COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII

PETITION TO AMEND INTERIM INSTREAM FLOW STANDARDS FOR HONOPOU, HANEHOI/PUOLUA (HUELO), WAIKAMOI, ALO, WAHINEPEE, PUOHOKAMOA, HAIPUAENA, PUNALAU/KOLEA, HONOMANU, NUAAILUA, PIINAAU, PALAUHULU, OHIA (WAIANU), WAIOKAMILO, KUALANI (HAMAU), WAILUANUI, WAIKANI, WEST WAILUAIKI, EAST WAILUAIKI, KOPILIULA, PUAKAA, WAIOHUE, PAAKEA, WAIAAKA, KAPAULA, HANAWI, AND MAKAPIPI STREAMS	Case No. CCH-MA13-01

FINDINGS OF FACT, CONCLUSIONS OF LAW, &

DECISION AND ORDER

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EXECUTIVE SUMMARY

The Hawaii Water Commission and its staff thank all the stakeholders of our East Maui streams and the communities served by them for their dedication and patience during this lengthy contested case process. Our ruling initiates a new era of water allocation and use in East Maui, after one hundred years of major stream diversions that supported plantation agriculture in Maui's central plains. Fortunately, the benefits of the long-term stewardship of the East Maui forests provide enough water to allow the Commission to meet its primary trust responsibilities:

- maintenance of waters in their natural state;
- domestic water uses of the general public, particularly for drinking;
- native Hawaiian traditional and cultural gathering, including appurtenant rights; and
- reservations of water for the Department of Hawaiian Home Lands.

East Maui Forests and Streams

"Hahai no ka ua i ka ululā'au" – Rains always follow the forest

Healthy streams are dependent on healthy forests. The East Maui watershed encompasses over 60,000 acres of predominately native forests, extending to 8,000 feet in elevation on the slopes of Haleakalā. It was one of the first forest reserves established in Hawai'i over 100 years ago. The forested watershed is currently managed by the East Maui Watershed partnership, a voluntary coalition of public agencies, non-profit entities, and private landowners. Hawai'i's most pristine native forests and bird habitat can be found in its upper elevations. Annual rainfall exceeds over 300 inches a year in the eastern portion of the watershed.

There are also varied geologic and hydrologic features in the watershed which impact the flows of the 27 streams in this contested case. 22 of these streams have been diverted for offstream uses. Some East Maui streams are gaining streams with replenishment from springs and other tributaries as they flow downhill. For these streams, there are opportunities to utilize water in diversions at higher elevations without compromising down-stream benefits. Others are considered losing streams. Flow diminishes in its movement downhill, especially during the drier summer months. Many streams terminate into estuaries benefiting important near shore marine resources. Others provide spectacular waterfalls, popular swimming holes and the aesthetic beauty that enriches our existence on these islands.

Decision Making Rationale and Process

Our goal was a decision that could be realistically implemented, measured, and assessed on the ground as well as communicated and understood by stakeholders. It was purposefully designed to increase the practical knowledge of stream flows and native habitat restoration. We believe the allocations to be reasonable accommodations to current conditions, yet we are committed to on-going monitoring in order to identify the need for adaptations to changing circumstances.

The Commission seeks to be transparent about our rationale and process for decision making in order to facilitate evaluation of the Decision and Order (D&O) based on indicators of system vibrancy, rather than siloed views of allocations for a single stream, use, or party.

Our decision establishes a quantity of water that must remain in each stream. It does not allocate any additional water that can potentially be diverted offstream to support other activities as that is under the purview of the Board of Land and Natural Resources (BLNR). The Commission also identifies specific issues in this decision for the BLNR to consider in their future water lease deliberations that will improve the long-term sustainability of East Maui streams.

The Commission first evaluated each stream individually, looking at their flow characteristics, instream uses, habitat restoration potential for fish and other stream animals, recreation opportunities, and scenic values. We then looked at all of the affected streams in an integrated manner with consideration for the overall ecological ramifications of our decision. We used those factors to align instream flow standards with our public trust responsibilities.

For over 100 years, the East Maui watershed forests have provided water for offstream uses that meet our consumptive needs and enable economic opportunities. These benefits provide additional impetus for sustainable management of the watershed. Therefore, the Commission considered the economic impact of our decision upon offstream uses, with a specific focus on supporting public uses such as drinking water, as well as diversified agriculture. We also considered factors that contribute to the operational capacity of the existing ditch system to deliver those offstream uses. Where necessary, changes were made to our original estimates of instream flow standards to accommodate reasonable and beneficial offstream uses.

Hydrologic Issues

Estimating natural stream flow is not an exact science. This is especially true in Hawaiʻi with our wet and dry seasons, large storm events, steep watersheds, varied underlying geologic features, and a long history of stream diversions. While a small number of East Maui streams have long term flow records, theoretical models of un-diverted total and base flows were used in the majority of the streams.

The *interim stream flow standard* is a numeric flow rate, measured in cubic feet per second (cfs), that must remain in the stream at a certain location. For purposes of this decision, the Commission used a median *base flow* (BFQ_{50}) or the amount of stream flow that can be expected to be found at least 50% of time. While the location of the flow standard can vary, it is normally set at an accessible location on the lower elevation of the stream. *Base flow* is a smaller component of the stream's *total flow,* which includes water input from normal rainfall and storm events. Large storm events provide important ecological functions in streams such as flushing out invasive species and adding nutrients in the near shore marine environments. They also provide opportunities for offstream uses if adequate storage capacity is available.

Current research indicates that the minimum viable flow necessary to provide suitable habitat conditions for recruitment, growth, and reproduction of native stream animals is 64% of median *base flow,* which is also known as H_{90}. The Commission has estimated that the minimum viable connectivity flow for the maintenance of a wetted pathway to facilitate the passage of organisms along the stream path is 20% of median *base flow* (20% of BFQ_{50}). In some cases, we recognize that habitat conditions are so compromised that the wetted pathway will fall short in achieving our goal of mauka (mountain) to makai (ocean) connection. Yet, we propose these allocations to align with our commitment to balance and as a first step toward enhancing system health.

East Maui Irrigation Ditch system

The ditch system was constructed in phases, beginning in the 1870s and extending to the completion of the current system in 1923. It remains a valuable asset that delivers offstream public trust benefits such as drinking water, as well as irrigation water for reasonable and beneficial uses. It is a complex system with 388 separate intakes, 24 miles of ditches, 50 miles of tunnels, as well as numerous small dams, intakes, pipes, and flumes. With few exceptions, the East Maui diversions historically captured all of the stream's *base flow,* which represented the ground-water contribution and an unknown percentage of the *total flow*. Many gaining streams were diverted multiple times at different elevations. It is a gravity flow ditch system, driven by the higher elevation diversions in the wetter, eastern portion of the watershed.

Our decision will necessitate significant reductions in offstream diversions. In many streams, we are recommending no diversions of either base or total flow. While our order specifically identifies the desired stream flow expected, we recognize that a universal remedy to modify or remove diversions is not practical. At this time, the Commission's overall guidance is to not remove diversion structures if modification can achieve desired results. The reduction in diversions does not by itself compromise the structural integrity of the ditch system so long as it continues to be maintained as a single coordinated system. Reduced flows will increase the amount of maintenance required of the open ditches in the system.

Stream Classifications

The Commission classified streams in four broad categories that represent different priorities and management strategies: kalo (taro) and community streams, habitat streams, public use streams, and other streams.

Kalo and Community Streams - Hawai'i's Water Code recognizes kalo and other traditional agriculture as an instream use. The Commission's decision will return free flowing water, with no upstream diversions, to all streams which have historically supported significant kalo cultivation (*Honopu, Huelo, Hanehoi, Pi'ina'au, Palauhulu, Ohia (Waianui), Waiokamilo, Kualani, Wailuanui, Makapipi*). The majority of these streams have been diverted for over 100 years. We believe we now have the opportunity to return that water to those streams and the affected communities without undermining the economic benefits of offstream use.

This decision will align policy with current on-the-ground conditions. The Commission acknowledges and commends A&B's decision to return free flowing water to these kalo streams. The Commission followed A&B's decision by issuing an interim order to the same effect. This decision will further solidify the commitment to these traditional kalo cultivating communities.

The Commission's intent is to modify, and remove if necessary, all diversions in each kalo stream and their tributaries to allow unrestricted *total flow* into the stream. The Commission set the interim instream flow standard at a location below the kalo lo'i. These instream flow standards serve as guidelines to monitor native habitat restoration. It is not the Commission's intent to regulate, at this time, where and how much water will be used for traditional kalo agriculture or how the water will be apportioned amongst the various fields and farmers.

Our decision provides an opportunity to refine our knowledge of kalo water requirements and the relationship between traditional uses and habitat viability. It also provides time and flexibility for the leadership within the affected areas to develop community-based allocation and management processes for the appropriate use of water from the kalo streams. At a later date, the Commission is willing to consider permanent instream flow standards for these streams.

Our decision recognizes the importance of water from streams for traditional agriculture. Inherent in that right is the responsibility to sustain the native fauna that live in that stream, as well as to provide for other traditional and cultural gathering activities. While this approach is not intended to automatically set precedents for other areas, it does provide a new model of water use that integrates traditional culture with modern natural resource management.

Habitat Streams - Hawaii's streams are home to a unique variety of native fish, shrimp, mollusks and insects, most found nowhere else in the world. Their origin and link to the ocean are evident in their mainly diadromous life cycle, which means "two runs," one to the ocean as newly hatched larvae and subsequent return from the ocean to freshwater as juveniles. This completes their life cycle and underscores the importance of maintaining the "mauka to makai" connection. There is universal agreement that more water and better connectivity in streams is a good thing for native habitat restoration.

The Commission's decision identifies the following habitat streams (*Honomanū, Waikamoi, East Wailuaiki, Kopiliula, Punalau/Kōlea, Waiohue, West Wailuaiki*) that will have limited or no water diversions in order to foster improved habitat for native fish and other stream animals. The Commission's intent is to have all diversions within these habitat streams modified to ensure connectivity to allow unrestricted movement of native species. The Commission set the interim instream flow standard in all habitat streams at 64% of the median *base flow* (H_{90}).

The two exceptions are *Waiohue* and *West Wailuaiki* streams which are to remain un-diverted (*total flow* included) as habitat reference streams. We have much to learn about stream restoration and the conditions needed for recruitment of native fauna into streams that have been diverted for over one hundred years. These un-diverted habitat reference streams will provide critical baseline data to validate and improve the theoretical restoration models that will inform future decisions.

The Commission's expectation is that restoring flows to streams that are spread out geographically will: 1) provide greater protection against localized habitat disruptions; 2) produce a wider benefit to estuarine and near-shore marine species; and 3) result in improved comprehensive ecosystem function across the entire East Maui watershed.

Public Use Streams - Public use streams were specifically identified for offstream uses that align with the Commission's public trust responsibilities. The Commission's decision has retained the potential of continued use of a portion of *Waikamoi, Puohokamoa, Ha'ipua'ena,* and *Honomanū* streams and the specific diversions that provide offstream water to the Upper and Lower Kula Pipelines. Fortunately, many of the diversions that supply water for these offstream purposes are from gaining streams where water can be diverted with minimum impact to down-stream benefits. More timely and accurate reporting by Maui County should be required to document the amounts of water diverted for these purposes. No diversions are allowed on *Honomanū* stream below the Lower Kula Pipeline, in recognition of the stream's contribution to the estuarine resources in Honomanū Bay.

Other Streams to Support Diversified Agriculture - Much uncertainty exists as to the timing and eventual replacement crops for the over 29,000 acres of former plantation sugar agriculture, 23,000 acres of which are designated Important Agricultural Lands (IAL). There is a lack of detail from HC&S in the record about the type of diversified agriculture that will be cultivated on this acreage and the amount of water required to support it. There is also ambiguity about alternative ground water availability for these lands.

Yet, we believe it to be reasonable and beneficial to use a portion of East Maui stream water for the development of diversified agriculture on Maui's central plains. Diversified agriculture has and should continue to provide economic benefits and can now make a larger contribution to Hawaii's food sustainability. We are also concerned that leaving these lands in an un-cultivated state will increase wind-blown erosion that will damage Maui's near shore marine environment, air quality and tourism competitiveness. The Commission's intent in this decision is to ensure that a sufficient amount of offstream water is available to support the cultivation of diversified agricultural crops on the lands designated as IAL in central Maui.

Our best estimate is that we have provided for about 90% of the irrigation needs for 23,000 acres of IAL. We also want to catalyze the innovation, efficiency and investments needed to optimize and enhance new sources of water needed for this diversified era of Maui agriculture. In addition, although estimates of over 20 percent transmission system losses may comport with current industry standards, they do not reflect best practices, will not serve the interests of future generations and are not acceptable. Modern agribusiness investors should not expect to build a new industry on the back of century-old infrastructure. Investment in ditch systems must be made to avoid leakage and waste, install modern ground water storage technologies, optimize use of non-potable water, and improve water capture and storage from storm events that increase *total flow* availability.

The Commission's decision will allow continued offstream use of portions of water from the following habitat streams (*Waikamoi, East Wailuaiki, Hanawī*) as long as instream flow standards are met; from the gaining streams of *Hanawī* and *East Wailuaiki* streams whose diversions are located on the highest elevation of the Wailoa ditch; and from flows of *Wahinepeʻe, Puohokamoa, Haʻipuaʻena, Nuaʻailua, Puaʻakaʻa, Paakea, Waiaaka, Kapaula* streams in excess of instream flow standards set at the 20% of the median base flow provided to sustain a wetted pathway within the stream bed. These streams were selected for more offstream uses because of their lower potential for instream uses and native habitat restoration. The Commission's intent is to have all diversions within these streams modified to enhance prospects for connectivity.

<u>Future Allocation and Water Use Recommendations</u>

The Commission recognizes that authorizing how much water will be allowed to be diverted offstream once the instream flow standards are met is the purview of the Board of Land and Natural Resources. However, the Commission would ask the Land Board to consider the following issues for future water leases:

- require improvements in the water delivery systems to minimize leakage and waste, as well as to provide accurate and timely gaging and monitoring of all offstream water uses;
- set aside a portion of water lease revenues to support the East Maui Watershed Partnership, monitoring of streams flows, and native habitat restoration in East Maui; and

Striking a Better Balance

Contested case hearings, while providing legal finality, are seldom the most effective process for achieving the vision, objectives and benefits called for in the State Water Code. We hope this Decision & Order is sufficiently balanced that it will resolve rather than extend already lengthy legal proceedings. It is time to redirect energy and capital from argumentation to education, from confrontation to cooperation, from stagnation to implementation, from depletion to profusion.

"Mōhala i ka wai ka maka o ka pua" – Unfurled by the water are the faces of the flowers

Findings of Fact,

Conclusions of Law, and Decision and Order

The Commission on Water Resource Management ("Commission") makes the following Findings of Fact ("FOF"), Conclusions of Law ("COL"), and Decision and Order ("D&O"), based on the records maintained by the Commission in contested case number CCH-MA13-01, Petition to Amend Interim Instream Flow Standards for Honopou, Hanehoi/Puolua (Huelo), Waikamoi, Alo, Wahinepeʻe, Puohokamoa, Haʻipuaʻena, Punalau/Kōlea, Honomanū, Nuaʻailua, Piinau, Palauhulu, Ohia (Waianu), Waiokamilo, Kualani (Hamau), Wailuanui, Waikani, West Wailuaiki, East Wailuaiki, Kopiliula , Puaʻakaʻa, Waiohue, Paʻakea, Waiaaka, Kapaula, Hanawī, and Makapipi Streams, and the witness testimonies and exhibits presented and accepted into evidence.

If any statement denominated a COL is more properly considered a FOF, then it should be treated as an FOF; and conversely, if any statement denominated as a FOF is more properly considered a COL, then it should be treated as a COL.

Proposed FOF not incorporated in this D&O have been excluded because they may be duplicative, not relevant, not material, taken out of context, contrary (in whole or in part) to the found facts, an opinion (in whole or in part), contradicted by other evidence, or contrary to law. Proposed FOF that have been incorporated may have minor modifications or corrections that do not substantially alter the meaning of the original findings.

I. FINDINGS OF FACT[1]

A. Procedural History

1. On May 24, 2001, the Native Hawaiian Legal Corporation ("NHLC") filed 27 Petitions to Amend the IIFS for 27 East Maui streams on behalf of Nā Moku ʻAupuni ʻO Koolau Hui, Beatrice Kepani Kekahuna, Marjorie Wallett, and Elizabeth Lehua Lapenia[2] (collectively "Nā Moku"). The petitions were accepted on July 13, 2001. (Exh. C-85, p. 2.)

2. On July 23, 2001, NHLC met to discuss the handling of the 27 petitions. Agreement was reached that efforts would focus on Honopou, Hanehoi, Waiokamilo, Kualani, Piʻinaʻau, Palauhulu, and Wailuanui streams ("Priority Streams"). (Exh. C-85, p. 2.)

3. Including the addition of Puolua (Huelo) Stream, the tributary of Hanehoi Stream, these eight streams were eventually organized into five surface water hydrologic units: 1) Honopou (6034) surface water hydrologic unit contains Honopou Stream; 2) Hanehoi (6037) contains Hanehoi and Puolua (Huelo) Streams; 3) Piʻinaʻau (6053) contains Piʻinaʻau and

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[1] References to the record are enclosed in parentheses, followed by a party's proposed Finding of Fact ("FOF"), in brackets, if accepted. FOF from the re-opened hearing are identified as "on reopening"; e.g., "HC&S" versus "HC&S on reopening." "Exh." refers to exhibits accompanying written or oral testimony, followed by the exhibit number and page or table number, if necessary. Written testimony is referred to as follows: name of the witness, the type of written testimony, and the page number or paragraph of that testimony. "WDT" means written direct testimony or witness statement; and "WRT" means written responsive testimony or the written rebuttal testimony to the written responsive testimony. Written testimony from the reopened hearing is further identified by the date. Oral testimony is referred to as follows: name of the witness, the date of the transcript ("Tr."), and the page and line numbers.

[2] The Commission was notified by letter on May 10, 2007, that NHLC no longer represented Ms. Lapenia.

Palauhulu Streams; 4) Waiokamilo (6055) contains Waiokamilo and Kualani Streams; and 5) Wailuanui (6056) contains Wailuanui Stream.[3] (Exh. C-85, pp. 1-2.)

4. From July 2001, there were meetings, site visits, and discussions among the interested parties regarding the possibility of a collaborative effort to carry out stream studies for the area. On March 20, 2002, the Commission approved a cooperative agreement between the United States Geological Survey ("USGS") and the Commission for a study on Water Resources Investigations for Northeast Maui streams. The Study was to run from October 2, 2002 to September 30, 2005. The study was completed in January 2006. (*Id.*)

5. On May 29, 2008, NHLC filed a complaint on behalf of Nā Moku, Beatrice Kekahuna, Marjorie Wallet, and Maui Tomorrow Foundation, Inc. ("MTF"), alleging that Hawaiian Commercial and Sugar Company ("HC&S") was wasting water, based on testimony of an HC&S employee who testified at the Board of Land and Natural Resources ("BLNR") contested case hearing on November 15, 2005. The waste complaint was resolved after staff corresponded with the parties. (Staff Submittal to Clarify the Scope of the Proceedings for the Contested Case Hearing on Remand from the Intermediate Court of Appeals No. CAAP-10-0000161, August 20, 2014, p. 2.)

6. On August 18, 2008, HC&S filed a Motion to Consolidate Petitions to Amend Interim Instream Flow Standards for East Maui Streams and Complaint Relating Thereto Filed May 29, 2008 requesting that the Commission consolidate its consideration of all 27 previously filed petitions into one and to consider amending the IIFS for all 27 streams in one unified

[3] The petition to amend the IIFS for Waikani Waterfall (Stream) was consolidated with and addressed as part of the petition to amend the IIFS for East and West Wailuanui Streams, hereinafter referred to as "Wailuanui Stream." (Staff submittal, September 24, 2008, p. 2.)

proceeding. There were briefs filed in support of the motion by various groups and individuals. A memorandum in opposition was filed by Nā Moku. The Commission denied the Motion on September 24, 2008. (Exh. C-88; Exh. C-89, pp. 3-9.)

<u>September 25, 2008 Decision</u>

7. On September 24, 2008, the Commission staff recommended amendment of the IIFS for eight of the 10 Priority Streams. (Exh. C-85, pp. 60-62.)

8. On September 25, 2008, the Commission accepted staff's recommendations regarding amendments of the IIFS for the following hydrologic units: Honopou (6034), Hanehoi (6037), Pi'ina'au (6053), Waiokamilo (6055), and Wailuanui (6056), Maui. (Exh. C-89)

9. In accepting staff's recommendation, the Commission added the following three amendments:

1) Moving forward on the staff's recommendation is the first step in (an) integrated approach to all 27 (twenty-seven) streams that are the subject of these petitions.

2) Staff shall provide progress reports to the Commission at regularly scheduled meetings during the course of the year.

3) In cases of return of water to losing streams, staff and all parties shall monitor and report whether there are increases in either downstream flow or groundwater in the vicinity.

(Exh. C-89, pp. 30-31.)

<u>May 25, 2010 Decision</u>

10. On December 16-17, 2009, the Commission met to consider staff's recommendations for the remaining 19 streams. Additional information was requested before the Commission would make its decision, including a focus on seasonal IIFS-i.e., different IIFS for wet versus dry seasons. (Exhs. C-90, C-106.)

11. On May 25, 2010, the Commission voted to amend the IIFS through a seasonal approach to address habitat availability for native stream animals for six of the remaining 19 streams, with winter total restorative amounts of 9.45 mgd, and summer restoration reduced to 1.11 mgd. (Exh. C-91, pp. 47-52.)

