of all sources of inflow to the reservoir;

(12) An assessment of the consequences of dam failure on downstream areas, including: (A) An estimation of the magnitude of the dam break flood hydrographs resulting from hypothetical dam failures occurring within the reservoir at normal storage elevation and maximum storage elevation; (B)

A general description of the areas downstream of the dam that could be affected by floodwater from a dam failure;  
(C) If there is the potential for loss of life, an inundation map delineating the maximum areal extent of flooding that could be produced by a dam failure.  
Inundation mapping should extend to a point downstream where the inundation from the dam failure is within the 100-year floodplain for the affected watercourse; and (D) The downstream hazard classification (high, moderate or low) which reflects the current conditions of development in downstream areas.

(13) The "estimated cost," as defined in sections 13-190-50(b) of this chapter, of the dam or reservoir or enlargement;

(14) Proof of financial responsibility;

(15) An Emergency Preparedness Plan; and

(16[11]) Other information as may be necessary for the board to determine the merits of the proposed construction or enlargement of the dam or reservoir and appurtenant works, including any hazards to the public health, safety, or welfare, and the desirability of issuing a permit.

(d) To be approved, the relevant construction drawings, plans and specifications must contain sufficient detail to describe the proposed construction work.

(1) The following items, as a minimum, shall be included as part of the construction plans: (A) Project location and vicinity maps; (B) Site map of dam, reservoir area and appurtenances; (C) Sectional view along longitudinal axis of dam and foundation; (D) Cross-sectional view of dam at location of maximum height; (E) Cross-sectional views and profiles of spillway(s), outlet facilities, and other appurtenances; (F) Steel reinforcement placement and bar sizing for concrete construction must be shown in at least one section or profile; and (G) The plan for diversion and control of water during construction.

(2) The following items, as a minimum, shall be included as part of the construction specifications: (A) Type, class, or description of all materials to be used;

(B) The requirements for fill placement, moisture conditioning, and minimum level of compaction of all earthen zones; (C) The requirements, procedures, and minimum standards for concrete construction and/or structural details.

(e) The Board shall, when in its judgment it is necessary, also require the following:

(1) Data concerning subsoil and rock foundation conditions and the materials involved in the construction or enlargement of the dam or reservoir;

(2) Investigations of, and reports on, subsurface conditions, exploratory pits, trenches and adits, drilling, coring, geophysical tests to measure in place and in the laboratory the properties and behavior of foundation materials at the dam and reservoir site;

(3) Investigations and reports on the geology of the dam or reservoir site, possible geologic hazards, seismic activity, faults, weak seams and joints, availability and quality of construction materials, and other pertinent features;

(4) Separate emergency preparedness plans (EPP) for construction and post construction periods; and

(5) Such other appropriate information as may be necessary.

(f) A non-refundable filing fee in accordance with Subchapter 5 [~~of \$25~~] shall accompany each application; provided that no fee shall be required of any federal, state, or county agency.

(g) Dams and reservoirs that are 90 percent or more constructed or enlarged on the effective date of these rules as determined by the board and that are subject to the provisions of these rules shall not be required to pay a filing fee but shall submit an application for approval pursuant to this section. Application approvals of dams and reservoirs that are made subject to these rules that are found by the board to have been less than 90 percent constructed, enlarged, repaired, altered or removed on the effective date of these rules shall be accompanied by fees

reduced by the percentage of construction or enlargement found by the board to have been completed on that date.

§13-190-21 Repair or alteration of dam, reservoir, or appurtenant works; removal of dam or reservoir.

(a) Before commencing the repair or alteration of an existing dam, reservoir, or appurtenant works, or the [~~alteration or~~] removal of a dam or reservoir so that it no longer constitutes a dam or reservoir as defined in this chapter, the owner shall file an application for the work and secure the written approval of the board; provided that owners proposing routine maintenance not affecting the safety of the structure are exempted from this requirement.

(b) Each application shall include such pertinent information and data concerning the dam, reservoir, or appurtenant works as may be required by the board, as follows:

(1) Proposed times of commencement and completion of remedial construction;

(2) Names and addresses of applicant and contractor;

(3) Changes which the work covered in the application is proposed to effect, with appropriate references to the existing dam or reservoir;

(4) Relevant construction plans and specifications signed and sealed by the design engineer;

(5) The "estimated cost," as defined in sections 13-190-50(b) of this chapter, of the repair, alteration or removal of the dam or reservoir;

(6) Proof of financial responsibility;

(7) An Emergency Preparedness Plan; and

(8[5]) Other information appropriate for a thorough consideration of the safety of such work, as may be required by the board.

(c) To be approved, the relevant construction drawings, plans and specifications must contain sufficient detail to describe the proposed construction work.



(1) The following items, as a minimum, shall be included as part of the construction plans: (A) Project location and vicinity maps; (B) Site map of dam, reservoir area and appurtenances; (C) Sectional view along longitudinal axis of dam and foundation; (D) Cross-sectional view of dam at location of maximum height; (E) Cross-sectional views and profiles of spillway(s), outlet facilities, and other appurtenances; (F) Steel reinforcement placement and bar sizing for concrete construction must be shown in at least one section or profile; and (G) The plan for diversion and control of water during construction.

(2) The following items, as a minimum, shall be included as part of the construction specifications: (A) Type, class, or description of all materials to be used; (B) The requirements for fill placement, moisture conditioning, and minimum level of compaction of all earthen zones; (C) The requirements, procedures, and minimum standards for concrete construction and/or structural details.

(d) The Board shall, when in its judgment it is necessary, also require the following:

(1) Data concerning subsoil and rock foundation conditions and the materials involved in the construction or enlargement of the dam or reservoir;

(2) Investigations of, and reports on, subsurface conditions, exploratory pits, trenches and adits, drilling, coring, geophysical tests to measure in place and in the laboratory the properties and behavior of foundation materials at the dam and reservoir site;

(3) Investigations and reports on the geology of the dam or reservoir site, possible geologic hazards, seismic activity, faults, weak seams and joints, availability and quality of construction materials, and other pertinent features;

(4) Separate emergency preparedness plans (EPP) for construction and post construction periods; and

(5) Such other appropriate information as may be necessary.

(e) [(e)] A non-refundable application fee in accordance with Subchapter 5 [of \$25] shall accompany each application; provided that no fee shall be required of any federal, state, or county agency.

(f) [(d)] The requirements of this section may be waived where appropriate.

(g) [(e)] Dams and reservoirs that are 90 percent or more constructed, enlarged, repaired, altered or removed on the effective date of these rules as determined by the board and that are subject to the provisions of these rules shall not be required to pay a filing fee but shall submit an application for approval pursuant to this section. Application approvals of dams and reservoirs that are made subject to these rules that are found by the board to have been less than 90 percent constructed, enlarged, repaired, altered or removed on the effective date of these rules shall be accompanied by fees reduced by the percentage of construction, enlargement, repair, alteration or removal found by the board to have been completed on that date.

§13-190-22 Supervision of plans preparation and construction inspection.

An engineer shall be in charge of the preparation of all plans and specifications for the initial construction, enlargement, alteration, repair, or removal of dams and reservoirs and of the inspection of the construction. The engineer may be assisted by other specialists as required.

§13-190-23 Application Approval [of plans and specifications].

(a) The board shall act upon an application and shall take into consideration the:

- (1) Cost and magnitude of the project;
- (2) Engineering and physical features involved;
- (3) Existing conditions; and
- (4) Public interest affected.

(b) If an application is incomplete or defective, it shall be returned to the applicant. The application shall be corrected and returned to the board within 60 days or such further time as may be given by the board in order to retain its validity. If the application is not returned within the required time limit, it shall be deemed automatically rejected.

(c) After the board has determined that the application is complete and the plans and specifications conform to accepted engineering practice, the board will issue an application approval.