12. At the end of the May 25, 2010 meeting, petitioners requested a contested case. (Exh. C-91, p. 50.)

13. On June 3, 2010, Nā Moku filed a Petition for a Contested Case for "Petitioners' right to sufficient stream flow to support the exercise of their traditional and customary native Hawaiian rights to growing kalo and gathering in, among, and around East Maui streams and estuaries and the exercise of other rights for religious, cultural and subsistence purposes. Specifically, the rights of members to engage in such practices in, on, and near Waikamoi, Puohokamoa, Ha'ipua'ena, Punalau/Kōlea, Honomanū, West Wailuaiki, East Wailuaiki, Kopiliula and Pua'aka'a, Waiohue, Pa'akea, Kapaula, Hanawī streams from HRS § 1-1 and HRS § 7-1 and protected under HRS § 174-101." (Exhs. C-92, p. 3.)

14. Petitioner's request for a contested case identified five of the six streams that had their IIFS amended, and eight of the 13 streams that had been left at their status quo IIFS in the Commission's May 25, 2010 decision. (Staff Submittal on the request for a contested case hearing, October 18, 2010, p. 4, table 1.)

15. On June 3, 2010, County of Maui, Department of Water Supply ("MDWS"), also filed a contested case petition, citing as its reasons that: 1) "any decision will directly affect MDWS's ability to provide water to homes, farms, schools, hospitals, churches, and businesses in Upcountry Maui, as MDWS's Upcountry System relies heavily on surface water"; and 2) "MDWS is the public water supplier for the County. MDWS is in the best position to represent

the public's interest in continued use of these resources for the Upcountry Maui public water supply." (Application to be a Party in a Contested Case Hearing Before the Commission on Water Resource Management, June 3, 2010, p. 2.)

16. On October 18, 2010, the Commission voted to deny both of the petitions filed by Nā Moku and the County of Maui. (Exh. C-93, pp. 3-5.)

17. On November 17, 2010, Nā Moku filed a timely notice of appeal, contending that the Commission erred in: 1) concluding that Nā Moku had no right to a contested case hearing; and 2) reaching its underlying decision regarding IIFS amendment for the nineteen streams at issue. (In Re Petition to Amend Interim Instream Flow Standardsfor Waikamoi, Puohokamoa, Ha'ipua'ena, Punalau/Kōlea, Honomanū, West Wailuaiki, East Wailuaiki, Kopiliula , Pua'aka'a, Waiohue, Pa'akea, Kapaula and Hanawī Streams, Hawai'i Intermediate Court of Appeals, CAAP-10-0000161, November 30, 2012, pp. 2-3.)

18. On November 30, 2012, the Intermediate Court of Appeals vacated the Commission's October 18, 2010 denial of Nā Moku's Petition for Hearing and remanded the matter to the Commission with instructions to grant Nā Moku's Petition for Hearing and to conduct a contested case hearing pursuant to Hawaii Revised Statutes (HRS) Chapter 91 and in accordance with state law. In its ruling, the Intermediate Court of Appeals concluded that "(t)he May 25, 2010 meeting, at which the Commission reached an IIFS determination for the nineteen streams, did not comply with the adjudicatory procedures of the Hawai'i Administrative Procedures Act (HAPA). Among other things, the Commission did not produce a written decision accompanied by findings of fact and conclusions of law. We consequently decline Nā Moku's invitation to address the merits of whether the Commission erred in reaching its determination on the petitions to amend the IIFS for the nineteen streams, as argued in the

parties' briefs. This matter is to be properly presented, argued, and decided pursuant to an HRS chapter 91 contested case hearing conducted by the Commission, the body statutorily empowered to make this determination." (*Id.*, pp. 7-8.)

19. On January 29, 2014, Lawrence Miike[4] was appointed Hearings Officer:

a. On March 4, 2014, a prehearing conference was held to establish timetables for the contested case proceedings (Minute Order #1, February 25, 2014), and

b. on April 21, 2014, Nā Moku, MDWS, Alexander & Baldwin, Inc./EMI ("HC&S"),[5] Hawaii Farm Bureau Federation, and MTF, were granted standing. (Minute Order #2, April 21, 2014.)

20. On May 13, 2014, MTF withdrew as a party to the contested case, without prejudice to the ability of its supporters, Neola Caveny and Ernest Shupp, to continue as parties, but on June 6, 2014, MTF requested that it be reinstated as a party to the contested case, and the request was granted on June 9, 2014. (Letter of May 13, 2014, from Isaac Hall, attorney for Maui Tomorrow Foundation, Inc.; Minute Order #6, May 28, 2014; Minute Order #8, June 9, 2014.)

21. On June 30, 2014, a hearing was held to address the Hearings Officer's proposal that the contested case must address all 27 streams in an integrative approach and not just the thirteen streams named in the request for the contested case. (Minute Order #7, May 30, 2014; Transcript of due process hearing, June 30, 2014.)

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[4] Dr. Miike was a member of the Commission from 1994 to 1998 and from 2004 to 2012. He was a member of the Commission at the time of its September 24, 2008 decision on the first eight streams, the May 25, 2010 decision on the remaining 19 streams, and the October 18, 2010 decision to deny standing to Nā Moku. Dr. Miike voted to approve the staff recommendation (with amendments) on the first eight streams, dissented from the majority's approval of the remaining 19 streams, and did not attend the meeting where the Commission denied standing to Nā Moku.

[5] Alexander and Baldwin, Inc./EMI was named as the party granted standing.

22. The Hearings Officer ruled that all 27 streams would be addressed in the contested case, because:

a. the Commission's decision on the first eight streams amended the staff recommendation to state that "(m)oving forward on the staff's recommendation is the first step in (an) integrated approach to all 27 (twenty-seven) streams that are the subject of these petitions," FOF 9, *supra*;

b. the Intermediate Court of Appeals had ruled that "(t)he May 25, 2010 meeting, at which the Commission reached an IIFS determination for the nineteen streams, did not comply with the adjudicatory procedures of HAPA (Hawaiʻi Administrative Procedures Act). Among other things, the Commission did not produce a written decision accompanied by findings of fact and conclusions of law. We consequently decline Nā Moku's invitation to address the merits of whether the Commission erred in reaching its determination on the petitions to amend the IIFS for the nineteen streams, as argued in the parties' briefs. This matter is to be properly presented, argued, and decided pursuant to an HRS chapter 91 contested case hearing conducted by the Commission, the body statutorily empowered to make this determination," FOF 18, *supra*;

c. neither the Commission's decision on the first eight streams nor its decision on the remaining 19 streams met the legal requirements for establishing IIFS, as those decisions did not "weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses," HRS § 174C-71(2)(D); and

d. the Commission cannot evaluate the cumulative impact of existing and proposed diversions on trust purposes without assessing the impacts of diversions on all 27 streams.

(Transcript of due process hearing, June 30, 2013, pp. 28-41.)

23. On July 16, 2014, the Commission met to discuss a Proposed Procedural Order to conduct a Contested Case Hearing for all twenty-seven (27) streams, and on August 20, 2014, the Commission voted to authorize, order, delegate, and direct the Hearings Officer to conduct a Contested Case Hearing on Petitions to Amend the Interim Instream Flow Standards for all twenty seven (27) Petitions and streams filed by NHLC. (Proposed Procedural Order to clarify

the scope of the proceeding and Contested Case Hearing, July 16, 2014; Minutes of the Commission Meeting of August 20, 2014, pp. 9-10.)

24. On September 8, 2014, a notice was published, announcing that the Contested Case Hearing would address all twenty-seven (27) petitions. (*Maui News*, September 8, 2014.)

25. On November 13, 2014, a standing hearing was held to address three applications to be additional parties in the Contested Case Hearing. Jeffrey Paisner was granted standing. John Blumer-Buell and Nikhilananda were denied standing but could testify at the hearing as the Hearings Officer's witness. (Minute Order # 10, October 28, 2014; Minute Order # 11, December 4, 2014.)

26. On January 7, 2015, a minute order was issued, standardizing the captions for the contested case hearing, because differing versions had been used by the parties and the Commission staff. (Minute Order # 13, January 7, 2015.)

27. Between March 2, 2015 and April 2, 2015, 15 days of hearings were held, during which 36 witnesses testified and an additional 16 witness statements and approximately 550 exhibits were introduced into evidence by Nā Moku, MTF, HC&S, MDWS, Jeffrey Paisner and the Hearings Officer.

28. On October 2, 2015, Nā Moku and MTF jointly, HC&S, and MDWS submitted their FOF, COL, and D&O to the hearings officer. Jeffrey Paisner and Hawaii Farm Bureau Federation did not submit any FOF, COL, and D&O.

29. On January 6, 2016, A&B announced that HC&S was terminating its sugarcane cultivation and was transitioning to a diversified farm model. The short-term impact would be a significant reduction of its use of East Maui surface water, and for the long-term, its water needs would increase to support diversified agriculture, though most likely less than what it consumes

currently. (Exh. C-153; Minute Order # 18, March 10, 2016.) [HC&S on reopening, FOF 45; MTF on reopening, FOF 4, 107.]

30. On January 15, 2016, the hearings officer submitted his Proposed FOF, COL, and D&O ("1/15/16 Proposed Decision") to the Commission and the parties, and on February 29, 2016, the parties submitted their exceptions to the Hearings Officer's Proposed Decision. (Minute Order # 16, January 15, 2016.) [HC&S on reopening, FOF 46-47.]

31. On March 10, 2016, CWRM directed the Hearings Officer to "reopen the hearing to address A&B's decision of January 6, 2016 to change HC&S's business operations from farming sugar to a diversified agricultural model." (Minute Order # 18, March 10, 2016.) [HC&S on reopening, FOF 47.]

32. On April 1, 2016, the Hearings Officer recommended that the scope of the re-opened hearing include the following areas:

a. HC&S/A&B's current and future use of surface waters and the impact on the groundwater sources for its cental Maui fields of HC&S's cessation of sugar operations;

b. the impact of HC&S's cessation of sugar operations on MDWS's use of surface water;

c. Maui County's position on the future use of the central Maui fields; and

d. how EMI is managing the decrease in diversions, how it would manage the interim restorations, and any issues concerning the integrity of the EMI ditch system with the current and any future changes in offstream diversions.

(Minute Order # 19, April 1, 2016.) [HC&S on reopening, FOF 48.]

33. On April 20, 2016, A&B announced that it had decided to fully and permanently restore the East Maui streams identified in 2001 by CWRM and NHLC on behalf of its clients. On April 22, 2016, A&B sent a letter to CWRM confirming this intent. The streams are:

Honopou, Hanehoi (including Puolua), Waiokamilo, Kualani,[6] Piʻinaʻau, Palauhulu, and East and West Wailuanui. (Rick Volner ("Volner"), WDT, 10/17/16, ¶ 8; Exh. C-154.) [HC&S on reopening, FOF 49; MTF on reopening, FOF 45; Nā Moku on reopening, FOF 7.]

34. On May 31, 2016, the Hearings Officer issued an "Amended Recommendation Re Interim Restoration of Stream Flows," adopting A&B/EMI's proposed phasing of the streams for full and permanent restoration and leaving in place his original interim restoration recommendation of April 1, 2016 of 18.00 – 18.60 mgd of the approximately 43.82 mgd of ground-water (base flows, BFQ_{50}) Commission staff had estimated that EMI had diverted historically. [Nā Moku on reopening, FOF 6, 8.]

35. On July 18, 2016, the Commission issued an "Order Re Interim Restoration of Stream Flow," affirming the Hearings Officer's amended interim recommendation and further ordered that the ten (10) streams A&B/EMI had stated were undiverted remain that way until further notice: Waiokamilo, Wailuanui (East and West), Makapipi, Hanawī, Waiohue, East Wailuaiki, West Wailuaiki, Waikamoi, Kopiliula, and Puaʻakaʻa. [Nā Moku on reopening, FOF 9.]

36. On August 18, 2016, CWRM approved the listing of the issues in Minute Order 19, *supra*, FOF 32. ("Order Regarding the Scope of the Re-opened Hearing to Address the Cessation of Sugar Operations by HC&S.") [HC&S on reopening, FOF 50; MTF on reopening, FOF 12; Nā Moku on reopening, FOF 10.]

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[6] Although this stream continues to be referred to as "Kualani," it is in fact the easternmost tributary of Waiokamilo Stream and now known as "East Waiokamilo Stream." Kualani Stream is below the EMI ditch system and has never been diverted, *infra*, FOF 62, 184, 186

37. On December 9, 2016, the Board of Land and Natural Resources ("BLNR") issued a temporary, one-year holdover of A&B/EMI's East Maui water licenses subject to the Commission's Interim Restoration Order and to EMI ceasing all diversions of Honomanū Stream for the duration of the one-year holdover period (through December 2017). (Tr., 2/9/17, p. 539, l. 6 to p. 540, l. 2.) [Nā Moku on reopening, FOF 11.]

38. The re-opened evidentiary hearing was conducted on February, 6, 8, and 9, 2017. The parties were to file their Proposed FOF, COL and D&O on April 7, 2017, but on April 5, 2017, MDWS requested that the proceedings be reopened. On April 6, 2017, the Hearings Officer suspended the deadline for submissions to provide MDWS the opportunity to petition the Commission to again re-open the hearings. MDWS filed its Motion to Reopen Evidence on April 13, 2017, and MTF and Nā Moku filed their Memoranda in Opposition on April 20, 2017. [HC&S on reopening, FOF 51; MTF on reopening, FOF 13-17; Nā Moku on reopening, FOF 12.]

39. The Hearings Officer circulated a draft recommendation for denial of the Motion to Reopen Evidence for consideration by the parties in a telephone conference on May 4, 2017. On May 10, 2017, he submitted his recommendation for denial of the Motion, and on May 31, 2017, the Commission denied the Motion. ("Order Denying County of Maui, Department of Water Supply's Motion to Reopen Evidence Dated April 13, 2017," May 31, 2017.) [MTF on reopening, FOF 18-20.]

40. Proposed FOF, COL, and D&O were to be filed by March 31, 2017, which date was amended two times with the final deadline being June 7, 2017. Objections were to be filed by April 7, 2017, which date was similarly amended two times with the final deadline being June 19, 2017. (Minute Orders 24, 25, and 27.) [MTF on reopening, FOF 21.]

41. On July 28, 2017, the Hearings Officer submitted his Proposed FOF, COL, and D&O to the Commission and the Parties.

42. On August 2, 2017, the Hearings Officer submitted his Amended Proposed FOF, COL and D&O to the Commission and the Parties.

B. The EMI-State Watershed Leases

43. "Since the 1930s, the Territory and then the State issued water permits to Alexander & Baldwin, Inc., Hawaiian Commercial & Sugar Co, and East Maui Irrigation Company, Ltd. (EMI) for the diversion of water from streams in East Maui. The collection system consist(ed) of 388 separate intakes, 24 miles of ditches, and fifty miles of tunnels, as well as numerous small dams, intakes, pipes, and flumes (*citation omitted*). With few exceptions, the diversions capture all of the base flow, which represents the ground-water contribution to total stream flow, and an unknown percentage of total stream flow[7] at each crossing...The source of diverted water is a watershed with an area of about 56,000 acres, about two-thirds of which is owned by the State (*citation omitted*) and managed by the State Department of Land and Natural Resources." (Gingerich, S.B., 2005, "Median and Low-Flow Characteristics for Streams under Natural and Diverted Conditions, Northeast Maui, Hawaii: Honolulu, HI, U.S. Geological Survey, Scientific Investigation Report 2004-5262, 72 pp., at p. 1, referenced by Stephen B. Gingerich, Transcript, March 3, 2015, p. 49 (*hereinafter*, "2005 Flow Study").)

44. The leases cover four watersheds of approximately 50,000 acres, of which 33,000 acres are owned by the State, and 17,000 acres are owned by EMI. (Garrett Hew ("Hew"), WDT, 12/30/14, ¶ 4.)

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[7] Stream flow consists of ground water, plus freshet ("normal" rainfall) and storm waters.

45. EMI pays the State $160,000 a year for the right to divert stream waters from the approximately 33,000 acres it leases. (Hew, Tr., March 17, 2015, pp. 198-200.)

46. The lease between the State and EMI traces back to a September 13, 1876 agreement. Construction of the ditch system began in the 1870's. (Exh. C-2; Hew, WDT, 12/30/14, ¶ 5.)

47. Since 1938, the leases have been governed by an agreement dated March 18, 1938 between the Territory of Hawaii and EMI. The last long-term licenses were issued in the 1950s and 1960s, and following their expiration, annual revocable licenses were issued by the Board of Land and Natural Resources (“BLNR”). The licenses are currently in holdover status due to the contested case hearing that is pending before the BLNR. (Exhs. C-3 to C-11; Hew, WDT, 12/30/14, ¶¶ 6, 8-11.)

48. Prior to 1985-86, the State contracted with the U.S. Geological Survey (“USGS.”) to operate gaging stations in various locations in the Ditch system to measure the volume of water collected in each license area from State lands. Beginning with fiscal year 1985-1986, the State no longer contracted with USGS for this service, and EMI took over the operation of the ditch gages and reports the license yields directly to the State. Since 1988 EMI reports a single annual yield to the State, aggregating the readings at the western end of the license areas at Honopou Stream and applying a single factor of 70 percent, based on a comparison of average yields reported by USGS in prior years and a series of studies from 1949 to 1985. (Hew, WDT, 12/30/14, ¶ 12, 13, 15; Exh. C-16.)

49. From east to west, the watersheds are:

a. Nahiku: between the Nahiku Homesteads and the easterly boundary of the Keanae license area. (Exh. C-10, p. 2.)

b. Keanae: between and including the easterly watershed of Waiaaka Stream and the westerly watershed of Pi‘ina‘au Stream. (Exh. C-8, p. 2.)

c. Honomanū: between and including Nua‘ailua and Haipuena Streams and tributaries. (Exh. C-6, ¶ 4.)

d. Huelo: between and including Puohokamoa and Honopou Streams and their tributaries. (Exh. C-4, p. 2.)

50. EMI’s meters measure ditch flows at the boundary of each license area and at its gauging station at Maliko Gulch. EMI contracts with USGS to maintain its gauging stations at the Honopou boundary to measure the aggregate amount of water diverted out of the four East Maui license areas at each of the following ditches: Wailoa, New Hāmākua, Lowrie, and Ha‘iku. (Hew, Tr., 2/6/17, p. 98, ll. 6-16; p. 149, ll. 11-15, p. 151, ll. 17-18.) [Nā Moku on reopening, FOF 31-32.]

51. License-area yields from 1985-1988 were as follows:

	% of total	% from government lands	% from private lands
Nāhiku:	12.9	95	5
Ke‘anae	25.7	79	21
Honomanū	19.8	47	53
Huelo	41.7	64	36
	100.1 (from rounding)		

(Exh. C-12, at 5; C-13, at 2; C-14, at 2.) [Nā Moku on reopening, FOF 38.]

52. From east to west, the State leases begin at Nahiku and end at Honopou Stream, and the East Maui Ditch System continues to collect stream waters between Honopou Stream and Maliko Gulch on EMI's and other private landowners' lands. These streams contribute about 7 percent of total ditch flows, with the lease lands contributing 93 percent, *infra*, FOF 445. The sugar cane fields of HC&S begin west of Maliko Gulch. (*See* Exh. C-1, attached.)

53. Streams in the lands leased from the State not only traverse EMI lands on their way to the ocean, but also traverse other private landowners' lands, particularly as the streams near the ocean. (See Exh. C-1, attached.)

54. The 1876 agreement between the State and EMI recognized the existence of other property owners, stating that "existing rights or present tenants of said lands or occupiers along said streams shall in no wise be lessened or affected injuriously by reason of anything hereinbefore granted or covenanted." (Exhibit C-2, pp. 2-3; Hew, Tr., March 17, 2015, pp. 161-169.)

55. Each of the four leases continues to recognize the rights of other property owners "for domestic purposes and the irrigation of kuleanas entitled to the same." (Exh. C-4, ¶ 6; Exh. C-6, ¶ 6; Exh. C-8, p. 2; Exh. C-10, p. 2.)

C. The East Maui Streams

56. There are 24, not 27, streams that are the subject of this contested case:

a. Waikani is not a stream but a waterfall on Wailuanui Stream. (Hew, WDT, 12/30/14, ¶ 36.)

b. Alo is a tributary of Waikamoi Stream. (*See* Exh. C-1, attached.)

c. Puaʻakaʻa is a tributary of Kopiliula Stream, *infra*, FOF 575;

d. Piʻinaʻau and Palauhulu are separate streams but join together before reaching the ocean, *infra*, FOF 265.

57. EMI and MDWS have diverted 22 of these 24 streams. Kualani (also known as "Hamau") and Ohia (also known as "Waianu") Streams are both below the EMI ditch system and have never been diverted. (Hew, WDT, 12/30/14, ¶ 36.)

58. EMI's and MDWS's ditches divert more than these 22 streams. (See Exhs. C-1 and C-33, attached.) From east to west, the streams that are in each of the state watershed lease areas are as follows, with the streams that are the subject of this contested case underlined:

a) Nahiku lease area:

1. Makapipi Stream
2. Hanawī Stream
3. Kapaula Stream

b) Keanae lease area:

4. Waiaaka Stream
5. Pa‘akea Stream
6. Waiohue Stream
7. Kopiliula Stream (Pua‘aka‘a tributary[8])
8. East Wailuaiki Stream
9. West Wailuaiki Stream
10. Wailuanui Stream (Waikani waterfall, *supra*, FOF 56)
11. Kualani (or Hamau) Stream (below ditch system, *supra*, FOF 57)
12. Waiokamilo Stream
13. Ohia (or Waianu) Stream (below ditch system, *supra*, FOF 57)
14. Palauhulu Stream (Hauoli Wahine and Kano tributaries)
15. Pi‘ina‘au Stream

c) Honomanū lease area:

16. Nua‘ailua Stream

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[8] Puakaa Stream is listed as an independent stream in the Petition, but on the map (*see* Exh. C-1, attached), it is a tributary of Kopiliula Stream.