(d) ~~(e)~~ Actual construction, enlargement, repair, alteration or removal shall be commenced within the time frame set by the board in the application approval; otherwise, the application approval becomes void~~[If the construction, alteration, or repair of a dam or reservoir is not commenced within five years of the date of approval of the application, the board's approval shall be deemed automatically void]~~. The board may, upon written application and for good cause shown, extend an owner's time for commencing construction, enlargement, repair, alteration or removal of a dam or reservoir.

(e) Written notice shall be provided to the board at least 10 days before construction, enlargement, repair, alteration or removal is to begin and such other notices shall be given to the board as it may require.

§13-190-24 Revocation of approval.

(a) An application approval ~~[of the plans and specifications]~~ for any construction, enlargement, alteration, repair, or removal of any dam or reservoir or its appurtenant works may be revoked in whole or in part for any:

(1) Material false statement in the application or in any report or statement of fact required pursuant to this chapter;

(2) Violation of this chapter; or

(3) Violation of the approved plans and specifications.

(b) In any proceeding for revocation, the board shall give prior written notice to the affected owner of the facts or conditions which warrant the action and provide the owner an opportunity for a hearing.

§13-190-25 Construction change orders.

(a) All dam projects subject to the provisions of this regulation shall be constructed in accordance with the application approval. Any proposed changes to the application approval which could have an effect on structural integrity or safe operations of the project must first be presented to the board for a determination if an approval is required.

(b) If the board determines that the proposed construction change order represents a significant modification of the application approval that could have an effect on structural integrity or safe operations of the project, then approval of the change order will be required.

(c) If board approval of the proposed construction change order is required, no action can be taken by the owner to make the construction change until approval is given by the board.

SUBCHAPTER 3  
CONSTRUCTION, INSPECTION, AND COMPLETION

§13-190-30 Inspection during progress of work.

(a) During the construction, enlargement, repair, alteration, or removal of any dam or reservoir, the owner shall:

(1) Perform, at its own expense, work or tests necessary to insure proper compliance with the approved plans and specifications;

(2) Provide adequate supervision by an engineer during construction; and

(3) Provide any information requested by the board to determine that conformity with the approved plans and specifications is being achieved. The department may make, through its own engineers or by consulting engineers of its selection, periodic inspections at State expense for the purpose of ascertaining compliance with the approved plans and specifications.

(b) After any tests, inspections, or investigations, or at any time as the work progresses, or at any time prior to completion of the project, the department may order the owner to revise, modify, or change its plans and specifications for safety reasons; provided that the owner may request a hearing before the board to review the order.

(c) If conditions are revealed which will not permit the construction, enlargement, repair, alteration, or removal of a safe dam or reservoir, the ~~[board's]~~application approval for construction, enlargement, repair, alteration, or removal shall be revoked.

(d) If at any time during the construction, enlargement, repair, ~~[or]~~ alteration or removal of any dam or reservoir the department finds that the work is not being done in accordance with approved plans and specifications, it shall give a written notice thereof to the owner. The written notice shall state the specific violations and shall order the immediate compliance with the approved plans and specifications. The department may order that no further work be done until such compliance has been effected and confirmed by the department or its designated representative.

(e) If the owner fails to comply with the department's written notice or the approved plans and specifications the board shall take action to revoke its approval and compel the owner to remove the incomplete structure sufficiently to eliminate any safety hazard to life or property.

§13-190-31 Completion of new or enlarged dam or reservoir.

(a) Upon completion of a new or enlarged dam or reservoir, the owner shall provide written notification of completion to the department signed by the responsible engineer supervising construction for the owner, certifying that the project was constructed in conformance with the approved plans and specifications, accompanied by supplementary drawings or descriptive matter showing or describing the dam or reservoir as actually constructed, which shall include a record of the following:

(1) All geological boreholes and grout holes and grouting;

(2) Permanent location points, benchmarks, and instruments embedded in the structure;

(3) Tests of concrete or other material used in the construction of the dam and reservoir;

(4) Seepage flows and embedded instrument readings after a year of operation; and

(5) Construction problems encountered and solutions implemented.