17. Honomanū Stream

18. Punalau Stream (Kōlea and Ulunui tributaries)

19. Ha‘ipua‘ena Stream

d) Huelo lease area:

20. Puohokamoa Stream

21. Wahinepe‘e Stream

22. Waikamoi Stream (Alo tributary)

23. Kōlea Stream

24. Punaluu Stream

25. Kaaiea Stream

26. Oopuola Stream (Makanali tributary)

27. Puehu Stream

28. Nailiilihaele Stream

29. Kailua Stream

30. Hanahana Stream (Ohanui tributary)

31. Hoalua Stream

32. Hanehoi Stream (Huelo (also known as Puolua) tributary)

33. Waipio Stream

34. Mokupapa Stream

35. Hoolawa Stream (Hoolawa ili and Hoolawa nui tributaries)

36. Honopou Stream (Puniawa tributary)

59. Additional streams between Honopou Stream and Maliko Gulch (*See* Exhs. C-1 and C-33, attached) include:

37. Kapalaalaea Stream (Piilo‘i tributary)

38. Halehaku Stream (Waihee, Makaa, Kaulu, Palama, Opana tributaries)

39. Keali Stream

40. Manawaiianu Stream

41. Opaepilau Gulch (labeled as a stream in Exh. C-33)

42. Lilikoi Gulch (labeled as a stream in Exh. C-33)

60. Exhibit C-33 needs further explanation in that:

a) In the Nahiku lease area, Kapaula Stream is not depicted.

b) In the Keanae lease area, Pa‘akea, Waiohue, East Wailuaiki, West Wailuaiki, Wailuanui, Waiokamilo, and Palauhulu Streams are not depicted. Of these, EMI has stated that it no longer diverts Waiokamilo. (Hew, Tr., March 17, 2015, pp. 125, 128.)

c) In the Honomanū lease area, Kōlea Stream is a branch of Punalau Stream, *supra*, FOF 58 (stream # 18).

d) In the Huelo lease area:

1. Alo Stream is a tributary of Waikamoi Stream.

2. Ohanui Stream is a tributary of Hanahana Stream.

3. Huelo (Puolua) Stream is a tributary of Hanehoi Stream.

4. Kōlea Stream is not depicted, but there is a Kōlea reservoir.

5. Wahinepe‘e, Punaluu, Puehu, and Mokupapa Streams are not depicted.

6. Hoolawa ili and Hoolawa nui are tributaries of Hoolawa Stream.

e) In the area between Honopou Stream and Maliko Gulch:

1. There is no Kapalaalaea Stream, but an unidentified stream flows into Kapalaalaea Reservoir.

2. Opana Stream is one of the tributaries of Halehaku Stream.

3. EMI states that Opana, Opaepilau, and Lilikoi Streams are not diverted at the Wailoa Ditch (but are diverted at the lower ditches). (Hew, Tr., March 18, 2015, p. 176.)

4. Keali and Manawaiianu Streams are below the Wailoa Ditch and not depicted, *see* Exh. C-1, attached.

D. Evaluation of Instream and Noninstream Uses

61. Instream Flow Standard Assessment Reports (IFSARs) are a compilation of the hydrology, instream uses, and noninstream uses related to a specific stream and its respective surface water hydrologic unit. The purpose of an IFSAR is to present the best available information for a given hydrologic unit. That information can then be used to determine IIFS recommendations. (IFSARs, § 1.0. p. 4.)

1. Instream uses

a. Maintenance of fish and wildlife habitats

62. When setting IIFS, the information that is considered in connection with the instream use of maintenance of fish and wildlife habitats is the presence of stream channelizations, native vertebrates, invertebrates, invasive species, and the recruitment, abundance, diversity, and distribution of species. (Exh. C-100, p. 8.)

63. After the Petitions were filed, the Division of Aquatic Resources and Bishop Museum, at the request of the Commission, undertook to survey and account for aquatic resources that have been observed in certain streams in east Maui. The streams studied include: Waikamoi, Puohokamoa, Haʻipuaʻena, Punalau, Honomanū, Nuaʻailua, Ohia, West Wailuaiki, East Wailuaiki, Kopiliula , Waiohue, Paʻakea, Kapaula, Hanawī, and Makapipi. (Hawaii DAR 2009 Report on East Maui Streams, Prepared for the State of Hawaii, Commission on Water Resources Management, *see e.g.* http://files.hawaii.gov/dlnr/cwrm/activity/iifsmaui1/dar-6047.pdf.)

64. These reports were incorporated into the IFSAR for the hydrologic unit which contained the studied stream. (*See e.g.* Waikamoi IFSAR, Bibliography, p. 170.)

65. DAR supports the following positions:

> The removal of stream diversions and the complete restoration of stream flow would be the best possible condition for native aquatic animals. DAR understands that management of the resource is a balance between the needs of the animals and the needs of people thus supports some use of water from East Maui Streams.
>
> The prioritization of the East Maui Streams is based upon the "biggest bank for the buck" concept, where priority is placed on streams with the greatest potential to increase suitable habitat for native species.
>
> The restoration of suitable flows to a single stream is more appropriate than the return of inadequate flow to multiple streams. DAR supports the trade-offs on the restoration of a smaller number of streams with sufficient water over the return of insufficient water (for example at H_{50} or H_{70} levels) to a larger number of streams.

(Exh. E-72, p. 3.)

b. Outdoor recreational activities

66. When setting IIFS, the information that is considered in connection with the instream use of outdoor recreation activities is the presence of opportunities for swimming, nature study, fishing, boating, and parks. (Exh. C-100, p. 8.)

67. Streams are often utilized for water-based activities such as boating, fishing, and swimming, while offering added value to land-based activities such as camping, hiking, and hunting. (*See e.g.* Honopou IFSAR § 5.0, p. 41.)

c. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

68. When setting IIFS, the information that is considered in connection with the maintenance of ecosystems such as estuaries, wetlands, and stream vegetation is the presence or proximity of estuaries, wetlands, nearshore waters, Natural Area Reserves, National Parks, and other protected areas. (Exh. C-100, p. 8.)

69. An ecosystem can be generally defined as the complex interrelationships of living (biotic) organisms and nonliving (abiotic) environmental components functioning as a particular ecological unit. Depending upon consideration of scale, there may be a number of ecosystem types that occur along a given stream such as estuaries, wetlands, and stream vegetation. (*See e.g.* Honopou IFSAR § 6.0, p. 45.)

d. Aesthetic values such as waterfalls and scenic waterways

70. When setting IIFS, the information that is considered in connection with aesthetic values such as waterfalls and scenic waterways is the presence of scenic views, waterfalls and whether there is tourism in the area. (Exh. C-100, p. 8.)

71. Aesthetics is a multi-sensory experience related to an individual's perception of beauty. As a subjective value, aesthetics cannot be quantitatively determined. Elements, such as waterfalls and cascading plunge pools that appeal to an observer's visual and auditory senses. (*See e.g.* Honopou IFSAR § 7.0, p. 52.)

e. Navigation

72. When setting IIFS, the information that is considered in connection with navigation is whether there are boating opportunities. (Exh. C-100, p. 8.)

73. Navigational water use is largely defined as water utilized for commercial, and sometimes recreational, transportation. Hawaii streams are generally too short and steep to support navigable uses. (*See e.g.* Honopou IFSAR § 8.0, p. 54.)

f. Instream hydropower generation

74. When setting IIFS, the information that is considered in connection with instream hydropower generation is whether there is the present of potential use of the stream for hydropower. (Exh. C-100, p. 8.)

75. The generation of hydropower is typically accomplished through instream dams and power generators, however, the relatively short lengths and flashy nature of Hawaii's streams often require water to be diverted to offstream power generators. (*See e.g.* Honopou IFSAR § 9.0, p. 55.)

g. Maintenance of water quality

76. When setting IIFS, the information that is considered in connection with maintenance of water quality is water quality standards, 303(d) impaired waters, total maximum daily loads, and adjacent land use. (Exh. C-100, p. 8.)

77. The maintenance of water quality is important due to its direct impact upon the maintenance of other instream uses such as fish and wildlife habitat, outdoor recreation, ecosystem, aesthetics, and traditional and customary Hawaiian rights. There are several factors that affect a stream's water quality, including physical, chemical and biological attributes. The State of Hawaii Department of Health is responsible for water quality management statewide. (*See e.g*. Honopou IFSAR § 10.0, p. 57.)

78. Fresh waters are classified for regulatory purposes, according to the adjacent land's conservation zoning. There are two classes for inland freshwaters. Class 1 inland waters

are protected to remain in their natural state as nearly as possible with an absolute minimum of pollution from any human-caused source. Class 2 inland waters are protected for uses such as recreational purposes, support of aquatic life, and agricultural water supplies. (*See e.g*. Honopou IFSAR § 10.0, pp. 57-58.)

79. Class 1 waters are further separated into Classes 1a and 1b. (*See e.g*. Honopou IFSAR § 10.0, p. 58.)

80. Class 1a waters are protected for the following uses: scientific and educational purposes, protection of native breeding stock, baseline references from which human-caused changes can be measured, compatible recreation, aesthetic enjoyment, and other non-degrading uses which are compatible with the protection of ecosystems associated with waters of this class. Streams that run through natural reserves, preserves, sanctuaries, refuges, national and state parks, and state or federal fish and wildlife refuges are Class 1a. (*See e.g.* Honopou IFSAR § 10.0, p. 58.)

81. Streams adjacent to the most environmentally sensitive conservation subzone, "protective" are Class 1b and are protected for the same uses as Class 1a waters, with the addition of domestic water supplies, food processing, and the support and propagation of aquatic life. These classifications are used for regulatory purposes, restricting what is permitted on the land around receiving waters. For example, public access to Class 1b waters may be restricted to protect drinking water supplies. (*See e.g.* Honopou IFSAR § 10.0, p. 58.)

82. The Clean Water Act ("CWA") requires the states to describe the overall water quality statewide. They must also describe the extent to which water quality provides for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows recreational activities in and on the water. (*See e.g*. Honopou IFSAR § 10.0, p. 59.)

83. The CWA requires states to submit a list of Water-Quality Limited Segments which are waters that do not meeting state water quality standards and those water' associated uses. States must also provide a priority ranking of waters listed for implementation of pollution controls which are prioritized based on the severity of pollution and the uses of the waters. (*See e.g*. Honopou IFSAR § 10.0, p. 59.)

84. Marine water body types are also classified. Marine water classifications are based on marine conservation areas. The objective of Class AA waters is that they remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions. Class A waters are protected for recreational purposes and aesthetic enjoyment, and protection of fish, shellfish, and wildlife. Discharge into these waters are permitted under regulation. (*See e.g.* Honopou IFSAR § 10.0, p. 60.)

h. The conveyance of irrigation and domestic water supplies to downstream points of diversion

85. When setting IIFS, the information that is considered in connection with the conveyance of irrigation and domestic water supplies to downstream points of diversion whether there are multiple diversions on a single stream. (Exh. C-100, p. 8.)

86. The inclusion of this instream use is intended to ensure the availability of water to all those who may have a legally protected right to the water flowing in a stream. (*See e.g.* Honopou IFSAR § 11.0, p. 62.)

i. The protection of traditional and customary Hawaiian rights

87. When setting IIFS, the information that is considered in connection with the protection of traditional and customary Hawaiian rights is whether there are traditional and

customary rights, taro cultivation, and appurtenant rights in the area and the cultural values in the area. (Exh. C-100, p. 8.)

88. The maintenance of instream flows is important to the protection of traditional and customary Hawaiian rights, as they relate to the maintenance of stream resources for gathering, recreation, and the cultivation of taro. (*See e.g.* Honopou IFSAR § 12.0, p. 63.)

89. Instream uses also include appurtenant water rights which are legally recognized to a specific amount of surface freshwater-usually from a stream-on the specific property that has that right. This right traces back to the use of water on a given parcel of land at the time of its original conversion into fee simple land, i.e. when land allotted by the 1848 Mahele was confirmed to the awardee by the Land Commission and/or when the Royal Patent was issued based on the award. The appurtenant right represents the water that was being used on that land at or shortly before the time of the Mahele. (*See e.g.* Honopou IFSAR § 12.0, p. 63-64.)

90. The amount of water under an appurtenant right is the amount that was being used at the time of the Land Commission award and is established by cultivation methods that approximate the methods utilized at the time of the Mahele, for example, growing wetland taro. The lands to which appurtenant rights attach are not necessarily adjacent to the freshwater source (i.e. the water may be carried to the lands via auwai or ditches). (*See e.g.* Honopou IFSAR § 12.0, p. 63-64.)

2. Noninstream uses

91. When setting IIFS, the information considered regarding noninstream uses include the presence of diversions; the use of water for municipal, agricultural; or industrial uses; present use versus potential use; and economic impacts of restricting noninstream use. (Exh. C-100, pp. 8-9.)

92. In most cases, water is diverted from the stream channel via a physical diversion structure. Diversions take many forms, from small PVC pipes in the stream that remove relatively small amounts of water to earthen auwai (ditches), hand-built rock walls, and concrete dams that remove relatively larger amounts of water. Water is most often used away from the stream channel and is not returned, however, as in the case of taro fields, water may be returned to the stream at some point downstream of its use. While the return of surface water to the stream would generally be considered a positive value, this introduces the need to consider water quality variables such as increased temperature, nutrients, and dissolved oxygen, which may impact instream uses. Additionally, discharge of water from a ditch system into a stream may introduce invasive species. (*See e.g.* Honopou IFSAR § 13.0, p. 86.)

93. In addition to the amount of water being diverted offstream, the Commission must also consider the diversion structure and the type of use, all of which impact instream uses in different ways. (*See e.g.* Honopou IFSAR § 13.0, p. 86.)

E. Individual Hydrologic Units

94. The development of a system of surface water hydrologic units was based on the need for staff to being able to organize and manage surface water information in a database environment that could be easily understood by the general public and other agencies. Hydrologic units are synonymous with watershed areas. (IFSARs § 1.0. p. 4.)

1. Honopou (6034)

a. Physical features

95. The hydrologic unit of Honopou is located northwest of Haleakala. It covers an area of 2.7 square miles from the lower slopes of Haleakala at 2,286 feet elevation to the sea. (Honopou IFSAR § 1.1, p. 1.)

96. The hydrologic unit of Honopou contains Honopou Stream and its tributary, Puniawa Stream. (Honopou IFSAR § 1.1, p. 1)

97. Honopou Stream is 4 miles in length, traversing north from its headwaters near Ulalena to the ocean. Puniawa Stream is 2.6 miles in length with intermittent flow. (Honopou IFSAR § 1.1, p. 1.)

b. Diversions

98. EMI operates diversions on Honopou Stream at Haiku Ditch, Lowrie Ditch, New Hamakua Ditch, and Wailoa Ditch. As of March 9, 2004, three 4-inch bypass pipes had been installed at Haiku Ditch on Honopou to allow water to bypass the diversion structure and flow back into the stream. (Exh. C-33; Exh. C-52, p. 12; Exh. C-85, p. 10.)

c. Gaging stations

99. Four continuous-record stream gaging stations operated by the USGS, one of which (station 16587000) is still taking active measurements, are located along Honopou Stream.

a. Station 16595000 is located at 383 feet elevation below Haiku Ditch and was active in 1907 and from 1932 to 1947. (Honopou IFSAR § 1.1, p. 28, (Table 3-1).)

b. Station 16593000 is located at 441 feet elevation above Haiku Ditch and was active in 1907 and from 1932 to 1947. (Honopou IFSAR § 1.1, p. 28 (Table 3-2).)

c. Station 16591000 is located at 557 feet at the Lowrie Ditch and was active from 1932 to 1947. (Honopou IFSAR § 1.1, p. 28 (Table 3-3).)

d. Station 16587000 is located at 1,208 feet near Wailoa (Koʻolau) Ditch and is still active. (Honopou IFSAR § 1.1, p. 28 (Table 3-4).)

d. **Streamflow values**

100. Honopou is mostly a gaining stream. The average annual ground water gain measured immediately downstream of Haiku Ditch is 3.56 cfs (2.3 mgd) with fifty percent originating upstream of the Wailoa Ditch. The average annual groundwater contribution from the stretch from the Wailoa ditch to the Haiku ditch (1.78 cfs, or 1.15 mgd) equals the groundwater (base flow) contribution above the Wailoa ditch (1.78 cfs, or 1.15 mgd), so under undiverted conditions, the base flow below the Haiku ditch would be twice that above the Wailoa ditch. Despite this doubling of base flow as measured by gages above the Wailoa ditch and below the Haiku ditch, the four ditches reduce total median stream flow (Q_{50}) by 50 percent, from 2.4 cfs (1.55 mgd) above the Wailoa ditch to 1.2 cfs (0.775 mgd) below the Haiku ditch. (Exh. C-85, pp. 10, 16.)

e. **Instream values**

i. **Maintenance of aquatic life and wildlife habitats**

101. Honopou rates average in comparison to other watersheds in Maui and statewide. DAR assigns Honopou a total watershed rating of 5 out of 10, a total biological rating of 5 out of 10, and a combined 5 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis, Lentipes con color,* and *Sicyoperus stimpsoni*
Crustaceans — *Atyoida bisulcata* and *Macrobrachium grandimanus*
Mollusks — none observed

102. Also observed were two native dragonflies, *Anax strenuous* and *Pantala flavescens*, and the native damselfly, *Megalagrion pacificum.* ‘O‘opu alamo‘o was found only in the upper reaches. Larval recruitment of native fish has been observed near the stream mouth. (DAR Report on Honopou Stream, Maui, Hawaii, June 2008, pp. 1-2; Exh. C-100, p. 28.)

103. The flow in Honopou Stream needed to achieve H_{90} is unknown. (Exh. HO-1; Uyeno, Tr., 3/30/15, p. 13, ll. 2-10.)

ii. Outdoor recreational activities

104. The recreational resources of Honopou Stream were classified as moderate by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for swimming related to Honopou Stream and it was not considered to be a high-quality experience. The following activities are known to occur or have been observed at or near Honopou: pole and line fishing, trolling/bottom fishing, and some specialized fisheries. (Exh. C-101, p. 37.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

105. The riparian resources of Honopou Stream were not classified by the Hawaii Stream Assessment. Nearly 25% of the Honopou hydrologic unit falls within the Ko‘olau Forest Reserve. Nearly 21% of Honopou is classified as seasonal, non-tidal palustrine wetlands occurring in the headwaters of the hydrologic unit. The density of threatened and endangered plant species is high at elevations above 1,300 feet, while the rest of the unit, roughly 72%, has a low concentration of threatened and endangered plant species at lower elevations. (Exh. C-101, pp. 41-44.)

iv. Aesthetic values

106. The headwaters of Honopou Stream originate in the lush tropical forests of the Ko‘olau Forest Reserve and the stream flows through approximately two miles of evergreen forests before tumbling over Twin Falls and into a natural pool below. Twin Falls is a popular tourist attraction where people are often seen jumping into the pool from the top of the waterfall.

Below the waterfall, the surrounding vegetation changes to mainly grasses and shrubs. At about the same elevation, the tributary of Puniawa Stream begins and flows through cultivated and shrub lands. Honopou Stream empties into Puniawa Bay, which can be viewed above the ocean cliffs at Honopou Point. (Exh. C-101, p. 48.)

v. Navigation

107. No navigation values are present. (Exh. C-101, p. 50.)

vi. Instream hydropower generation

108. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from Honopou Stream. (Exh. C-101, p. 51.)

vii. Maintenance of water quality

109. Honopou Stream does not appear on the 2006 List of Impaired Waters in Hawaiʻi, Clean Water Act § 303(d). While some data exist for Honopou Stream, there were not sufficient data for decision-making. Samples collected in Honopou Stream indicated no exceedance of water quality standards. (Exh. C-101, p. 53; Exh. C-85, p. 11.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

110. There are 22 registered diversions, 15 of which are not EMI's. Of these 15, 13 were declared for domestic purposes, in part, with a total of 15 service connections. All 15 diversions are utilized for irrigation of various crops and taro. (Exh. C-101, p. 55.)

ix. Protection of traditional and customary Hawaiian rights

111. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Honopou. (Exh. C-101, p. 66.)

e. Kuleana users

112. CWRM records for the hydrologic unit of Honopou indicate that there are a total of 22 registered diversions. Six of the diversions were declared for taro cultivation. (Exh. C-101, p. 68.)

113. In Table No. 1 at page 10 of Nā Moku's Opening Brief, Nā Moku claims 26.06 acres of cultivable area in Honopou and "Total Estimated Water Needs for Taro (in addition to 64% base flow)" of 2.61 - 7.82 mgd. This is said to be based on Exhibits A-137 (the "***Nā Moku TMK Spreadsheet***") and Exhibits A-138 and A-139 (tax maps with highlighted areas referencing certain parcels in Honopou).

114. The 26.06 acres is simply the sum of the total acreage of TMK Nos. 2-9-01-14, 29-01-23, 2-9-01-25, 2-9-14-13, and 2-9-14-23, which are described in the declaration of Lurlyn Scott ***("Scott")*** as parcels in which her family has an interest. These appear to be the same properties referenced generally in the declarations of her cousins, Sanford Kekahuna, Jonah Jacintho, Juliana Jacintho and Lezley Jacintho.

115. The only information offered about the specific locations on these properties currently being used or planned to be used for taro cultivation is in Scott's declaration and Exhibit A-149, a schematic drawing she prepared to show the loi system on her family's properties in Honopou. She initially estimated this system to be approximately one acre in size, but later increased her estimate to two acres. (Scott, WDT 12/16/14, 91 30; Scott, Tr., 3/4/15, p. 193, ll. 19-24.)

116. Nā Moku has estimated the water need for taro on Honopou by simply multiplying the total acreage of all the parcels in which Scott's family has an interest by Paul

Reppun's ("Reppun") estimate of 100,000 to 300,000 gad as the irrigation requirement for taro, which resulted in the 2.61 mgd — 7.82 mgd (in addition to 64% baseflow) claimed by Nā Moku.

117. The median baseflow of Honopou at the level of the Haiku Ditch, according to USGS, is 2.3 mgd, with 50% being contributed by ground water above Wailoa Ditch and 50% between Wailoa Ditch and Haiku Ditch. This is the average amount estimated by USGS to be in the stream at the level of the Haiku Ditch in its natural condition when it is not raining. Nā Moku wants 1.472 mgd (64% of 2.3 mgd) to be left in the stream before calculating the amount to be restored to satisfy taro needs. This would only leave 0.828 mgd of average baseflow from which to meet Nā Moku's taro water claim of 2.61 mgd — 7.82 mgd. There is obviously not enough base flow in Honopou Stream, even in the absence of any diversions by EMI, to satisfy Nā Moku's claimed amounts for "restoration." (Exh. C-85, pp. 13-16.)

118. Honopou Stream can, however, support cultivation by Scott's family of the entire one to two acre loi system (the "Kekahuna lo'i system") shown on Exh. A-149. Using the taro irrigation requirement of 130,000 to 150,000 gad previously established by CWRM in the Na Wai 'Eha case, the flows needed would be 260,000 to 300,000 gad. At the current IIFS of 1.29 mgd below the Haiku Ditch, this irrigation requirement can easily be satisfied without dewatering the stream between the loi intake diversion and the outflow ditch.

119. Nā Moku has complained that, notwithstanding the current availability of water at the Kekahua lo'i system intake, the water at times is too warm for taro and thus more water needs to be released into the stream.

120. Sometime between 2008 and 2010, USGS installed gages in the Kekahuna lo'i system to measure water flow and temperature in the complex, among other things. The gages are no longer operational. (Scott, Tr., 3/4/15, p. 179, ll.7-30, p. 180, l.20 to p. 182, l. 6.)

121. USGS gage 205548156143901 (“Gage ‘3901”) was installed at the ‘auwai at the top of the lo‘i complex and it measured the inflow temperature of water. USGS gage 205549156143601 (“Gage ‘3601”) was installed on the ‘auwai near the bottom on the western boundary of the complex (Lo‘i Outlet #1) and it measured the outflow temperature of water. USGS gage 205549156143602 (“Gage ‘3602”) was installed on an ‘auwai situated near the middle of the complex (Lo‘i Outlet #2) and it also measured the outflow temperature of water. The locations of the gages are depicted on Exhibit A-149A. (Scott, Tr., 3/4/15, p. 184, 11. 12-20, p. 194, l.3 to p. 195, l.3; Exh. A-149A.)

122. In general, the outflow temperatures recorded at Gage ‘3601 in Lo‘i Outlet #1 tended to be lower and exhibited less variability than the outflow temperatures recorded at Gage ‘3602 in Lo‘i Outlet #2. For example, during the period from July 2009 to July 2010, the daily mean inflow temperatures recorded at Gage ‘3901 ranged between 64°F and 76°F. During the same period, the daily mean outflow temperatures recorded at Gage ‘3601 ranged between 65°F and 77°F, whereas the daily mean outflow temperatures recorded at Gage ‘3602 ranged between 68°F and 82°F. (Exh. A-155; Exh. A-156; Exh. A-157.)

123. At the location of Gage ‘3602, the water in the ‘auwai has passed through a series of taro patches above. (Scott, Tr., 3/4/15, p. 202, ll. 10-19.)

124. The ‘auwai in which Gage ‘3601 was installed takes water directly from the intake and traverses along the western boundary of the lo‘i complex, bypassing taro patches that are in cultivation. The cooler water from this ‘auwai can be, but is not, used to irrigate those patches by diverting it to an ‘auwai in the middle of the complex. (Scott, Tr., 3/4/15, p. 195, l. 4 to 196, l.6, p. 196, ll. 7-22; Hew, Tr., 3/17/15, p. 117, l. 1 to p. 118, l.9; Exh. A-149A.)

125. Reppun testified that the way each farmer manages his water is important to understanding how much and why outflow temperatures might exceed inflow temperatures. Reppun did not study and did not express an opinion on the Kekahuna lo‘i system water management practices as they may affect the higher temperature of the outflows measured by Gage ‘3602 versus Gage ‘3601. There was also no explanation offered by Nā Moku for this discrepancy. (Reppun, Tr., 3/4/15, p. 17, 11. 16-23, p. 59, 1. 2 to p. 60, 1. 4, p. 77, 1. 6 to p. 83, 1. 13, p. 98, l. 11 to p. 99, l. 11.)

126. The flow measurements recorded at USGS gage station 16595100 on Honopou Stream in the vicinity of the Kekahuna lo‘i system consistently exceed 300,000 gpd. (Exh. A-155, pp. 1, 4; Hew, Tr., 3/17/15, p. 113, 1.4 to p. 116, l. 24.)

127. EMI had previously taken measurements of flow and temperature at the intake to the ‘auwai feeding the Kekahuna lo‘i complex for a 14-month period from March 15, 2004 to May 20, 2005 during which time water was being passed through EMI's Haiku Ditch diversion via three 4-inch pipes. During the period covered by those measurements, the ‘auwai intake gate was not fully open because if it were, all of the water available at the intake would overflow the banks of the ‘auwai during times of high flows in Honopou Stream. The flow rate measured at the intake consistently remained in excess of 235,500 gpd except on one occasion, even during times of low rainfall. At certain times, the flow rate was so high that it was not possible to obtain a measurement with a Parshall Flume. (Exh. C-52, p. 13; Exh. C-107, Exh. A-13 thereto.)

2. Hanehoi (6037)

a. Physical features

128. The hydrologic unit of Hanehoi is located in the northwest section of Haleakala. It contains Hanehoi Stream and Puolua (Huelo) Stream and covers an area of 1.41 square miles on the lower slopes of Haleakala from 1,361 feet elevation to the sea. (Hanehoi IFSAR § 1.1, p. 1)

129. Hanehoi Stream is 1.3 miles in length and flows intermittently in the upper section of the stream. (Hanehoi IFSAR § 1.1, p. 1.)

130. A terminal waterfall at the mouth of the stream would likely restrict upstream migration. (Exh. C-85, p. 20.)

b. Diversions

131. EMI operates diversions on Hanehoi Stream at Haiku Ditch, Lowrie Ditch, New Hamakua Ditch, and Wailoa Ditch. (Exh. C-33.)

132. A diversion for domestic purposes serves approximately 30 families, or approximately 100 people in the Huelo community. There is rarely water available in residents' sections of the streams under present conditions, so they are not using stream water for their crops. (Exh. C-85, pp. 21-22.)

133. The estimated BFQ_{50} undiverted flow of Hanehoi Stream is 1.64 mgd (2.54 cfs) below the Lowrie Ditch and above the Haiku Ditch. The estimated BFQ_{50} undiverted flow of Puolua (Huelo) Stream is 0.69 mgd (1.07 cfs) below the Lowrie Ditch and above the Haiku Ditch and 0.95 mgd (1.47 cfs) below the Haiku Ditch. The estimated BFQ_{50} undiverted flow at the mouth of Hanehoi Stream is 3.46 mgd (5.35 cfs).

c. Gaging stations

134. No USGS gaging station was installed in Hanehoi Stream. (Hanehoi IFSAR § 3.0 at 27.)

d. Streamflow values

135. Measured stream flow data are limited for Hanehoi/Puolua Streams, so flow statistics were estimated with regression equations. There is no data on whether Hanehoi and Puolua Streams are losing or gaining flow from groundwater. There is currently very little flow in Hanehoi Stream, but residents reported that the streams had continuous flow before the 1960s except in times of drought, and archaeological evidence of extensive taro lo‘i along the lower reaches of the streams suggests that water was once readily available. Streamflow data from long-term gaging stations around the islands indicate that monthly mean total and base flows have generally decreased from the 1940s to 2002, which is consistent with decreasing rainfall trends statewide. (Exh. C-85, pp. 20, 26.)[9]

136. Based on the regression equation for ungaged basin of Hanehoi, for Hanehoi Outlet, which is near the coast at 12 feet above mean sea level, the BFQ_{50} is 5.35 cfs and at Hanehoi middle, the middle reach of Hanehoi at 536 feet elevation, BFQ_{50} is 2.54 cfs. (Hanehoi IFSAR § 3.0, pp. 28-29, Table 3-4.)

137. Based on the regression equation for ungaged basin of Huelo lower, the lower reach of Huelo at 420 feet elevation, BFQ_{50} is 1.47 cfs, and at Huelo middle, the middle reach of Huelo at 528 feet elevation, BFQ_{50} is 1.07. (Hanehoi IFSAR § 3.0, pp. 28-29, Table 3-4.)

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[9] Hanehoi/Puolua are outside the 2005 Flow Study area in which the regression equations were developed, so the estimated flow statistics may not be representative of the flow conditions in Hanehoi and Puolua (Huelo) Streams. (Exh. C-85, p. 20.)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

138. Hanehoi rates below average in comparison to other watersheds in Maui and statewide. DAR assigns Hanehoi a total watershed rating of 6 out of 10, a total biological rating of 2 out of 10, and a combined 4 out of 10. Native species observed in the stream include:

Fish — none observed
Crustaceans —*Atyoida bisulcata*
Mollusks — none observed

139. Also observed were two native dragonflies, *Anax strenuous* and *Pantala flavescens* and two native damselflies, *Megalagrion nigrohamatum* and *Megalagrion pacificum.* Hanehoi has degraded native aquatic and insect biota in the middle and lower reaches. Large sections of the stream are currently unsuitable habitat for native animals. Only native mountain ʻōpae observed and are present in the upper reaches. Native dragonflies and damselflies were observed in the upper reaches as well. (DAR Report on Hanehoi Stream, Maui, Hawai 1, June 2008, pp. 1-2; Exh. C-85, p. 20; Exh. C-100, p. 44.)

140. The flow in Hanehoi Stream needed to achieve H_{90} is unknown. (Exh. HO-1.)

ii. Outdoor recreational activities

141. The recreational resources of Hanehoi Stream were classified as limited by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified no recreational opportunities for Hanehoi Stream. (Hanehoi IFSAR § 5.0, p. 33.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

142. Riparian resources of Hanehoi Stream were not classified by the Hawaii Stream Assessment. Nearly 30% of Hanehoi falls within the Koʻolau Forest Reserve. Nearly 26% of Hanehoi is classified as seasonal, non-tidal palustrine wetlands occurring in the headwaters of

the hydrologic unit. The density of threatened and endangered plant species is high at elevations above 1,200 feet, while the rest of the unit, roughly 79%, has a low concentration of threatened and endangered plant species at lower elevations. (Hanehoi IFSAR § 6.0, pp. 37-40.)

iv. Aesthetic values

143. The headwaters of Hanehoi Stream originate in the lush tropical forests of the Koʻolau Forest Reserve. Along with its tributary Puolua (Huelo) Stream, they flow northeasterly through miles of evergreen forests before reaching the confluence where the surrounding vegetation is dominated by grasses and shrubs. Hanehoi Stream empties into the western boundary of Hoalua Bay, which can be viewed above the ocean cliffs at Hanehoi Point. (Hanehoi IFSAR § 7.0, p. 44.)

v. Navigation

144. No navigation values are present. (Hanehoi IFSAR § 8.0, p. 46.)

vi. Instream hydropower generation

145. HC&S operates the run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from Hanehoi Stream. (Hanehoi IFSAR § 9.0, p. 47.)

vii. Maintenance of water quality

146. Neither Hanehoi nor Puolua (Huelo) Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Hanehoi, there were not sufficient data for decision-making. Hanehoi Stream is Class 2 from the coast to approximately 1,200 feet elevation. Above that elevation, it is Class 1. Puolua (Huelo) Stream is Class 2. Marine waters at the mouth of the hydrologic unit of Hanehoi are mostly Class AA waters, except for the northern tip of the hydrologic unit, where they are Class A waters. (Hanehoi IFSAR § 10.0, p. 49.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

147. There are a total of 12 registered diversions, of which five are non-EMI. Of these five, one was declared for domestic purposes, in part, for one service connection. Four of the five diversions are utilized for irrigation of various crops and livestock, including the cultivation of taro. The one remaining registrant claimed to use water for irrigation 0.09 acres of taro, but in the course of the field verification, no diversion could be located and the declarant expressed the intention to grow taro in the future. (Hanehoi IFSAR § 11.0, p. 51.)

ix. Protection of traditional and customary Hawaiian rights

148. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Hanehoi. (Hanehoi IFSAR § 12.0, p. 61.)

f. Kuleana users

149. CWRM records for the hydrologic unit of Hanehoi indicate that there are a total of 12 registered diversions, of which five are non-EMI. Of these five, two registrants declared water use for taro cultivation with an estimated cultivable area of 2.25 acres. One other registrant claimed to use water for 0.09 acres of taro, but in the course of the field verification no diversion could be located and the declarant expressed the intention to grow taro in the future. (Hanehoi IFSAR § 12.0, p. 63.)

150. There is one taro farmer, Ernest Schupp, who has cultivated approximately one acre of taro off and on since 1998 on the parcel designated as TMK No. 2-9-08:15, which is owned by George and Mary Keala. The intake for his auwai is on Puolua Stream just below

where the Haiku Ditch crosses and diverts water from the stream. Water passes through the Haiku Ditch diversion through two four inch pipes. (Schupp, WDT 12/15/14, ¶J[3, 9, 13.)

151. Mr. Schupp also testified that he is involved with an organization that would like to restore ancient loi along the stream that have long been abandoned and that may have appurtenant rights, but no testimony was submitted by the owners of the property where these ancient loi are located. *(See generally,* Schupp on behalf of TARO, WDT 12/15/14.)

152. Neola Caveny owns a parcel adjacent to Hanehoi Stream but does not cultivate taro. She currently obtains water for her property from a private catchment system, and claims that she is unable to exercise her riparian rights to use water from Hanehoi Steam due to low stream flows. (*See generally,* Caveny, WDT 12/13/14.)

153. Solomon Lee owns a number of parcels adjacent to Hanehoi Stream. While no taro is currently cultivated on these parcels, he testified that taro was previously cultivated on portions of these parcels and he would like to restore and cultivate taro on three acres. (*See generally,* Lee, WDT 12/30/14.)

154. Lucienne De Naie tesitified in support of restoration but does not reside on either stream and thus does not claim any appurtenant or riparian rights. (*See generally,* De Naie, WDT 12/30/14.)

155. Donald M. Halley Jr. and Crista A. Moil similarly testified in support of restoration, but do not reside on land bordered by any stream and thus do not claim any appurtenant or riparian rights. (*See generally,* Halley, WDT 12/30/14.)

156. Michael D'Addario is the land manager of the Hale Akua Garden Farm and Agricultural Education Center (the "Center") located on top of a steep pali overlooking Hanehoi Stream. Because of its elevation where the Center's land abuts the stream, the Center only

receives water from Hanehoi Stream through the Huelo Community pipeline. Mr. D'Addario alluded in his testimony to possible appurtenant rights in favor of the Center, but did not offer any evidence of prior taro cultivation on the Center's land or explain how, given its elevation above the stream, Hanehoi Stream may have been the irrigation source for any such prior taro cultivaton. *(See generally,* D'Addario, WDT 12/30/14.)

3. Waikamoi (6047)

a. Physical features

157. The hydrologic unit of Waikamoi contains the Waikamoi Stream, Alo Stream, and Wahinepe‘e Stream and covers 5.3 square miles from the upper slopes of Haleakala at 9,300 feet elevation to the sea. (Waikamoi IFSAR § 1.1, p. 1.)

158. Waikamoi Stream is 8.5 miles in length, traversing north from the headwaters of its tributaries to Hosmer Grove Spring at the 6,560 feet altitude to the ocean. A major tributary to Waikamoi Stream is Alo Stream, which branches east at about 840 feet altitude. East of Waikamoi Stream within the same hydrologic unit is Wahinepe‘e Stream, which is a mile in length with headwaters beginning at about the 800 feet elevation. (Waikamoi IFSAR § 1.1, p. 1.)

159. The presence of terminal waterfalls in Waikamoi Stream and Wahinepe‘e Stream have restricted those native species that lack climbing ability from inhabiting the stream. (Waikamoi IFSAR § 4.4, pp. 51, 52; DAR Report on Waikamoi Stream, Maui, Hawaii, August 2009, pp. 6, 7.)

b. Diversions

160. EMI operates diversions on Waikamoi Stream at the Ko‘olau/Wailoa Ditch, Spreckels Ditch, and the Manuel Luis/Center Ditch. Waikamoi Stream is also diverted by the Upper Kula Pipeline and Lower Kula Pipeline. (Waikamoi IFSAR § 3.3, p. 30.)

161. Alo Stream is diverted by the Ko'olau/Wailoa Ditch and New Hamakua Ditch. (Waikamoi IFSAR § 3.3, p. 30.)

162. Wahinepe'e Stream is diverted by the Manuel Luis/Center Ditch. (Waikamoi IFSAR § 3.3, p. 30; Exh: C-33.)

c. Gaging stations

163. Waikamoi Stream has one active USGS continuous-record stream gaging station and seven inactive gaging stations, one of which was located on Alo Stream. Station number 5528 remains active, and is located at an altitude of 4,487 feet, upstream from the Upper Kula Pipeline. (Waikamoi IFSAR § 3.3, p. 29 (Table 3-2).)

d. Streamflow values

164. According to USGS, the natural median baseflow immediately downstream of a minor diversion at the upper reach of Waikamoi Stream is 3.50 cfs (1.88 mgd). (Table attached to Gingerich WDT 10/31/14, p. 3; USGS Regression Study, p. 66 (Table 12).)

165. According to USGS, the natural median baseflow at the upper reach of Alo Stream directly uptream of the Spreckels Ditch is 1.50 cfs (0.81 mgd); after the confluence of Alo Stream and Waikamoi Stream at the middle-upper reach directly upstream of the Center Dich, it is 6.60 cfs (3.55 mgd); at the middle-lower reach, it is 6.70 cfs (3.61 mgd); and at the lower reach it is 7.00 cfs (3.77 mgd). (Table attached to Gingerich WDT 10/31/14, p. 3; USGS Regression Study, p. 66 (Table 12).)

166. According to USGS, the natural median baseflow at the middle reach of Wahinepe'e Stream is 0.90 cfs (0.48 mgd). (Table attached to Gingerich WDT 10/31/14, p. 3; USGS Regression Study, p. 66 (Table 12).)

e. **Instream values**

i. **Maintenance of aquatic life and wildlife habitats**

167. Only the native ‘o‘opu alamo ‘o *(Lentipes concolor)* and ‘ōpae kala‘ole *(Atyoida bisulcata)* were observed in Waikamoi Stream. During the more recent surveys, both species were observed in the upper reach; although, the ‘ōpae kala’ole was seen in the middle and headwater reaches of the stream in earlier surveys. The Hawaii Stream Assessment rates Waikamoi as “without,” meaning no native species were present during prior surveys. Waikamoi rates high in comparison to other watersheds in Maui and statewide. DAR assigns Honopou a total watershed rating of 7 out of 10, a total biological rating of 7 out of 10, and a combined 8 out of 10. The study to assess the effects of surface water diversion systems on habitat availability found that Waikamoi maintained 50 to 75 percent of the natural habitat below Wailo and New Hamakua Ditch under diverted conditions. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis, Kuhlia xenura* and *Sicyoperus stimpsoni*
Crustaceans —*Atyoida bisulcata*
Insects — *Anax Junius, Anax* sp, *Anax strenuous, Limonia grimshawi, Limonia Jacobus, Megalagrion blackburni, Megalagrion calliphya, Megalagrion* sp., *Procanacae acuminata, Procanace confusa, Saldula exulans, Scatella cilipes, Scatella clavipes, Scatella femoralis, Telmatogeton abnormis, Telmatogen* sp., *Telmatogeton torrenticola*
Snails — *Ferrissia sharpi* and *Neritina granosa* Sponge — *Heteromeyenia baileyi*

(DAR Report on Waikamoi Stream, Maui, Hawaii, August 2009, pp. 5-6; Waikamoi IFSAR § 4.4, p. 51.)

168. The estimated natural (undiverted) median baseflow of Waikamoi Stream is 6.60 cfs (4.26 mgd). The amount of flow in Waikamoi Stream below the confluence of Waikamoi Stream and Alo Stream needed to achieve H_{90} is 4.20 cfs (2.71 mgd). (Table attached to Gingerich WDT 10/31/14, p. 3; Exh. HO-1.)