(b) Supplementary drawings and descriptive matter for the enlargement of a dam or reservoir shall only apply to any new construction not already shown in the original plans on file with the department.

§13-190-32 Completion of repair or alteration of dam or reservoir.

(a) Upon completion of the repair or alteration of any dam or reservoir, the owner shall provide a notice of completion to the department and thereafter shall file with the department a completion report, signed by the responsible engineer supervising the work for the owner, attesting that the repairs or alterations were completed in accordance with the approved plans and specifications, accompanied by supplementary drawings or descriptive matter showing or describing the dam or reservoir as actually repaired or altered, together with all applicable maps, data, records, and information required by the department.

§13-190-33 Completion of removal of dam or reservoir.

(a) Upon completion of the removal of a dam or reservoir, the owner shall file with the department a report regarding the manner in which the work was performed and the conditions existing after the removal of the dam. No filing shall be required for the routine drawdown of reservoirs for normal operations and maintenance not affecting the safety of the structure.

(b) The report shall show that a sufficient portion of the dam has been removed to permit the safe flow of water down the watercourse across or around which the dam was situated and that adequate provisions have been made by the owner to

prevent any damage downstream that may result from the remaining portion of the dam due to subsequent flooding.

§13-190-34 Certificates of Approval to Impound

(a) Each dam owner must hold a valid certificate of approval to impound in order to legally impound water under the laws of this State.

(b) An application for a certificate of approval to impound for any dam not having an application approval to construct, enlarge, alter or repair a dam or reservoir shall be made on forms available from the board. An application for a certificate of approval to impound is not required for dams already having an application approval to construct, enlarge, alter or repair. Any dam owner who is notified by the board of the need to apply for a certificate for approval to impound shall submit such application within thirty (30) days of the notification.

(c) A certificate of approval to impound shall be issued by the board upon a finding by the board that the dam and reservoir are safe to impound water within the limitations prescribed in the application approval. No water shall be impounded by a dam or reservoir prior to issuance of a valid certificate of approval to impound, provided however, that pending issuance of a new or revised certificate of approval to impound, the owner of the dam or reservoir shall not cause the dam or reservoir to impound water beyond the limitations or conditions prescribed in the existing certificate of approval to impound.

(d) The board shall revoke, suspend, or amend any certificate of approval to impound whenever it determines that the dam or reservoir constitutes a danger to life and property. Upon the board's revocation of a certificate to impound, the owner of the dam must take action within time limits specified by the board to alleviate the hazard associated with the dam.

(e) Certificates of approval to impound are not transferable from one person to another or from one dam to another.

§13-190-34 Complaints as to unsafe conditions.

(a) Upon receipt of a written complaint alleging that the person or property of the complainant is endangered by the

construction, enlargement, repairs, alterations, maintenance, or operation of any dam or reservoir, the department shall contact the owner and conduct an inspection unless the data, records, and inspection reports on file with the department are sufficiently adequate to determine whether the complaint is valid.

(b) In determining whether an existing dam or reservoir or proposed dam or reservoir constitutes or would constitute a danger to life or property, the department shall evaluate the possibility that the dam or reservoir might be endangered by overtopping, seepage, settlement, erosion, cracking, earth movement, earthquakes, and failure of bulkheads, flashboard, gates, and conduits which exist or which might occur in any area in the vicinity of the dam or reservoir.

(c) If an unsafe condition exists, the department shall notify the owner to take action necessary to render the condition safe, including breaching or removal of any dam found beyond repair. If the owner is unavailable or unresponsive, the board may commence action under section 13-190-41 - Emergency Work.

#### SUBCHAPTER 4 MAINTENANCE, OPERATION, AND EMERGENCY WORK

§13-190-40 Maintenance and operation.

(a) Owners shall provide for the adequate and timely maintenance, operation, and inspection of their dams and reservoirs and shall be responsible for any engineering and geologic investigations which may be required to insure public safety. Owners or their agents shall keep available and in good order records of original construction and any modifications, and shall report to the department their maintenance, operation and engineering activities, including horizontal and vertical controls, seepage measurements, piezometric data collection and geologic investigations.

(b) The owner of a dam or reservoir or his agent shall fully and promptly advise the department of any sudden or unprecedented flood or unusual or alarming circumstance or occurrence existing or anticipated which may adversely affect the dam or reservoir.



(c) [~~Upon reasonable notice to the owners of dams and reservoirs,~~] [~~†~~]The department, from time to time and without prior notice to the owners of dams and reservoirs, but not less than once every three years for high hazard and moderate hazard dams, and not less than once every five years for low hazard dams, either with its own engineers or by consulting engineers of its selection, shall make inspections of dams and reservoirs at [State]the owner's expense for the purpose of determining their safety[~~, but~~]. The department shall require owners to perform at their expense any necessary remedial work and work reasonably required to disclose information sufficient to enable the department to determine conditions of dams and reservoirs in regard to their safety, including the installation, maintenance, and monitoring of necessary instrumentation. As part of the inspection, the department will periodically review the classification of the dams by evaluating the consequences of failure applying the definitions of Section 13-190-2.

(d) All costs incurred by the department to conduct the inspection shall be charged to the owner. The department shall present a bill for the expenses to the owner, and if the owner neglects for 30 days thereafter to pay it, the bill and costs become a lien upon the lands and property of the owner so liable for the payment of the bill, and must be collected as delinquent taxes against the lands and property are collected.

#### §13-190-41 Emergency work.

(a) Owners of dams and reservoirs have the primary responsibility for determining when an emergency involving a dam or reservoir exists. When the owner of a dam or reservoir determines an emergency exists, the owner shall immediately implement the emergency preparedness plan required by section 13-190-42, notify any persons who may be endangered if the dam should fail, notify emergency management organizations, and take additional actions necessary to safeguard life, health and property.

(b) [~~(a)~~] In case of an emergency where the department declares that repairs, breaching of the dam, or other actions are immediately necessary to safeguard life and property, the work shall be initiated by the owner, or by the department through its authorized agent at the owner's expense if the owner fails to do so. The department shall

be notified at once of any emergency repairs or other work instituted by the owner.

(c) In applying the remedial means provided for in this article, the department may in an emergency with its own forces, or by other means at its disposal, do any or all of the following:

(1) Take full charge and control of any dam or reservoir;

(2) Lower the water level by releasing water from the reservoir;

(3) Completely drain the reservoir;

(4) Perform any necessary remedial or protective work at the site; or

(5) Take such other steps as may be essential to safeguard life and property.

(d) The department shall continue in full charge and control of such dam and reservoir and its appurtenances until they are rendered safe or the emergency occasioning the action has ceased and the owner is able to take back such operations. The department's take-over of the dam, the reservoir, or their appurtenances shall not relieve the owner of a dam or reservoir of legal liability to the department or third parties for those items which are causing an emergency situation. The department's assumption of control over the dam shall not constitute a takings and the department shall not be liable to the dam owner or others for diminution in value that may be caused by the department's work.

(e) The cost and expense of the remedial means provided in this subchapter, including cost of any work done to render a dam and reservoir or its appurtenances safe, shall be collected by presentation of bills to owners in the same manner as other debts to the state are recoverable. If such bills are not promptly paid by the owners, the cost shall be recovered by the state from the owner by action brought by the department in a court of appropriate jurisdiction, and shall become a lien upon the lands and property of the owner so liable for the payment of the bill, and shall be

collected as delinquent taxes against the lands and property are collected.

(f)~~(b)~~ Where appropriate, the repairs, breaching, or other emergency work shall conform to an order issued by the department.