169. The estimated natural (undiverted) median baseflow of Wahinepe‘e Stream is 0.90 cfs (0.58 mgd). The amount of flow in Wahinepe‘e Stream needed to achieve $_{H90}$ is 0.58 cfs (0.37 mgd). (Table attached to Gingerich WDT 10/31/14, p. 3; Exh. HO-1.)

ii. Outdoor recreational activities

170. Recreational resources of Waikamoi Stream were classified as “substantial” by the Hawaii Stream Assessment’s regional recreation committee. Hawaii Stream Assessment identified opportunities for hunting, swimming, and scenic views. None of the recreational opportunities were considered to be a high-quality experience. CWRM determined that trolling, bottom fishing, and opihi picking were the only activities known to occur or observed at or near Waikamoi. (Waikamoi IFSAR § 5.0, p. 60.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

171. Riparian resources of Waikamoi Stream were classified as “substantial” by the Hawaii Stream Assessment. About 29% of the Waikamoi hydrologic unit falls within the Haleakala National Park. Approximately 28% of the Waikamoi hydrologic unit falls within the Ko‘olau Forest Reserve. Approximately 7% of the Waikamoi hydrologic unit falls within the Waikamoi Preserve. (Waikamoi IFSAR § 6.0, pp. 63-64.)

iv. Aesthetic values

172. The headwaters of Waikamoi Stream originate in Haleakala National Park where vegetation is predominately native shrub lands with sparse alien grasses. In the intermediate slopes of the hydrologic unit, Waikamoi Stream flows through native communities of Ohia forests and Uluhe shrub lands that lie within the Waikamoi Preserve and Ko‘olau Forest Reserve. The lower elevations are mostly alien forests of the Ko‘olau Forest Reserve. The surrounding

vegetation for Wahinepeʻe Stream is predominately alien forests. A number of waterfalls and plunge pools are located along the lower reaches of Waikamoi Stream, which provide scenic spots for the public. Among the many waterfalls is Waikamoi Falls that is about 70-foot high and it can be seen from Hana Highway. There are two springs in the hydrologic unit, Hosmer Grove Spring at the 6,560 feet altitude near the headwaters and Waikamoi Spring at 3,200 feet altitude. Keopuka Rock, a State seabird sanctuary, can be seen from the shoreline of the hydrologic unit. Located at Hana Highway between Kōlea and Waikamoi Streams is the Waikamoi Roadside Park, which offers views of Waikamoi Stream and access to the upper reach of the stream. (Waikamoi IFSAR § 7.0, p. 72.)

v. Navigation

173. No navigation values are present. (Waikamoi IFSAR § 8.0, p. 74.)

vi. lnstream hydropower generation

174. No instream hydropower generation occurs in Waikamoi. (Waikamoi IFSAR § 9.0, p. 75.)

vii. Maintenance of water quality

175. Waikamoi Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). Waikamoi Stream is classified as Class la inland waters at its headwater tributary that lies in the Haleakala National Park, and in the lower reach that lies within the Koʻolau Forest Reserve. From the tributary down to approximately 6, l00 feet elevation and the short section of the stream near the ocean, Waikamoi Stream is classified as Class 2 inland waters. Between the 6, l00 feet and 1,300 feet altitudes, the stream is classified as Class lb inland waters as parts of the stream lie in the Waikamoi Preserve (upper reaches) and the Koʻolati

Forest Reserve (lower reaches). Marine waters at the mouth of the Waikamoi hydrologic unit are Class AA waters. (Waikamoi IFSAR § 10, pp. 80-81.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

176. There is one diversion, registered by Puohokama Farm, that diverts water for domestic purposes. The diversion is a 1-inch pipe and is also used for watering of livestock, aquaculture, hydroelectric power generation, and irrigation. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the Waikamoi hydrologic unit. (Waikamoi IFSAR § 11.0, p. 83.)

ix. Protection of traditional and customary Hawaiian rights

177. According to the 1990 Hawai‘i Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the Waikamoi hydrologic unit. (Waikamoi IFSAR § 12.0, p. 100.)

f. Kuleana users

178. CWRM records for the hydrologic unit of Waikamoi indicate that there are a total of eleven registered diversions (10 by EMI or MDWS). The remaining diversion is registered by Puohokamoa Farm, and is declared for domestic water use purposes, watering of livestock, aquaculture, hydroelectric power generation, and irrigation. Waikamoi does not currently have any active taro diversions. (Waikamoi IFSAR § 12.0, p. 94; Exh. C-90, p. 17.)

4. Puohokamoa (6048)

a. Physical features

179. The hydrologic unit of Puohokamoa covers 3.15 square miles, extending from the coast to inland elevation of 1,700 feet above mean sea level that terminates into the slope of a cinder cone. (Puohokamoa IFSAR § 2.1, p. 11.)

180. Puohokamoa Stream splits into three branches (west, middle, and east branch) 4.4 miles from the coast at 2, l00 feet elevation. The longest is the middle branch that is headed at the 4,400 feet altitude 6.4 miles inland. (Puohokamoa IFSAR § 3.3, p. 27 and 29.)

181. Puohakamoa Stream appears to be mostly a gaining stream, except for a losing and a dry reach in the headwater tributaries near the Lower Kula pipeline. (Exhibit C-90, p. 19)

b. Diversions

182. EMI operates diversions on Puohokamoa at the Lower Kula Pipeline and Upper Kula Pipeline for MDWS as well as at the Spreckels Ditch, Manuel Luis Ditch, and Ko‘olau Ditch. (Puohokamoa IFSAR § 13.1 at 98-105, Table 13-1; Exh. C-33.)

c. Gaging stations

183. Six inactive USGS continuous-record stream gaging stations were located in the hydrologic unit of Puohokamoa. (Puohokamoa IFSAR § 3.3, p. 28.)

d. Streamflow values

184. According to USGS, the natural median baseflow at the upper reach of Puohokamoa Stream immediately downstream of the Ko‘olau Ditch is 6.40 cfs (3.44 mgd); at the middle-upper reach immediately downstream of the Manuel Luis Ditch, it is 8.40 cfs (4.52 mgd); at the middle-lower reach it is 10.00 cfs (5.38 mgd); and at the lower reach it is 11.00 cfs (5.92

mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 61 (Table 11) and p. 66 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

185. The Hawaii Stream Assessment classifies the aquatic resources of Puohokamoa Stream as "limited", meaning very little native species were present. Only the native ʻoʻopu alamoʻo *(Lentipes concolor),* ʻoʻopu nakea *(Awaous guamensis),* and ʻōpae kalaʻole *(Atyoida bisulcata)* were observed in Puohokamoa Stream. During the more recent surveys, ʻoʻopu alamoʻo was observed in the middle reach below the diversions. Puohokamoa Stream rates in the middle in comparison to other watersheds in Maui and statewide. DAR assigns Puohokamoa a total watershed rating of 8 out of 10, a total biological rating of 5 out of 10, and a combined overall rating of 5 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis* and *Lentipes concolor*
Crustaceans — *Atyoida bisulcata*
Insects — *Anaxjunius, Anax* sp, *Megalagrion* sp., and *Telmatogen* sp.

(Puohokamoa IFSAR § 4.2, p. 42 and § 4.4, p. 46; DAR Report on Puohokamoa Stream, Maui, Hawai ʻi, October 2009, p. 6.)

186. The estimated natural (undiverted) median baseflow of Puohokamoa Stream is 8.40 cfs (5.43 mgd). The amount of flow in Puohokamoa Stream needed to achieve Hgo is 5.40 cfs (3.49 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

187. The recreational resources of Puohokamoa Stream were classified as "substantial" by the Hawaii Stream Assessment regional recreational committee. The Hawaii Stream Assessment identified opportunities for hunting, swimming, and scenic views related to

Puohokamoa. Of the three, only swimming was considered to be a high-quality experience. There is a hunting area of approximately 1.8 square miles or 56% of the Puohokamoa hydrologic unit, and it lies within the lower half of the hydrologic unit. (Puohokamoa IFSAR § 5.0, p. 54.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

188. Riparian resources of Puohokamoa Stream were classified as “substantial” by the Hawaii Stream Assessment. About 56% of Puohokamoa unit lies within the Koʻolau Forest Reserve, and less than 1% within the Waikamoi Preserve. Approximately 76% of Puohokamoa is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. Based on current designations, the Puohokamoa hydrologic unit contains critical habitat areas for five plant species: *Brighamia rochii* (Pua'ala), *Cyanea hamatiflora ssp. hamatiflora, Cyanea mceldowneyi, Diplazium molokaiense, Phyllostegia mannii.* The density of threatened and endangered plant species is high at elevations above 1,300 feet, while the rest of the unit, roughly 14%, has a low concentration of threatened and endangered plant species at lower elevations. (Puohokamoa IFSAR § 6.0, pp. 58-60.)

iv. Aesthetic values

189. Puohokamoa Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of Puohokamoa Stream is predominately alien forests that lie within the Koʻolau Forest Reserve. A number of waterfalls are located along the middle and lower reaches of the stream, most of which are followed by a plunge pool. Among the many waterfalls is Puohokamoa Falls that is about 20-foot high and it can be seen from Hana Highway.

Keopuka Rock, a State seabird sanctuary, can be seen from the shoreline of the hydrologic unit. (Puohokamoa IFSAR § 7.0, p. 66.)

v. Navigation

190. No navigation values are present. (Puohokamoa IFSAR § 8.0, p. 68.)

vi. Instream hydropower generation

191. No instream hydropower generation values are present. (Puohokamoa IFSAR § 9.0, p. 69.)

vii. Maintenance of water quality

192. Puohokamoa Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Puohokamoa, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of water quality standards or the applicable designated uses. Puohokamoa Stream is classified as Class lb inland waters from its headwaters to approximately 1,200 feet elevation, as the surrounding land is in the conservation subzone "protective." From there down to about 700 feet elevation, Puohokamoa Stream is classified as Class la inland waters because the stream lies in the Ko'olau Forest Reserve. From there to the sea, it is classified as Class 2 inland waters. Marine waters at the mouth of the Puohokamoa hydrologic unit are Class AA waters. (Puohokamoa IFSAR § 10.0, p. 74.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

193. Other than EMI's and MDWS' diversions, no diversions divert water from Puohokamoa Stream for domestic or irrigation purposes. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the Puohokamoa hydrologic unit. (Puohokamoa IFSAR § 11.0, p. 76.)

ix. Protection of traditional and customary Hawaiian rights

194. According to the 1990 Hawaiii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the Puohokamoa hydrologic unit. (Puohokamoa IFSAR § 12.0, p. 91)

f. Kuleana users

195. CWRM records for the hydrologic unit of Puohokamoa indicate that there are a total of eight registered diversions (all EMI or MDWS). None of the diversions were declared for taro cultivation or other domestic purposes. Puohokamoa currently does not have any active taro diversions. (Puohokamoa IFSAR § 12.0, p. 93; Exh. C-90, p. 21.)

5. Haʻipuaʻena (6049)

a. Physical features

196. The hydrologic unit of Haʻipuaʻena is located north of Haleakala, and it covers an area of 1.6 square miles from the intermediate slopes of Haleakala at 6, l00 feet elevation to the sea. (Haʻipuaʻena IFSAR § 1.1, p. 1.)

197. Haʻipuaʻena Stream is 7.7 miles in length, traversing north from its headwaters near 5, l00 feet elevation to the altitude. (Haʻipuaʻena IFSAR § 1.13, p. 1.)

198. Haipuena Stream appears to be mostly a gaining stream, except a losing reach above the Spreckels Ditch and a dry reach downstream from the Manuel Luis Ditch. When flow is abundant, Haʻipuaʻena Stream terminates as a waterfall, allowing only ʻōpae and ʻoʻopu alamoʻo to migrate upstream. (Exh. C-90, p. 21; Haʻipuaʻena IFSAR § 4.3, p. 43.)

b. Diversions

199. EMI operates diversions on Ha'ipua'ena Stream at the Upper Kula Pipeline, Lower Kula Pipeline, Spreckels Ditch, Manuel Luis Ditch, and Ko'olau Ditch. (Ha'ipua'ena IFSAR § 13.1 at 96-101, Table 13-1; Exh. C-33.)

c. Gaging stations

200. Four inactive USGS continuous-record gaging stations are in the hydrologic unit of Ha'ipua'ena. (Ha'ipua'ena IFSAR § 3.3, p. 27.)

d. Streamflow values

201. According to USGS, the natural median baseflow at the upper reach of Ha'ipua'ena Stream immediately downstream of Spreckels Ditch is 3.60 cfs (1.94 mgd); at the middle-upper reach immediately downstream of the Manuel Luis Ditch it is 4.30 cfs (2.31 mgd); at the middle-lower reach it is 4.90 cfs (2.64 mgd); and at the lower reach it is 5.50 cfs (2.96 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 61 (Table 11) and p. 66 (Table 12).)

202. Near the coast, Ha'ipua'ena Stream loses water and retains approximately 50% of the expected habitat availability. (Ha'ipua'ena IFSAR § 4.3, p. 43.)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

203. The Hawaii Stream Assessment classifies the aquatic resources of Ha'ipua'ena as "limited," meaning very little native species were present. The presence of a terminal waterfall has restricted most of the native species that lack climbing ability from inhabiting the stream. Only the native 'o'opu alamo'o *(Lentipes concolor),* 'o'opu nākea *(Awaous guamensis),* and 'ōpae kala'ole *(Atyoida bisulcata)* were observed in Ha'ipua'ena Stream. Ha'ipua'ena Stream

rates in the middle in comparison to other watersheds in Maui and statewide. DAR assigns Haʻipuaʻena a total watershed rating of 8 out of 10, a total biological rating of 5 out of 10, and a combined overall rating of 6 out of 10. Native species observed in the stream include:

> Fish — *Awaous guamensis* and *Lentipes concolor*
> Crustaceans — *Atyoida bisulcata*
> Insects — *Megalagrion blackburni, Megalagrion calliphya, Megalagrion hawaiiense, Megalagrion pacificum, Megalagrion* sp., and *Telmatogen* sp.

(Haʻipuaʻena IFSAR § 4.4, pp. 41, 45; DAR Report on Haʻipuaʻena Stream, Maui, Hawaiʻi, October 2009, p. 6.).

204. The estimated natural (undiverted) median baseflow of Haʻipuaʻena Stream is 4.30 cfs (2.78 mgd). The amount of flow in Haʻipuaʻena Stream needed to achieve H_{90} is 2.80 cfs (1.81 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

205. The recreational resources of Haʻipuaʻena Stream were classified as "moderate" by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for hunting, swimming, and scenic views related to Haʻipuaʻena. Of the three, none was considered to be a high-quality experience. (Haʻipuaʻena IFSAR § 5.0, p. 53.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

206. Riparian resources of Haʻipuaʻena Stream were not classified by the Hawaii Stream Assessment. In Haʻipuaʻena, about 53% of the unit lies within the Koʻolau Forest Reserve, and about 6% within the Waikamoi Preserve. Approximately 58% of Haʻipuaʻena is classified as non-tidal palustrine wetlands occuring in the upper slopes of the hydrologic unit. (Haʻipuaʻena IFSAR § 6.0, pp. 57-59.)

iv. Aesthetic values

207. Ha‘ipua‘ena Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of Ha‘ipua‘ena Stream is predominately alien forests that lie within the Ko‘olau Forest Reserve. Of the three waterfalls located along Ha‘ipua‘ena Stream, two are located in the middle reach and one is located in the lower reach that can be seen from Hana Highway. Keopuka Rock, a State seabird sanctuary, can be seen from the shoreline of the hydrologic unit. (Ha‘ipua‘ena IFSAR § 7.0, p. 65.)

v. Navigation

208. There are no navigation values present. (Ha‘ipua‘ena IFSAR § 8.0, p. 67.)

vi. Instream hydropower generation

209. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Ha‘ipua‘ena Stream. (Ha‘ipua‘ena IFSAR § 9.0, p. 68.)

vii. Maintenance of water quality

210. Ha‘ipua‘ena Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Ha‘ipua‘ena Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of water quality standards or the applicable designated uses. Ha‘ipua‘ena Stream is classified as Class lb inland waters from its headwaters to approximately 1,200 feet elevation, as the surrounding land is in the conservation subzone “protective.” From there down to about 700 feet elevation, Ha‘ipua‘ena Stream is classified as Class la inland waters because the stream lies in the Ko‘olau Forest Reserve. From there to the sea, it is classified as Class 2 inland waters.

Marine waters at the mouth of the Haʻipuaʻena hydrologic unit are Class AA waters. (Haʻipuaʻena IFSAR § 10.0, pp. 72-74.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

211. The State Division of State Parks registered a diversion for the purpose of providing non-potable waer to the comfort station at the Kaumahina State Wayside. Approximately 5,000 to 8,000 gpd of water is diverted via a 2-in. pipe to a 10,000 gallon holding tank. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the Haipueena hydrologic unit. (Haʻipuaʻena IFSAR § 11.0, p. 75.)

ix. Protection of traditional and customary Hawaiian rights

212. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the Puohokamoa hydrologic unit. (Haʻipuaʻena IFSAR § 12.0, p. 92.)

f. Kuleana users

213. CWRM records for the hydrologic unit of Haipuaʻena indicate that there are a total of five registered diversions (four EMI or MDWS, one by Hawaii Divisions of State Parks for non-potable use at its comfort station in Kaumahina State Wayside). None of the diversions were declared for taro cultivation or other domestic purposes. (Haipueena IFSAR § 12.0, p. 86.)

6. Punalau (6050)

a. Physical features

214. The hydrologic unit of Punalau is located north of Haleakala, and it covers an area of 1.2 square miles from the lower slopes of Haleakala at 2,558 feet elevation to the sea. (Punalau IFSAR § 1.1, p. 1.)

215. The hydrologic unit contains Punalau Stream and Kōlea Stream. (Punalau IFSAR § 3.3, p. 27.)

216. Punalau Stream runs 3 miles in length, traversing northeast from its headwater tributary Kōlea Stream at 2,050 feet elevation to the ocean. The 0.3 mile reach of Punalau Stream below the Manual Luis Ditch gains groundwater flow. (Punalau IFSAR § 3.3, p. 27.)

b. Diversions

217. Kōlea Stream is diverted by the Spreckels Ditch and the Koolau/Wailoa Ditch. The main Punalau Stream is diverted by the Manuel Lui Ditch. (Punalau IFSAR § 3.3, p. 28.)

c. Gaging stations

218. Two inactive USGS gaging stations were located in the hydrologic unit of Punalau. Both gages are ditch gages that measure flow in the ditch and do not measure flow in the stream.

A. Station 16529000 was located at Spreckels Ditch on tributary Kōlea Stream. (Punalau IFSAR § 3.3, p. 28.)

B. Station 16535000 is located at about 1,880 feet elevation, where water was diverted from Ha‘ipua‘ena Stream into tributary Kōlea Stream from 1938 to 1960 to generate electricity. (Punalau IFSAR § 3.3, p. 28.)

d. Streamflow values

219. According to USGS, the natural median baseflow at the middle reach of Punalau Stream is 3.90 cfs (2.10 mgd); at the lower reach it is 4.50 cfs (2.42 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 61 (Table 11) and p. 66 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

220. For Punalau Stream, the Hawaii Stream Assessment classifies the aquatic resources as "limited," meaning very little or no native species were present. Only the native ʻoʻopu nakea *(Awaous guamensis)* and ʻoʻopu nōpili *(Sicyopterus stimpsoni)* were observed in Punalau Stream. While no native species were observed during the more recent surveys, the ʻoʻopu nakea were seen in the upper and lower reaches and the ʻoʻopu nōpili were seen in the middle reach of the stream in earlier surveys. Introduced species such as river prawns *(Macrobrachium lar)* were observed in the lower reach. Punalau Stream rates average in comparison to other watersheds in Maui and statewide. DAR assigns Punalau a total watershed rating of 7 out of 10, a total biological rating of 5 out DAR assigns Haʻipuaʻena a total watershed rating of 5 out of 10, a total biological rating of 5 out of 10, and a combined overall rating of 5 out of 10. Native species observed in the stream include:

> Fish — *Awaous guamensis* and *Sicyopterus stimpsoni*
> Insects — *Megalagrion blackburni, M. hawaiiense* and *M. pacificum*

(Punalau IFSAR § 4.2, pp. 37, 41; DAR Report on Punalau Stream, Maui, Hawaiʻi, October 2009, pp. 5-6.).

221. The estimated natural (undiverted) median baseflow of Punalau Stream is 3.90 cfs (2.52 mgd). The amount of flow in Punalau Stream needed to achieve H_{90} is 2.50 cfs (1.62 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

222. The recreational resources of Punalau Stream were classified as "limited" by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment did not identify any recreational opportunities. (Punalau IFSAR § 5.0, p. 47.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

223. Riparian resources of Punalau Stream were not classified by the Hawaii Stream Assessment. Nearly 92% of the Punalau hydrologic unit lies within the Koʻolau Forest Reserve, and about 1% within the Kaumahina State Wayside. Approximately 47% of Punalau is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. (Punalau IFSAR § 6.0, p. 54.)

iv. Aesthetic values

224. Punalau Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper slopes. In the intermediate and lower slopes, vegetation surrounding the stream is mostly alien forests. Almost the entire hydrologic unit of Punalau lies within the Koʻolau Forest Reserve, with the exception of the shoreline. Punalau Falls is located near Hana Highway, and it is publicly accessible. Punalau Stream empties into Honomanū Bay, where a number of coastal activities are enjoyed by the public in addition to being a popular surf spot. Located at the west end of the hydrologic unit is Kaumahina State Wayside, which offers great views of the northeast Maui coastline and the Keʻanae Peninsula. (Punalau IFSAR § 7.0, p. 59.)

v. Navigation

225. No navigation values are present. (Punalau IFSAR § 8.0, p. 61.)

vi. Instream hydropower generation

226. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources included Punalau Stream and tributary Kōlea Stream. (Punalau IFSAR § 9.0, p. 62.)

vii. Maintenance of water quality

227. Punalau Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Punalau Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of State of Hawaii Water Quality Standards or the applicable designated uses. Punalau Stream is classified as Class lb inland waters from its headwaters to approximately 1,200 feet elevation, as the surrounding land is in the conservation subzone "protective", and it is part of the Koʻolau Forest Reserve. From there down to about 300 feet elevation, Punalau Stream is classified as Class 1a inland waters because the stream lies in the Koʻolau Forest Reserve. From there to the sea, it is classified as Class 2 inland waters. Marine waters at the mouth of the Punalau hydrologic unit are Class AA waters. (Punalau IFSAR § 10.0, pp. 65-66, 74.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

228. There are a total of three registered diversions. All three registered diversions are owned by EMI for transport of water outside the hydrologic unit. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the Punalau hydrologic unit. (Punalau IFSAR § 11.0, p. 67.)

ix. Protection of traditional and customary Hawaiian rights

229. According to the 1990 Hawaiʻi Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the Punalau hydrologic unit. (Punalau IFSAR § 12.0, p. 86.)

f. Kuleana users

230. None of the registered diversions were declared for taro cultivation or other domestic purposes. (Punalau IFSAR § 12.0, p. 86.)

7. Honomanū (6051)

a. Physical features

231. The hydrologic unit of Honomanū covers an area of 5.6 square miles from the upper slopes of Haleakala at about 8,700 feet elevation to the sea. (Honomanū IFSAR § 1.1, p. 1.)

232. Honomanū Stream is 8.7 miles in length, traversing northeast from its headwaters at about 8,700 feet elevation. (Honomanū IFSAR § 1.1, p. 1.)

233. Honomanū Stream appears to be a gaining stream from the Spreckels Ditch and a losing stream downstream from the ditch. Near the coast are two springs that contribute to streamflow into the estuary. (Exh. C-90, p. 25; Honomanū IFSAR § 3.3, p. 31.)

b. Diversions

234. EMI operates diversions on Honomanū Stream at Spreckels Ditch, Lower Kula Pipeline, and Center Ditch. (Honomanū IFSAR § 13.1, pp. 100-110, Figure 13-1; Exh. C-33.)

c. Gaging stations

235. Four inactive USGS stream gaging stations are located in the hydrologic unit of Honomanū, two of which are long-term continuous-record gaging stations. (Honomanū IFSAR at § 3.3, p. 28.)

d. Streamflow values

236. According to USGS, the natural median baseflow at the upper reach of Honomanū directly downstream of the Spreckels Ditch is 2.80 cfs (1.81 mgd); at the middle

reach it is 6.70 cfs (3.61 mgd); and at the lower reach it is 9.00 cfs (4.84 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 61 (Table 11) and p. 65 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

237. For Honomanū Stream, the Hawaii Stream Assessment classifies the aquatic resources as limited, meaning very little native species were present. While the available instream habitats were limited, a number of native stream animals were observed in Honomanū Stream, including ʻoʻopu nākea *(Awaous guamensis),* ʻoʻopu akupa *(Eleotris sandwicensis),* ʻoʻopu alamoʻo *(Lentipes concolor),* ʻōpae kalaʻole *(Atyoida bisulcata),* hīhīwai *(Neritina granosa),* and hapawai *(Neritina vespertina).* During the more recent surveys, both freshwater snail species and the ʻoʻopu akupa were observed near the stream mouth and the ʻoʻopu nākea were seen in the lower and middle reaches (below diversions). The ʻoʻopu alamoʻo and ʻōpae kalaʻole were observed in the upper reach (above diversions); although the ʻōpae kalaʻole had been seen in the headwaters during earlier surveys. Cast net sampling of the estuary at Honomanū resulted in catches of endemic aholehole *(Kuhlia xenura),* Iao *(Atherinomorus insularum),* Kanda mullet *(Valamugil engeli),* and indigenous amaama *(Mugil cephalus).* Honomanū Stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns Honomanū a total watershed rating of 8 out of 10, a total biological rating of 7 out of 10, and a combined overall rating of 8 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis, Kuhlia xenura, Lentipes concolor,* and *Mugil cephalus*
Crustaceans — *Atyoida bisulcata*
Insects — *Anax junius, Anax* sp., *Megalagrion hawaiiense, Megalagrion* sp., and *Telmatogen* sp.
Snails — *Neritina vespertina* and *Neritina granosa*

(Honomanū IFSAR §§ 4.2, p. 42 and § 4.4, pp. 47, 48; Exh. C-143, p. 6.)

238. In the dry reaches, it is estimated that restoring 50 percent of the natural base flow would produce at least 90 percent of the expected natural habitat. The estimated natural (undiverted) median baseflow of Honomanū Stream is 2.80 cfs (1.81 mgd). The amount of flow in Honomanū Stream needed to achieve H_{90} is 1.80 cfs (1.16 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

239. The recreational resources of Honomanū Stream were classified as "outstanding" by the Hawaii Stream Assessment's regional recreational committee. The HAS identified opportunities for camping, hiking, fishing, hunting, swimming, and scenic views related to Honomanū Stream. Of the six, only scenic views were considered to be a high-quality experience. (Honomanū IFSAR § 5.0, p. 56.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

240. Riparian resources of Honomanū Stream were classified as "outstanding" by the Hawaii Stream Assessment. About 45% of the hydrologic unit of Honomanū lies within the Koʻolau Forest Reserve, 17% in the Waikamoi Preserve, and about 4% within the Haleakala National Park. Approximately 59% of Honomanū is classified as non-tidal palustrine wetland wetlands occurring in the upper slopes of the hydrologic unit. (Honomanū IFSAR § 6.0, pp. 60-62.)

iv. Aesthetic values

241. The headwaters of Honomanū Stream originate in Haleakala National Park where vegetation is predominately native shrub lands with sparse alien grasses. In the intermediate

slopes of the hydrologic unit, Honomanū Stream flows through native communities of Ohia forests and Uluhe shrub lands that lie within the Waikamoi Preserve and Koʻolau Forest Reserve. The lower elevations are mostly alien forests of the Koʻolau Forest Reserve. A number of waterfalls and plunge pools are located along the middle reach of Honomanfi Stream, which provide great scenic spots for the public. The stream empties into Honomanū Bay, where a number of coastal activities are enjoyed by the public in addition to being a popular surf spot. (Honomanū IFSAR § 7.0, p. 69.)

v. Navigation

242. No navigation values are present. (Honomanū IFSAR § 8.0, p. 71.)

vi. Instream hydropower generation

243. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Honomanū and its tributaries. (Honomanū IFSAR § 9.0, p. 72.)

vii. Maintenance of water quality

244. Honomanū Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Honomanū Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of water quality standards or the applicable designated uses. Honomanū Stream is classified as Class la inland waters from its headwaters to the 6,200 feet elevation, and from 1,700 feet to 100 feet elevation as parts of the stream lie in the Waikamoi Preserve (upper reaches) and the Koʻolau Forest Reserve (lower reaches). Between the 6,200 feet and 1,700 feet altitudes, the stream is classified as Class lb inland waters because the surrounding land is in the conservation subzone "protective." The stream reach near the ocean is classified as Class 2 inland waters. Marine

waters at the mouth of the hydrologic unit of Honomana are Class AA waters. (Honomanū IFSAR § 10.0, pp. 76-78.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

245. There 8 registered diversions in Honomanū, of which five are EMI diversions and one was registered by both EMI and MDWS. The two remaining diversions were registered by Haleakala Ranch for the primary purpose of watering livestock (6,000 to 7,000 heads of cattle) with occasional use for domestic purposes at two cabins on the property. (Honomanū IFSAR § 11.0, p. 80.)

ix. Protection of traditional and customary Hawaiian rights

246. According to the 1990 Hawai‘i Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the Honomanū hydrologic unit. (Honomanū IFSAR § 12.0, p. 97.)

f. Kuleana users

247. CWRM records for the hydrologic unit of Honomanū indicate that there are a total of 8 registered diversions. None of the diversions were declared for taro cultivation. (Honomanū IFSAR § 12.0, p. 91.)

8. Nua‘ailua (6052)

a. Physical features

248. The hydrologic unit of Nua‘ailua covers an area of 1.6 square miles from the lower slopes of Haleakala at 2,400 feet elevation to the sea. (Nua‘ailua IFSAR § 1.1, p. 1.)

249. Nua‘ailua Stream is 3.2 miles in length, traversing north from its headwaters near the 2,250 feet altitude to the ocean. (Nua‘ailua IFSAR § 1.1, p. 1.)

b. Diversions

250. EMI operates diversions on Nuaʻailua Stream at Spreckels Ditch. (Nuaʻailua IFSAR § 13.1, pp. 95-96, Table 13-2; Exh. C-33.)

c. Gaging stations

251. There are no stream gaging stations within the hydrologic unit. (Nuaʻailua IFSAR § 3.3, p. 29.)

d. Streamflow values

252. According to USGS, the natural median baseflow at the upper reach of Nuaʻailua Stream directly downstream of the Spreckels Ditch is 0.28 cfs (0.18 mgd); at the middle reach it is 2.50 cfs (1.35 mgd); and at the lower reach it is 7.40 cfs (3.98 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 61 (Table 11) and p. 65 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

253. For Nuaʻailua Stream, the Hawaii Stream Assessment classifies the aquatic resources as "limited", meaning very little native species were present. While the available instream habitats were limited, a number of native stream animals were observed in Nuaʻailua Stream, including: ʻoʻopu nākea *(Awaous guamensis),* ʻoʻopu nōpili *(Sicyopterus stimpsoni),* ʻoʻopu akupa *(Eleotris sandwicensis),* ʻoʻopu alamoʻo *(Lentipes concolor),* ʻōpae kalaʻole *(Atyoida bisulcata),* hīhīwai *(Neritina granosa),* and hapawai *(Neritina vespertina).* During the more recent surveys, almost all these stream animals were observed in the lower and middle reaches (below diversions). The 'ōpae kalaʻole had been seen in the upper reach during earlier surveys. Cast net sampling of the stream mouth at Nuaʻailua resulted in catches of the endemic Hawaiian surf fish *(Iso hawaiiensis)* and aholehole *(Kuhlia xenura).* Although no flow was

observed from the stream to the small coastal embayment, diverted base flow in Nuaʻailua is about 90 percent of the natural base flow conditions, which would provide close to 100 percent of the natural habitat for all species. Nuaʻailua Stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns Nuaʻailua a total watershed rating of 7 out of 10, a total biological rating of 7 out of 10, and a combined overall rating of 8 out of 10. Native species observed in the stream include:

> Fish — *Awaous guamensis, Eleotris sandwicensis, Gobiid sp. Kuhlia xenura, Lentipes concolor,* and *Sicyopterus stimpsoni*
> Crustaceans —*Atyoida bisulcata*
> Insects —*Anaxjunius, Anax* sp., and *Megalagrion* sp.
> Mollusks — *Neritina vespertina* and *Neritina granosa*

(Nuaʻailua IFSAR §§ 4.2, p. 39 and § 4.4, p. 43; Exh. C-146, p. 5.)

254. The estimated natural (undiverted) median baseflow of Nuaʻailua Stream is 0.28 cfs (0.18 mgd). The amount of flow in Nuaʻailua Stream needed to achieve Hgo is 0.18 cfs (0.12 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

255. The recreational resources of Nuaʻailua Stream were classified as "substantial" by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for hiking, fishing, and scenic views related to Nuaʻailua Stream. Of the three, only fishing was considered to be a high-quality experience. (Nuaʻailua IFSAR § 5.0, p. 50.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

256. Riparian resources of Nuaʻailua Stream were not classified by the Hawaii Stream Assessment. In Nuaʻailua, nearly 90% of the unit lies within the Koʻolau Forest Reserve.

Approximately 42% of Nua‘ailua is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. (Nua‘ailua IFSAR § 6.0, pp. 54-55.)

iv. Aesthetic values

257. Nua‘ailua Stream is fed by lush native communities of Ohia forests that dominate the upper slopes. In the intermediate and lower slopes, vegetation surrounding the stream is mostly alien forests. Almost the entire hydrologic unit of Nua‘ailua lies within the Ko‘olau Forest Reserve, with the exception of the shoreline. Two waterfalls are located in the upper reaches of Nua‘ailua Stream, which are not visible from Hana Highway but do provide great scenic spots for the occasional adventurer. The stream empties into Nua‘ailua Bay, where a number of coastal activities are enjoyed by the locals as well as the public. Located in the west end of the hydrologic unit is Kapapa Point and the east end is Ke‘anae Point, both of which offer views of Nua‘ailua Bay and the islet Mokuholua. (Nua‘ailua IFSAR § 7.0, p. 62.)

v. Navigation

258. No navigation values are present. (Nua‘ailua IFSAR § 8.0, p. 64.)

vi. Instream hydropower generation

259. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Nua‘ailua Stream. (Nua‘ailua IFSAR § 9.0, p. 65.)

vii. Maintenance of water quality

260. Nua‘ailua Stream does not appear on the 2006 List of Impaired Waters in Hawai‘i, Clean Water Act § 303(d). While some data exist for Nua‘ailua Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of water quality standards or the applicable designated uses. Nua‘ailua Stream is classified as

Class lb inland waters from its headwaters to approximately 1,600 feet elevation, as the surrounding land is in the conservation subzone “protective.” From there down to the sea, Nuaʻailua Stream is classified as Class 2 inland waters. Marine waters at the mouth of the Nuaʻailua hydrologic unit are Class AA waters. (Nuaʻailua IFSAR § 10.0, pp. 69-70.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

261. Two diversions divert water for domestic or irrigation purposes (one for EMI, and the other for Maui Family YMCA for the purpose of irrigating taro and flowers; however, this diversion is inactive). The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the Nuaʻailua hydrologic unit. (Nuaʻailua IFSAR § 11.0, p. 72.)

ix. Protection of traditional and customary Hawaiian rights

262. According to the 1990 Hawaiʻi Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the Nuaʻailua hydrologic unit. (Nuaʻailua IFSAR § 12.0, p. 90.)

f. Kuleana users

263. CWRM records for the hydrologic unit of Nuaʻailua indicate that there are no diversions declared for taro cultivation or other domestic purposes. (Nuaʻailua IFSAR § 12.0, p. 84.)

9. Piʻinaʻau (6053)

a. Physical features

264. The hydrologic unit of Piʻinaʻau is located on the northeast slope of Haleakala. It covers an area of 22 square miles from the summit of Haleakala at 10,000 feet to the sea. (Piʻinaʻau IFSAR § 1.0, p. 1.)

265. Piʻinaʻau Stream is 13.1 miles in length, traversing in a northeasterly direction from its headwaters originating in the Waikamoi Preserve to Waialohe Pond before entering the ocean. A tributary to Piʻinaʻau Stream is Palauhulu Stream, which is 4.8 miles in length. Palauhulu Stream is itself fed by Hauoli Wahine Gulch and Kano Stream. It is fed perennially by the Koʻolau Forest Reserve and flows through Keahu Falls, Waiokuna Falls, and the Waiokuna Pond before joining with Piʻinaʻau Stream. (Piʻinaʻau IFSAR § 1.0, p. 1 and § 3.0, p. 29.)

b. Diversions

266. EMI diverts the Piʻinaʻau and Palauhulu Streams at the Koʻolau Ditch. (Piʻinaʻau IFSAR § 13.0, p. 97; Exh. C-33.)

c. Gaging stations

267. There is an inactive USGS gaging station at the Koʻolau Ditch near Piʻinaʻau Stream, Station 16523000. There is an inactive USGS continuous-record gaging stations on Palauhulu Stream upstream of the confluence with Piʻinaʻau Stream, Station 16522000. (Piʻinaʻau IFSAR § 13.0, pp. 112, 113.)

d. Streamflow values

268. USGS did not make estimates of flow-duration statistics for natural (undiverted) streamflow for Piʻinaʻau Stream because no flow data was available and the regression equations were not applicable to this intermittent stream. Furthermore, all three of the basin characteristics that were used in the regression equations fall outside the range of values used to develop the equations, thus rendering any estimate unreliable. Actual measurements for this stream are unavailable due to the complex geomorphology of the area and a major landslide in 2001. (USGS Regression Study, p. 58, 63; Gingerich, WDT 10/31/14, Table attached thereto, p. 2; Exh. C-85, p. 30.)

269. Palauhulu Stream loses water in its middle reach. The average flow of Plunkett Spring at the middle reach below Koʻolau Ditch is 2.7 cfs, but the stream goes dry above Store Spring due to infiltration losses, so the effects of natural flow addition are unknown. (Piʻinaʻau IFSAR, §3.0, p. 32 (Table 3-1); Exh. C-85, p. 30.)

270. According to USGS, the natural median baseflow at Hauoli Wahine Stream, the western tributary of Palauhulu Stream, before the Koʻolau Ditch (station HWU), is 0.93 cfs (0.50 mgd). At Kano Stream, the eastern tributary of Palauhulu Stream, before the Koʻolau Ditch (station KoU), the natural median baseflow is 2.50 cfs (1.35 mgd). At the middle reach of Palauhulu Stream, below Plunkett Spring and above Store Spring (station PhM), the natural median baseflow is 9.30 cfs (15.77 mgd). At the lower reach, below Store Spring (station 5220), the natural median baseflow is 11.00 cfs (5.92 mgd). (Exh. C-85, p. 36; USGS Regression Study, p. 61 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

271. For Piʻinaʻau Stream, the Hawaii Stream Assessment classifies the aquatic resources as outstanding. Piʻinaʻau was noted for the presence of ʻoʻopu alamoʻo *(L. concolor),* ʻoʻopu nākea (A. *stamineus),* ʻoʻopu nōpili *(S. stimpsoni),* and hīhīwai *(N. granosa),* along with one other species from its defined Native Species Group Two. Piʻinaʻau Stream and Palauhulu Streams feed Waialohe Pond, which provides habitat for estuarine animals. The size of the watershed and the diversity of native stream animals present makes Piʻinaʻau Stream rate high in comparison to other watersheds in Maui and statewide. DAR assigns Piʻinaʻau a total watershed rating of 8 out of 10, a total biological rating of 8 out of 10, and a combined overall rating of 9 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis, Kuhlia sp. Lentipes concolor, Sicyopterus stimpsoni,* and *Stenogobius hawaiiensis*
Crustaceans –*Atyoida bisulcata* and *Macrobrachium grandimanus*
Mollusks – *Ferrissia sharpi, Neritina vespertina* and *Neritina granosa*

(Pi'ina'au IFSAR § 4.0, p. 36; Exh. C-142, pp. 1-2.)

272. The estimated natural (undiverted) median baseflow of Palauhulu Stream is 3.40 cfs (2.20 mgd). The amount of flow in Palauhulu Stream needed to achieve H_{90} is 2.20 cfs (1.42 mgd). The estimated natural (undiverted) median baseflow of Pi'ina'au Stream is unknown, and therefore, the amount of flow in the stream needed to achieve H_{90} is also unknown. (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

273. The recreational resources of Pi'ina'au Stream were classified as outstanding by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for hiking, fishing, swimming, hunting, nature study, and scenic views related to Pi'ina'au Stream. Of the six, five were considered to be high-quality experiences. CWRM identified the following activities known to occur or observed at or near Pi'ina'au: pole and line fishing, spear fishing, throw netting, opihi picking, gill netting, and some specialized fisheries. (Pi'ina'au IFSAR § 5.0, p. 43.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

274. Riparian resources of Piina'au Stream were classified as outstanding by the Hawaii Stream Assessment. In Pi'ina'au, there are three large management areas—Haleakala National park, Ko'olau Forest Preserve, and Waikamoi Preserve—which comprise over 85% of the hydrologic unit. Nearly 34% of Pi'ina'au is classified as seasonal, non-tidal palustrine wetlands occurring in the headwaters of the hydrologic unit. (Pi'ina'au IFSAR § 6.0, pp. 48, 50.)

iv. Aesthetic values

275. The headwaters of Pi‘ina‘au Stream originate in the lush tropical forests of the Waikamoi Preserve. Along with its tributary Palauhulu Stream, the waters flow northeasterly through miles of evergreen forests, most of which is part of the Ko‘olau Forest Reserve. The streams are bordered by the steep sides of the Ke‘anae Valley walls, altogether creating a picturesque view. A number of waterfalls are located along the streams, one on Pi‘ina‘au and ten on Palauhulu, most of which are immediately followed by a plunge pool. Waiokuna and Keaku Falls are among the waterfalls located in the more accessible lower reaches of Palauhulu Stream. A diverse collection of the native plants found in the Ke‘anae Arboretum can be viewed in the lower reaches of Pi‘ina‘au Stream. Pi‘ina‘au and its tributary join near the coast and empty into the waters surrounding Ke‘anae Peninsula. (Piina'au IFSAR § 7.0, p. 55.)

v. Navigation

276. No navigation values are present. (Pi‘ina‘au IFSAR § 8.0, p. 57.)

vi. Instream hydropower generation

277. No instream hydropower generation occurs on Pi‘ina‘au Stream. (Pi‘ina‘au IFSAR § 9.0, p. 58.)

vii. Maintenance of water quality

278. Pi‘ina‘au Stream and Palauhulu Stream do not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Pi‘ina‘au Stream (and its “entire network”), there were not sufficient data for decision-making. Pi‘ina‘au Stream is classified as Class 2 from the coast to approximately 1,550 feet elevation. Palauhulu Stream is Class 2 from the coast to approximately 960 feet elevation. Above those elevations,

both streams are Class 1. Marine waters at the mouth of the hydrologic unit of the entire Pi‘ina‘au hydrologic unit are Class AA waters. (Pi‘ina‘au IFSAR § 10.0, p. 60.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

279. There are a total of 14 registered diversions, of which 8 are non-EMI. Of the 8, four were declared for domestic, in part, with a total of five service connections. All 8 diversions are also utilized for irrigation of various crops and livestock, including the cultivation of taro. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the Pi‘ina‘au hydrologic unit. (Pi‘ina‘au IFSAR § 11.0, p. 62.)

ix. Protection of traditional and customary Hawaiian rights

280. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* the Waialohe fishponds still exists at the mouth of Pi‘ina‘au Stream. (Pi‘ina‘au IFSAR § 12.0, p. 74.)

f. Kuleana users

281. CWRM records for the hydrologic unit of Pi‘ina‘au indicate that there are a total of 14 registered diversions. Six of the diversions were declared for taro cultivation or other domestic purposes. (Pi‘ina‘au IFSAR § 12.0, p. 72.)