(g)~~(e)~~ The following emergency actions not impairing the safety of the dam may be taken by the owner without prior notification or approval of the department:

(1) Stockpiling materials such as riprap, earthfill, sand, sandbags, and plastic sheeting;

(2) Lowering the reservoir level by making releases through the outlet or a gated spillway, by pumping or by siphoning; however, when large releases are to be made, the department shall be notified. Lowering the water level by excavating the spillway or embankment is prohibited unless failure is imminent. In this situation, the department shall be notified as soon as reasonably possible of any emergency condition that exists and any emergency action taken;

(3) Armoring eroded areas by placing sandbags, riprap, plastic sheeting, or other available material;

(4) Plugging leakage entrances on the upstream slope;

(5) Increasing freeboard by placing sandbags or temporary earthfill on the dam;

(6) Diverting floodwaters to prevent them from entering the reservoir basin;

(7) Constructing training berms to control floodwaters;

(8) Placing sandbag ring dikes around boils at the downstream toe to provide back pressure; and

(9) Removing obstructions from outlet or spillway flow areas.

§13-190-42 Emergency preparedness plan.

(a) Owners of high hazard and moderate hazard dams shall prepare, maintain, and implement an emergency preparedness plan for each dam or reservoir for immediate defensive action to alert and evacuate the affected population and to mitigate damages to property. The emergency preparedness plan shall be submitted to the board for review and acceptance. The board may issue an acceptance after determining the emergency preparedness plan is substantially complete. The emergency preparedness plan shall contain as a minimum the following:

(1) The identification of equipment, labor, and material available for implementation of the plan;

(2) A notification procedure for informing the department and the civil defense office of the affected county;

(3) A dam failure inundation map

(4) A procedure for warning the affected population if failure of the dam is imminent.

(b) The owner shall submit a copy of the emergency preparedness plan to the affected county civil defense office and other emergency coordinators involved in the plan for review.

(c) The owner shall annually review and update the emergency preparedness plan as necessary.

§13-190-43 Change In Ownership.

Changes in ownership of a dam shall be immediately filed with the department.

SUBCHAPTER 5

FEES

§13-190-50 Filing Fees

(a) The owner shall submit with the application for construction, enlargement, alteration, repair or removal an amount equal to three dollars for each one thousand dollars or fraction thereof of the estimated cost of construction including engineering costs, but the maximum fee shall not exceed three thousand dollars, nor shall the minimum fee be less than one hundred dollars.

(b) For the purposes of this part, the estimated cost of the construction, enlargement, alteration, repair or removal shall include the following:

(1) The cost of all labor and materials entering into the construction of the dam and appurtenant works or reservoir.

(2) The cost of preliminary investigations and surveys.

(3) The cost of the construction plant properly chargeable to the cost of the dam or reservoir.

(4) Any and all other items entering directly into the cost of the construction, enlargement, alteration, repair or removal.

(c) The costs of right-of-way, detached powerhouses, electrical generating machinery, and roads and railroads affording access to the dam or reservoir shall not be included among the items used in the determination of cost.

(d) An application shall not be considered by the department until the filing fee is received.

(e) In the event the actual cost exceeds the estimated cost by more than 15 percent, a further fee shall be required by the board before final approval and shall be 115 percent of the amount by which the original fee is less than it would have been had the cost it was based upon been the same as the actual cost. No further fee shall be required, however if such fee is to be computed at less than twenty dollars (\$20).

#### §13-190-50 Annual Fees

(a) An annual fee shall be paid by the owner of the dam on or before December 31, 2007, and on or before December 31 of each succeeding year, based upon a fixed rate and height of the dam. The annual fee shall be four hundred dollars (\$100) per dam, plus one hundred ten dollars (\$50) per foot of height.

(b) Any owner who fails to pay any annual fee or any part of any annual fee required to be paid within the time

required shall pay a penalty of 10 percent of the annual fee or part of the annual fee, plus interest at the rate of one-half of 1 percent per month, or fraction thereof, from the date on which the annual fee or the part of the annual fee became due and payable to the state until the date of payment.

(c) For the purposes of this section, "height of the dam" means the vertical distance, to the nearest foot, from the natural bed of the stream or watercourse at the downstream toe of the barrier, as determined by the department, or from the lowest elevation of the outside limit of the barrier, as determined by the department, if it is not across a stream channel or watercourse, to the maximum possible water storage elevation.