282. In Table No. 1 at page 10 of Nā Moku's Opening Brief, Nā Moku claims 29.695 acres of cultivable area in Ke‘anae and a total estimated water need for taro (in addition to 64% base flow) of 2.97 - 8.91 mgd. This is said to be based on the Nā Moku TMK Spreadsheet and Exhibit A-140, which is a tax map with highlighted areas referencing certain parcels in Ke‘anae.

283. The 29.695 acre estimate of cultivable area is the simple sum of the aggregate acreages for all the TMK parcels listed on A-137 from the 1-1-03 plat. No testimony or other

information has been offered to quantify what percentage of each of these parcels actually contain lo‘i as opposed to being house lots, constituting open space or being in other uses.

284. Palauhulu Stream is the sole water source for the taro cultivated in Ke‘anae. There are a few lo‘i in the Ke‘anae Arboretum on land owned by the State of Hawaii that are irrigated directly from Pi‘ina‘au Stream above the elevation of the flume intake on Palauhulu Stream that serves Ke‘anae. No person has come forward to assert a claim in this proceeding of appurtenant rights to use water from Pi‘ina‘au Stream. (Hew, WDT 1/27/15, at 129.)

285. Exhibit C-108 is a copy of an excerpt from a report published by the USGS in 2007 of a study conducted in 2006 entitled, "Water Use in Wetland Kalo Cultivation in Hawaii." Ke‘anae was one of the loi complexes studied on Maui. As shown on in Figure 35 on page 57 of that report (the *“USGS 2007 Taro Water Report”),* the entire Ke‘anae complex was 10.53 acres when studied.

286. Exhibits C-109 and 110 are copies of aerial photographs taken of Ke‘anae on January 5, 2015. The configuration of the loi shown in these recent photographs is very similar to the schematic of the entire 10.53 acre Ke‘anae lo‘i system contained in Figure 35 of the USGS 2007 Taro Water Report.

287. Application of the 130,000 to 150,000 gad irrigation requirement for taro from the Nā Wai ‘Ehā case to the 10.53 acre Ke‘anae lo‘i complex results in a taro water need of from 1.37 to 1.58 mgd. This is less than half of the current IIFS of 5.50 cfs (3.56 mgd) for Palauhulu Stream.

288. It appears from the evidence submitted in this proceeding that there is generally enough water collected from the flume intake on Palauhulu Stream above Ke‘anae to meet the needs of the Ke‘anae taro farmers. While there was some testimony regarding shortages of water

during low flow conditions, there was also testimony indicating that there has been enough water to recently reopen patches that had been fallow. (Clark, Tr., 3/10/15, p. 126, 1. 15 to p. 131, 1. 12; Exh. A-168).

289. Since at least September 15, 2010, EMI has been releasing water into Palauhulu Stream from the Koʻolau Ditch, but the water is lost in the leaky sections of the streambed between the release point and the origin of Store Spring, which is the source of the water in Palauhulu Stream that supplies the Keʻanae loʻi complex. This was documented in a site visit that took place on September 15, 2010 attended by CWRM staff, Isaac and Gladys Kanoa, and EMI personnel. Exhibits C-111 and C-112 are photos taken during that site visit showing water being released just below the Koʻolau Ditch. The water being released constituted the entire flow of the stream on that date, and the sluice gate has remained open to the same setting ever since. Exhibit C-113 is a photo taken during that site visit of the last of several sinkholes in the streambed between Koʻolau Ditch and Store Spring. Exhibit C-114 is a copy taken during that site visit of the source of Store Spring. (Hew, WDT 1/27/15, l. 27.)

290. As a result of the loss into the streambed of the entire base flow of Palauhulu Stream between the Koʻolau Ditch and Store Spring, there is nothing more that can be done to increase the availability of water in the lower reaches during periods of low flows. At the current sluice gate setting, all of the low flows are already being released, but they do not reach Store Spring. Increasing the IIFS will not produce any more water in Palauhulu Stream at the flume intake to Keʻanae during periods of low flows. (Hew, WDT 1/27/15, 1. 27.)

10. Ohia (6054)

a. Physical features

291. The hydrologic unit of Ohia is located north of Haleakala. It covers a small drainage area of 0.3 square miles from the 410 feet altitude to the sea. (Ohia IFSAR § 1.1 at 1.)

292. Ohia Stream is 0.6 miles in length, traversing north from its headwaters at Ohia Spring near the Hana Highway at 230 feet elevation to the ocean. (Ohia IFSAR § 1.1 at 1.)

b. Diversions

293. Ohia Stream is not diverted by any major surface water diversion system. (Ohia IFSAR § 3.2 at 26; Hew, WDT, 2/10/15, at 12.)

c. Gaging stations

294. There are no stream gaging stations within the Ohia hydrologic unit. (Ohia IFSAR § 3.3 at 26.)

d. Streamflow values

295. According to USGS, the natural median baseflow in the lower reach of Ohia Stream is 4.70 cfs (3.04 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 61 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

296. The Hawaii Stream Assessment did not assess Ohia Stream. Native ʻoʻopu alamoʻo *(Lentipes concolor), ʻōpae* kala'ole *(Atyoida bisulcata),* and hīhīwai *(Neritina granosa)* were observed in Ohia Stream. During the more recent surveys, the ʻoʻopu alamoʻo and ʻōpae kaleole were observed in the middle reach. Introduced species such as guppies *(Poecilia reticulata)* and river prawns *(Macrobrachium lar)* were observed in the stream as well. The

poeciliid fishes dwell in the deep pools created above diversion structures and are known to transmit parasites to native fishes. No insect survey was conducted in Ohia Stream. DAR assigns Ohia a total watershed rating of 4 out of 10, a total biological rating of 5 out of 10, and a combined overall rating of 5 out of 10. Native species observed in the stream include:

Fish — *Lentipes concolor*
Crustaceans — *Atyoida bisulcata*
Mollusks — *Neritina granosa*

(Ohia IFSAR § 4.0, pp. 34, 37; DAR Report on Ohia Stream, Maui, Hawaii, October 2009, p. 6.)

297. The estimated natural (undiverted) median baseflow of Ohia Stream is 4.70 cfs (3.04 mgd). The amount of flow in Ohia Stream needed to achieve H_{90} is 3.00 cfs (1.94 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

298. The recreational resources of Ohia Stream were classified as "substantial" by the Hawaii Stream Assessment's regional recreational committee. The HSA identified opportunities for fishing and scenic views related to Ohia Stream. Of the two, only scenic views was considered to be a high-quality experience. (Ohia IFSAR § 5.0, p. 43.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

299. Riparian resources of Ohia Stream were not classified by the Hawaii Stream Assessment. About 2% of the hydrologic unit lies within the Pauwalu Point Wildlife Sanctuary. There are no palustrine wetlands in the Ohia hydrologic unit. The density of threatened and endangered plant species is low in the entire unit. (Ohia IFSAR § 6.0, pp. 46, 47, 48.)

iv. Aesthetic values

300. Ohia Stream is only 0.6 miles in length that is fed by Ohia Spring near Hana Highway. The stream is surrounded by mainly alien forests with scattered native Ohia forests

and Uluhe shrub lands. The hydrologic unit of Ohia does not lie within any forest reserve or preserve. The east end of the hydrologic unit is Pauwlau Point, which offers great views of the Hahaha Bay, and two islets of the Mokumana State Seabird Sanctuary. (Ohia IFSAR § 7.0, p. 51.)

v. Navigation

301. There are no navigation values present. (Ohia IFSAR § 8.0, p. 53.)

vi. Instream hydropower generation

302. Instream hydropower generation does not occur on Ohia Stream. (Ohia IFSAR § 9.0, p. 54.)

vii. Maintenance of water quality

303. Ohia Stream is a newly listed stream on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). Data indicated that turbidity, total nitrogen, total phosophorus, nitrite and nitrate nitrogen exist as visual listing from 2001 to 2004. Trash was recorded as one of the other pollutants in the stream. According to the available data, Ohia Stream is listed as category 5 as having one or more designated use non-attainments or water quality impairment. It is also a low priority stream for initiating TDML development. Ohia Stream is classified as Class 2 inland waters in which the stream is protected for uses such as recreational purposes, support of aquatic life, and agricultural water supplies. It should be noted that the conservation subzone map utilized for this interpretation is general and elevations are not exact. It should also be noted that there is no direct relationship between elevation and attainment of water quality standards. Marine waters at the mouth of the hydrologic unit of Ohia are Class AA waters. (Ohia IFSAR § 10.0, pp. 57, 58.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

304. There is only one registered diversion on Ohia stream by Hokoana BK, which diverts water for the purpose of irrigating 2.09 acres of taro, along with domestic and landscaping uses for a house on the property. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the hydrologic unit of Ohia. (Ohia IFSAR § 11.0, p. 60.)

ix. Protection of traditional and customary Hawaiian rights

305. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Ohia. (Ohia IFSAR § 12.0, p. 78.)

f. Kuleana users

306. CWRM records for the hydrologic unit of Ohia indicate that there is only one registered diversion for 2.09 acres of taro cultivation from an unnamed/unmapped spring mauka of Hana Highway via an auwai. (Ohia IFSAR § 13.1, p. 82-83.)

11. Waiokamilo (6055)

a. Physical features

307. The hydrologic unit of Waiokamilo is located on the northeast slope of Haleakala. It covers an area of 2.45 square miles from the slopes of Haleakala at 4,891 feet elevation to the sea. (Waiokamilo IFSAR § 1.0, p. 1.)

308. The hydrologic unit contains Waiokamilo Stream and its tributary, Kualani (Hamau) Stream. (Waiokamilo IFSAR § 1.0, p. 1.)

309. Waiokamilo Stream is 4.4 miles in length, traversing in a northeasterly direction from its headwaters originating in the Ko‘olau Forest Reserve to Waiokamilo Falls before entering the ocean. (Waiokamilo IFSAR § 1.0, p. 1.)

b. Diversions

310. EMI ceased all diversions within the Waiokamilo hydrologic unit after the Board of Land and Natural Resources ruled in March 2007 that EMI should release 6 mgd from Waiokamilo Stream. (Hew, WDT, 12/30/14, at 133; Hew, WDT, 1/27/15, at 135; Exh. C-83.)

c. Gaging stations

311. There is no USGS continuous-record stream gaging station in the hydrologic unit of Waiokamilo. (Waiokamilo IFSAR § 3.0, p. 29.)

d. Streamflow values

312. Waiokamilo Stream is generally a losing stream. The stream is dry immediately downstream of Ko‘olau Ditch. The stream then gains about 5.87 cfs (3.80 mgd) from Akeke (Banana) Spring. Thereafter, the stream loses flow to ground water, minor diversions, and a known losing stretch near Dams 2 and 3. (Exh. C-85, p. 40.)

313. According to USGS, the natural median baseflow in the upper reach of Waiokamilo Stream directly downstream of the Ko‘olau Ditch is 3.90 cfs (2.10 mgd); at the middle reach it is 6.10 cfs (3.28 mgd); and at the lower reach it is 8.70 cfs (4.68 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 61 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

314. The Hawaii Stream Assessment classifies the aquatic resources of Waiokamilo Stream as “unknown.” Waiokamilo Stream rates average in comparison to other watersheds in

Maui and statewide. DAR assigns Waiokamilo a total watershed rating of 7 out of 10, a total biological rating of 3 out of 10, and a combined overall rating of 5 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis*
Crustaceans — *Atyoida bisulcata*
Mollusks — No native mollusks

(Waiokamilo IFSAR § 4.2, p. 42; DAR Report on Waiokamilo Stream, Maui, Hawai‘i, June 2008, pp. 1-2.)

315. The estimated natural (undiverted) median baseflow of Waiokamilo Stream is 3.90 cfs (2.52 mgd). The amount of flow in Waiokamilo Stream needed to achieve Hgo is 2.50 cfs (1.62 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

316. The recreational resources of Waiokamilo Stream were classified as outstanding by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for fishing, hunting, swimming, and scenic views related to Waiokamilo Stream. Three were considered high-quality experiences (hunting and scenic view, air and ocean). (Waiokamilo IFSAR § 5.0, p. 40.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

317. Riparian resources of Waiokamilo Stream were not classified by the Hawaii Stream Assessment. Nearly 75% of the hydrologic unit of Waiokamilo falls within the Ko‘olau Forest Reserve. Nearly 46% of Waiokamilo is classified as seasonal, non-tidal palustrine wetlands occurring in the headwaters of the hydrologic unit. (Waiokamilo IFSAR § 6.0, pp. 44-46.)

iv. Aesthetic values

318. The headwaters of Waiokamilo Stream originate in the lush tropical forests of the Koʻolau Forest Reserve. Along with its tributary Kualani Stream, they flow northeasterly through the evergreen forests that cover a majority of the drainage basin. Of the two waterfalls along Waiokamilo Stream, Waiokilo Falls is located near the coast. Wailua Valley State Wayside Lookout is located at about 430 ft elevation and provides a picturesque view of the upper basin as well as the lower basin where the stream empties into the ocean. (Waiokamilo IFSAR § 7.0, p. 52.)

v. Navigation

319. No navigation values are present. (Waiokamilo IFSAR § 8.0, p. 54.)

vi. Instream hydropower generation

320. No instream hydropower generation occurs on Waiokamilo Stream. (Waiokamilo IFSAR § 9.0, p. 55.)

vii. Maintenance of water quality

321. Waiokamilo Stream and Kualani Stream do not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Waiokamilo Stream (and its "entire network"), there were not sufficient data for decision-making. Waiokamilo Stream is Class 2 from the coast to approximately 1,550 feet elevation. Above that elevation, it is Class 1. Kualani Stream is Class 2. Marine waters at the mouth of the hydrologic unit of Waiokamilo are Class AA waters. (Waiokamilo IFSAR § 10.0, p. 57.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

322. There are a total of 19 registered diversions on Waiokamilo Stream, of which 15 are non-EMI. Eleven diversions divert water for domestic or irrigation purposes, in part, with a

total of eight service connections. Fifteen diversions are utilized for irrigation of various crops and livestock, including the cultivation of taro. (Waiokamilo IFSAR § 11.0, p. 59.)

ix. Protection of traditional and customary Hawaiian rights

323. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* the Puu Polu fishpond exists towards the northern portion of the hydrologic unit near the ocean. (Waiokamilo IFSAR § 12.0, p. 69.)

f. Kuleana users

324. CWRM records for the hydrologic unit of Waiokamilo indicate that there are a total of 19 registered diversions, of which 11 were declared for taro cultivation. (Waiokamilo IFSAR § 12.0, p. 67.)

325. In Table No. 1 at page 10 of Nā Moku's Opening Brief, Nā Moku claims 90.992 acres of cultivable area and a total estimated water need for taro (in addition to 64% base flow) of 9.1 — 27.3 mgd in "Wailua." This is an area that encompasses two separate hydrologic units, Waiokamilo and Wailuanui. This is said to be based on the Nā Moku TMK Spreadsheet and Exhibit A-142, which is a combined set of three tax maps (plats 1-1-04, 05 and 06) with highlighted areas referencing certain parcels in Wailuanui.

326. The 90.992 acres for which Nā Moku claimed a need for water for taro was arrived at by simply adding the total acreage of TMK parcels listed on the Nā Moku TMK Spreadsheet within the 1-1-04 plat, the 1-1-05 plat and the 1-1-06 plat without taking into account what portion of those parcels have ever been or are currently cultivated with taro. There

was also no breakdown provided of which of these parcels are claimed to be served by Waiokamilo Stream and which are claimed to be served by Wailuanui Stream.

327. To the extent Nā Moku is claiming that these parcels have appurtenant or riparian rights to receive water from Waiokamilo Stream and Kualani Stream, these streams are not being diverted by EMI. EMI has provided testimony and photographic evidence that, following the BLNR's 2007 ruling, EMI sealed all of its diversion works and structures that previously diverted water from this hydrologic unit into the Ko'olau Ditch. This has also been confirmed by CWRM staff following a series of field investigations. (Hew, WDT 1/27/15, ¶ 35; Hew, Tr., 3/17/15, p. 128, 1. 7 to p. 129, 1. 10; Exh. C-52, pp. 56-67; Exh. C-147, pp. 84-96.)

328. Inasmuch as EMI has agreed to the setting and implementation of an IFS that would preclude EMI from diverting any water from the entirety of the hydrologic unit of Waiokamilo, it is unnecessary to make any more specific findings, individually or in the aggregate, regarding the water rights or needs of the farmers who irrigate their taro and other crops from Waiokamilo Stream and Kualani Stream.

12. Wailuanui (6056)

a. Physical features

329. The hydrologic unit of Wailuanui is located on the northeast slope of Haleakala. It covers an area of 6 square miles from the upper slopes of Haleakala at 8,891 feet elevation to the sea. (Wailuanui IFSAR § 1.0 at 1.)

330. The hydrologic unit contains Wailuanui Stream and its two main tributaries, West Wailuanui and East Wailuanui Streams. (IFSAR § 1.0, p. 1)

331. Wailuanui Stream is 6.4 miles in length with two main tributaries, West Wailuanui and East Wailuanui. Wailuanui Stream is also known as Waikani stream. (Wailuanui IFSAR § 1.0, p. 1; Hew, WDT, 2/10/15, p. 1.)

b. Diversions

332. EMI operates diversions on Wailuanui Stream and it tributaries at the Koʻolau Ditch. (Wailuanui IFSAR § 13.0, p. 77.)

c. Gaging stations

333. Three inactive USGS continuous-record stream gaging stations are located along Wailuanui Stream and its tributaries. (Wailuanui IFSAR § 3.0, p. 28.)

A. Station 16521000 is located at 620 feet elevation in Wailuanui Stream, and was active from1932 to 1936 and 1939 to1947. (Wailuanui IFSAR § 3.0, pp. 27-28 (Table 3-1).)

B. Station 16519000 is at 1,268 feet elevation in the lower reach of West Wailuanui Stream, and was active from 1914 to 1917 and 1922 to 1958. (Wailuanui IFSAR § 3.0, pp. 27-28 (Table 3-2).)

C. Station 16520000 is at 1,287 feet elevation in the lower reach of East Wailuanui Stream, and was active from 1915 to 1917 and 1923 to 1957. (Wailuanui IFSAR § 3.0, pp. 27-28, (Table 3-3).)

d. Streamflow values

334. According to USGS, the natural median baseflow at the upper reach of West Wailuanui Stream directly downstream of Koʻolau Ditch is 2.50 cfs (1.35 mgd). At the upper reach of East Wailuanui Stream directly downstream of Koʻolau Ditch the natural median baseflow is 2.00 cfs (1.08 mgd). At the middle reach, below the confluence of West and East Wailuanui Streams and above Waikani Falls, the median baseflow is 6.10 cfs (3.28 mgd). (Table

attached to Gingerich WDT 10/31/14, p. 2; USGS Regression Study, p. 60 (Table 11) and p. 65 (Table 12).)

335. Wailuanui Stream is gaining flow from the lower reaches of its tributaries down to the coast. (Exh. C-85, p. 51.)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

336. The Hawaii Stream Assessment classifies the aquatic resources of Wailuanui Stream as outstanding. Wailuanui Stream has a combination of large watershed size, higher biodiversity protection, high native species diversity and low alien species population. The ditch diversions create disconnected deep pools, restricting the movement of adult animals and standing postlarvae recruits at the stream mouth. Wailuanui Stream rates highly in comparison to other watersheds in Maui and statewide. DAR assigns Wailuanui a total watershed rating of 7 out of 10, a total biological rating of 8 out of 10, and a combined overall rating of 8 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis, Kuhlia sp., Lentipes concolor,* and *Sicyopterus stimpsoni*
Crustaceans —*Atyoida bisulcata* and *Macrobrachium grandimanus*
Mollusks — *Neritina granosa* and *Neritina vespertina*

(Wailuanui IFSAR § 4.0, pp. 35, 41-42; DAR Report on Wailuanui Stream, Maui, Hawaii, June 2008, pp. 1-2.)

337. The estimated natural (undiverted) median baseflow of Wailuanui Stream is 4.50 cfs (2.91 mgd). The amount of flow in Wailuanui Stream needed to achieve H_{90} is 2.90 cfs (1.87 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

338. The recreational resources of Wailuanui Stream were classified as outstanding by the Hawaii Stream Assessment's regional recreational committee. The HAS identified opportunities for fishing, hunting, swimming, and scenic views related to Wailuanui Stream. Of a total of seven experiences, five were considered to be a high-quality experience. CWRM identified the following activities that were known to occur or observed at or near Wailuanui (Wailua Nui Bay): gill netting, throw netting, torch fishing, pole and line fishing, and board surfing. (Wailuanui IFSAR § 5.0, pp. 43-44.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

339. Riparian resources of Wailuanui Stream were classified as substantial by the Hawaii Stream Assessment. In Wailuanui, there are three large management areas (Haleakala National Park, Koʻolau Forest Reserve, and Waikamoi Preserve) which comprise over 80% of the hydrologic unit. Approximately 27% of Wailuanui is classified as seasonal, non-tidal palustrine wetlands occurring in the central portion of the hydrologic unit. (Wailuanui IFSAR § 6.0, pp. 48, 49, 51.)

iv. Aesthetic values

340. The headwaters of Wailuanui Stream originate in the lush tropical forests of the Koʻolau Forest Reserve. Along with its tributaries West and East Wailuanui Streams, they flow northeasterly through the evergreen forests that cover a majority of the drainage basin. A number of waterfalls are located along the streams, three on each of the tributaries and six on the main channel, most of which are immediately followed by a plunge pool. Waikani Falls is among the waterfalls located in the more accessible lower reaches of Wailuanui Stream. A lookout point is

located about 250 feet elevation that provides a picturesque view of the upper basin and the lower basin where Wailuanui Stream empties into Wailua Nui Bay. (Wailuanui IFSAR § 7.0, p. 56.)

v. Navigation

341. No navigation values are present. (Wailuanui IFSAR § 8.0, p. 58.)

vi. Instream hydropower generation

342. No instream hydropower generation occurs on Wailuanui Stream. (Wailuanui IFSAR § 9.0, p. 59.)

vii. Maintenance of water quality

343. Wailuanui Stream (both tributaries) does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). It appears that no data were available for Wailuanui Stream. Wailuanui Stream is Class 2 from the coast to approximately 1,380 feet elevation, excepting for a small area near the confluence with East Wailuanui Stream, where it is Class 1. Above 1,380 feet elevation, West Wailuanui Stream is Class 1. East Wailuanui Stream is Class 2 from the coast to approximately 1,000 feet elevation, above that elevation, it is Class 1. Marine waters at the mouth of the entire hydrologic unit of Wailuanui are Class AA waters. (Wailuanui IFSAR § 10.0, p. 61.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

344. Four out of 7 diversions were registered under EMI. Of the three non-EMI diversions, none was declared for domestic purposes. Two registered diversions divert water for irrigation and livestock purposes. One diversion declared by MDWS diverts water for municipal use. (Wailuanui IFSAR § 11.0, p. 63; Exh. C-100, p. 52.)

ix. Protection of traditional and customary Hawaiian rights

345. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds in the hydrologic unit of Wailuanui. (Wailuanui IFSAR § 12.0, p. 75.)

f. Kuleana users

346. CWRM records for the hydrologic unit of Wailuanui indicate that there are two registered diversions declared for taro cultivation. (Wailuanui IFSAR § 11.0, p. 75.)

347. The 2007 USGS Taro Water Report included findings regarding water use in what it referred to as the "Wailua (Waikani) complex" which is the loi system that is irrigated solely with water from Wailuanui Stream. As of the summer of 2006, this system comprised 2.80 acres as shown Figure 32 on page 54. This system was being cultivated at that time by Norman "Bush" Martin and Joseph "Kimo" Day with water drawn from the pond below Waikani Falls on Wailuanui Stream. (Hew, WDT 1/27/15, 9136; Exh. C-108.)

348. The amount of water available from Waikani pond increased following the releases of stream flow to comply with the 2008 IIFS decision due to the closing of EMI's minor diversions and the opening of the sluice gates on the major diversions operated on East Wailuanui Stream and West Wailuanui Stream. EMI estimates that, since Wailuanui Stream is a gaining stream below the IIFS point, this has resulted in a consistent flow of from 2 to 3 mgd entering the pond below Waikani Falls (and much more during rain events). (Hew, WDT 1/27/15, ¶ 37.)

349. In spite of this increased flow to Waikani Pond after 2008, the lo'i system that was previously being cultivated with water from Waikani Pond was no longer in operation as of

the date of the hearings held herein. Mr. Day testified in paragraph 5 of his declaration that he stopped farming "about four years ago." Mr. Martin testified that he has temporarily cut back on his taro cultivation while he works on addressing needed improvements to the pipe intake at the head of the ʻauwai that brings water from Waikani pond to the Waikani loʻi complex. Mr. Clark testified that he has been assisting Mr. Martin in evaluating the needed repairs, which involve the removal of rocks that may have become lodged in a buried section of the pipe ʻauwai 100 feet or more from the intake. From these photos, the area previously irrigated with Wailuanui Stream water appears to now be substantially, if not entirely, removed from taro production. (Hew, WDT 1/27/15, 1 38; Martin, Tr., 3/9/15, p. 185, I. 3 to p. 189, l. 18; Clark, Tr. 3/10/15, p. 113, 1. 18 to p. 117, l. 20.)

350. Application of the 130,000 to 150,000 gad irrigation requirement for taro from the Nā Wai ʻEhā case to the 2.80 acres that were being irrigated from Waikani Pond in 2006 results in a taro water need of from 0.36 to 0.42 mgd. Since this is far less than the 2-3 mgd that has been available for the past six years, it appears that the supply of irrigation water to the area served by Waikani Pond is much greater than needed. The current IIFS setting for Wailuanui Stream, therefore, allows more than enough stream flow to reach Waikani pond to service taro cultivation in the areas that have been irrigated with Wailuanui Stream water in the recent past.

351. To the extent that Nā Moku has identified parcels of land owned by its members in the vicinity of Wailuanui Stream that may have previously been irrigated with Wailuanui Stream water, and which may have appurtenant rights to claim some amount of water on that basis, the record does not include an adequate breakdown of the parcels and acreage involved to support any detailed findings to that effect. Under current conditions, however, if the infrastructure challenge of conveying water from Waikani Pond to the areas sought to be

irrigated can be solved, there is enough water available to more than double the acreage that has recently been irrigated without dewatering the stretch between Waikani pond and the seaward terminus of Wailunanui Stream.

352. Further, since the current IFS setting for Wailuanui Stream is occasionally not met when stream flows are low, increasing the IIFS will not result in any greater amount of water being available during low flows since, during such periods, no water is being diverted by EMI.

353. The adequacy of the IIFS to meet the needs for taro cultivation are demonstrated by the hydrograph for Wailuanui Stream for the period of March 23, 2011 to September 23, 2014, which shows that the flow in Wailuanui Stream exceeds the IIFS of 3.05 cfs (2.97 mgd) the vast majority of the time, often by a very large quantity. (Uyeno, 12/18/14 written report, p. 30.)

13. West Wailuaiki (6057)

a. Physical features

354. The hydrologic unit of West Wailuaiki is located northeast of Haleakala. It covers an area of 4.1 square miles from the upper slopes of Haleakala at 8,860 feet elevation to the sea. (West Wailuaiki IFSAR § 1.1, p. 1.)

355. West Wailuaiki Stream is 6.9 miles in length, traversing north from its headwater at the 6,000 feet altitude to the ocean. West Wailuaiki Stream has one tributary that branches west from the main stream at the 2,600 feet altitiude. (West Wailuaiki IFSAR § 1.1, p. 1.)

356. West Wailuaiki Stream is mostly a gaining stream, with average annual ground water gains of 4.5 mgd (6.96 cfs) above the Koolau/Wailoa Ditch level. (Exh. C-90, p. 31.)

b. Diversions

357. EMI operates a diversion on West Wailuaiki Stream at the Koʻolau Ditch. (West Wailuaiki IFSAR § 13.1, p. 94.)

c. Gaging stations

358. West Wailuaiki Stream has one active USGS continuous record stream gaging station (station 16518000) located upstream of Koʻolau Ditch at 1,343 feet altitude. The gaging station is currently in operation, and has streamflow record for at least 90 years. Since the station is located upstream of the ditch, streamflow records reflect flows under natural (undiverted) conditions. (West Wailuaiki IFSAR § 3.3, p. 29.)

d. Streamflow values

359. According to USGS, the natural median baseflow at the upper reach of West Wailuaiki Stream directly downstream of the Koʻolau Ditch is 6.00 cfs (3.23 mgd). At the middle reach the natural median baseflow is 6.80 cfs (3.66 mgd) and at the lower reach it is 7.20 cfs (3.87 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11) and p. 65 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

360. For West Wailuaiki Stream, the Hawaii Stream Assessment classifies the aquatic resources as "moderate," meaning a fair amount of native species were present. A number of native stream animals were observed in West Wailuaiki Stream, including ʻoʻopu nākea *(Awaous guamensis),* ʻoʻopu nōpili *(Sicyopterus stimpsoni),* ʻoʻopu akupa *(Eleotris sandwicensis),* ʻoʻopu alamoʻo *(Lentipes concolor),* ʻōpae kalaʻole *(Atyoida bisulcata),* and hīhīwai *(Neritina granosa).* During the more recent surveys, these stream animals except the ʻoʻopu alamoʻo and ʻōpae

kaleole were observed in the middle reach at water temperatures of 20.9°C and 22.1°C. A cast net sampling of the stream mouth and shoreline at West Wailuaiki resulted in a total catch of 34 fishes and invertebrates. The most dominant catch was aholehole *(Kuhlia xenura),* which were found in the lower salinity areas (i.e., stream mouth)[10]. The endemic Hawaiian surf fish *(Iso hawaiiensis)* were found in areas with higher salinity, typically the shoreline. Other species found included uouoa *(Neomyxus leuciscus)* and tiger shrimp *(Palaemon pacificus).* West Wailuaiki Stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns West Wailuaiki a total watershed rating of 7 out of 10, a total biological rating of 7 out of 10, and a combined overall rating of 8 out of 10. Native species observed in the stream include:

> Fish — *Awaous guamensis, Eleotris sandwicensis, Gobiid sp., Lentipes concolor, Kuhlia sp., Kulhia xenura,* and *Sicyopterus stimpsoni*
> Crustaceans — *Atyoida bisulcata, Metopograpsus thukuhar*
> Insects — *Telmatogen* sp.
> Mollusks — *Ferrissia sharpi* and *Neritina granola*
> Sponge — *Heteromeyenia baileyi*

(West Wailuaiki IFSAR § 4.2, pp. 39, 43 and § 4.4, p. 43; DAR Report on West Wailuaiki Stream, Maui, Hawai‘i, October 2009, p. 6.)

361. Upstream from the Koolau Ditch, where there are no diversions, there is 100 percent natural habitat. Downstream from the ditch, enough base flow could be maintained by ground water contribution to provide about 39 to 49 percent of the exptect natural habitat for all species except opae. Near the coast, the stream retains enough flow to provide over 50 percent of the expected habitat availability for all species when about 83 percent of the natural base flow was diverted. Overall, about 40 to 50 percent of the natural habitat for all species in West

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[10] The abundance of aholehole in the estuary could be an indicator for a healthy stream since this species of fish was commonly found in estuaries with flowing streams and open stream mouths to the ocean. (West Wailuaiki IFSAR § 4.4, p. 44.)

Wailuaiki Stream is maintained below Koolau Ditch under diverted conditions. The estimated natural (undiverted) median baseflow of West Wailuaiki Stream is 6.00 cfs (3.88 mgd). The amount of flow in West Wailuaiki Stream needed to achieve H_{90} is 3.80 cfs (2.46 mgd). (West Wailuaiki IFSAR § 4.3, p. 41; Table attached to Gingerich WDT 10/31/14, p. 1; Exh. HO-1.)

ii. Outdoor recreational activities

362. The recreational resources of West Wailuaiki Stream were classified as "outstanding" by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for hiking, fishing, hunting, swimming, and scenic views related to West Wailuaiki Stream. Of the five, only scenic views was considered to be a high-quality experience. (West Wailuaiki IFSAR § 5.0, pp. 51, 53.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

363. Riparian resources of West Wailuaiki Stream were classified as "substantial" by the Hawaii Stream Assessment. About 71% of the West Wailuaiki hydrologic unit lies within the Koʻolau Forest Reserve, 18% within the Waikamoi Preserve, and only 1% within the Haleakala National Park. Approximately 59% of West Wailuaiki is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. (West Wailuaiki IFSAR § 6.0, pp. 55-57.)

iv. Aesthetic values

364. West Wailuaiki Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of West Wailuaiki Stream is predominately alien forests. The hydrologic unit lies within the Waikamoi Preserve in the upper elevations, and the

Ko ʻolau Forest Reserve in the intermediate and lower elevations. A number of waterfalls are located along the lower reaches of the stream, one of which can be seen from Hana Highway. The stream empties into Wailua lki Bay, where a number of coastal activities are enjoyed by the locals as well as the general public. (West Wailuaiki IFSAR § 7.0, p. 63.)

v. Navigation

365. No navigation values are present. (West Wailuaiki IFSAR § 8.0, p. 65.)

vi. Instream hydropower generation

366. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including West Wailuaiki Stream. (West Wailuaiki IFSAR § 9.0, p. 66.)

vii. Maintenance of water quality

367. West Wailuaiki Stream appears on the 2006 List of Impaired Waters in Hawaiʻi, Clean Water Act § 303(d). While some data exist for West Wailuaiki Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of water quality standards or the applicable designated uses. West Wailuaiki Stream is classified as Class lb inland waters from its headwaters to approximately 1,400 feet elevation, as the surrounding land is in the conservation subzone "protective" and the stream also lies in the Koʻolau Forest Reserve. From there down to about 100 feet elevation, West Wailuaiki Stream is classified as Class la inland waters because the stream lies in the Koʻolau Forest Reserve. From there to the sea, it is classified as Class 2 inland waters. Marine waters at the mouth of the hydrologic unit of West Wailuaiki are Class AA waters. (West Wailuaiki IFSAR § 10.0, pp. 70-71.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

368. There is only one registered diversion which belongs to EMI. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the hydrologic unit of West Wailuaiki. (West Wailuaiki IFSAR § 11.0, p. 73.)

ix. Protection of traditional and customary Hawaiian rights

369. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds in the hydrologic unit of West Wailuaiki. (West Wailuaiki IFSAR § 12.0, p. 90.)

f. Kuleana users

370. CWRM records for the hydrologic unit of West Wailuaiki indicate that there are no registered diversions declared for taro cultivation or other domestic purposes. (West Wailuaiki IFSAR § 12.0, p. 84.)

14. East Wailuaiki (6058)

a. Physical features

371. The hydrologic unit of East Wailuaiki is located northeast of Haleakala. It covers an area of 3.5 square miles from the upper slopes of Haleakala at 8,500 feet elevation to the sea. (East Wailuaiki IFSAR § 1.1, p. 1.)

372. East Wailuaiki Stream is 7.1 miles in length, traversing north from its headwater at the 6,350 feet altitude to the ocean. East Wailuaiki Stream has one tributary that branches west from the main stream at the 1,540 feet altitude and it is headed at the 3,300 feet altitude. (East Wailuaiki IFSAR § 1.1, p. 1.)

b. Diversions

373. EMI operates a diversion on East Wailuaiki Stream at the Koʻolau Ditch. (East Wailuaiki IFSAR § 13.1, p. 95.)

c. Gaging stations

374. East Wailuaiki Stream has one inactive USGS continuous-record stream gaging station (16517000), located upstream of Koʻolau Ditch at the 1,343 feet altitude. The gaging station has streamflow record for at least 37 years. Since the station is located upstream of the ditch, streamflow records reflect flows under natural (undiverted) conditions. (East Wailuaiki IFSAR § 3.3, p. 29.)

d. Streamflow values

375. According to USGS, the natural median baseflow of East Wailuaiki at the upper reach, directly downstream of the Koʻolau Ditch, is 5.80 cfs (3.12 mgd); at the middle reach it is 6.80 cfs (3.66 mgd); and at the lower reach it is 7.20 cfs (3.87 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

376. For East Wailuaiki Stream, the Hawaii Stream Assessment classifies the aquatic resources as "moderate," meaning a fair amount of native species were present. A number of native stream animals were observed in East Wailuaiki Stream, including ʻoʻopu nākea *(Awaous guamensis),* ʻoʻopu nōpili *(Sicyopterus stimpsoni),* ʻoʻopu akupa *(Eleotris sandwicensis),* ʻoʻopu alamoʻo *(Lentipes concolor),* ʻōpae kalaʻole *(Atyoida bisulcata),* and hīhīwai *(Neritina granosa).* During the more recent surveys, these stream animals except the ʻōpae kalaʻole were observed in the middle reach at water temperatures of 20.6°C and 22.4°C. The ʻōpae kalaʻole dominated the

upper reach above the ditch at water temperatures of 18.9°C. A cast net sampling of the stream mouth and shoreline at East Wailuaiki resulted in a total catch of 116 fishes and invertebrates. The most dominant catch was uouoa *(Neomyxus leuciscus),* which were found in high surge and white water. Other species found included Tao *(Atherinomorus insularutn),* nehu *(Encrasicholina purpurea),* ahole‘hole *(Kuhlia xenura),* and tiger shrimp *(Palaemon pacificus)*[11]. A school of striped mullet *(Mugil cephalus)* were seen along the shoreline but not captured during sampling. East Wailuaiki Stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns East Wailuaiki a total watershed rating of 7 out of 10, a total biological rating of 7 out of 10, and a combined overall rating of 8 out of 10. Native species observed in the stream include:

> Fish — *Awaous guamensis, Eleotris sandwicensis, Kulhia xenura,* and *Sicyopterus stimpsoni*
> Crustaceans — *Atyoida bisulcata*
> Insects — *Anax junius, Anax* sp., *Anax strenuous, Limonia grimshawi, Limonia Jacobus, Megalagrion blackbumi, Megalagrion calliphya, Megalagrion* sp., *Procanacae acuminate, Procanace confuse, Saldula exulans, Scatella cilipes, Scatella clavipes, Scatella femoralis, Telmatogeton abnormis, Telmatogen* sp.
> Mollusks — *Ferrissia sharpi* and *Neritina granosa*
> Sponge — *Heteromeyenia baileyi*

(East Wailuaiki IFSAR § 4.2, pp. 39, 43 and § 4.4, p. 44; DAR Report on East Wailuaiki Stream, Maui, Hawaii, October 2009, p. 6.)

377. Upstream from the Koolau Ditch, where there are no diversions, there is 100 percent natural habitat. Downstream from the ditch, enough base flow could be maintained by ground water contribution to provide about 43 to 53 percent of the exptect natural habitat for all

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[11] The abundance of aholehole in the estuary could be an indicator for a healthy stream since this species of fish was commonly found in estuaries with flowing streams and open stream mouths to the ocean. (East Wailuaiki IFSAR § 4.4, p. 45.)

species except opae. Near the cost, the stream retains enough flow to provide over 49 percent of the expected habitat availability for all species when about 79 percent of the natural base flow was diverted. Overall, about 40 to 50 percent of the natural habitat for all species in East Wailuaiki Stream is maintained below Koolau Ditch under diverted conditions. The estimated natural (undiverted) median baseflow of East Wailuaiki Stream is 5.80 cfs (3.75 mgd). The amount of flow in East Wailuaiki Stream needed to achieve H_{90} is 3.70 cfs (2.39 mgd). (East Wailuaiki IFSAR § 4.3, p. 42; Table attached to Gingerich WDT 10/31/14, p. 1; Exh. HO-1.)

ii. Outdoor recreational activities

378. The recreational resources of East Wailuaiki Stream were classified as "outstanding" by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for hiking, fishing, hunting, swimming, and scenic views related to East Wailuaiki Stream. Of the five, only scenic views were considered to be a high-quality experience. (East Wailuaiki IFSAR § 5.0, p. 52.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

379. Riparian resources of East Wailuaiki Stream were classified as "outstanding" by the Hawaii Stream Assessment. About 78% of the East Wailuaiki hydrologic unit lies within the Koʻolau Forest Reserve, 10% within the Waikamoi Preserve, and only 3% within the Haleakala National Park. Approximately 66% of East Wailuaiki is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. (East Wailuaiki IFSAR § 6.0, pp. 56-59.)

iv. Aesthetic values

380. East Wailuaiki Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of East Wailuaiki Stream is predominately alien forests. The hydrologic unit lies within the Waikamoi Preserve in the upper elevations, and the Koʻolau Forest Reserve in the intermediate and lower elevations. A number of waterfalls are located along the lower reaches of the stream, one of which can be seen from Hana Highway. The stream empties into Wailua Iki Bay, where a number of coastal activities are enjoyed by the locals as well as the general public. The easternmost end of the hydrologic unit is Papiha Point, which offers a great view of Wailua Iki Bay and Makoloaka Island. (East Wailuaiki IFSAR § 7.0, p. 64.)

v. Navigation

381. No navigation values are present. (East Wailuaiki IFSAR § 8.0, p. 66.)

vi. Instream hydropower generation

382. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including East Wailuaiki Stream. (East Wailuaiki IFSAR § 9.0, p. 67.)

vii. Maintenance of water quality

383. East Wailuaiki Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for East Wailuaiki Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of water quality standards or the applicable designated uses. East Wailuaiki Stream is classified as Class lb inland waters from its headwaters to approximately 1,400 feet elevation, as the

surrounding land is in the conservation subzone “protective” and the stream also lies in the Ko‘olau Forest Reserve. From there to the sea, East Wailuaiki Stream is classified as Class 2 inland water. Marine waters at the mouth of the hydrologic unit of East Wailuaiki are Class AA waters. (East Wailuaiki IFSAR § 10.0, pp. 71-72.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

384. No diversions other than EMI diversions diverts water for irrigation purposes. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the hydrologic unit of East Wailuaiki. (East Wailuaiki IFSAR § 11.0, p. 74.)

ix. Protection of traditional and customary Hawaiian rights

385. According to the 1990 Hawaii Coastal Zone Management Program’s *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds in the hydrologic unit of East Wailuaiki. (East Wailuaiki IFSAR § 12.0, p. 91.)

f. Kuleana users

386. CWRM records for the hydrologic unit of East Wailuaiki indicate that there are no registered diversions declared for taro cultivation or other domestic purposes. (East Wailuaiki IFSAR § 12.0, p. 85.)

15. Kopiliula (6059)

a. Physical features

387. The hydrologic unit of Kopili‘ula is located northeast of Haleakala. It covers an area of 5.2 square miles from the upper slopes of Haleakala at 8,200 feet elevation to the sea. (Kopili‘ula IFSAR § 1.1, p. 1.)

388. The hydrologic unit of Kopili‘ula contains Kopili‘ula Stream and its tributary, Pua‘aka‘a Stream, that branches east from the main stream at the 77 feet altitude and is headed at the 2,000 feet altitude. (Kopili‘ula IFSAR § 3.3, p. 28.)

389. Kopili‘ula Stream is 7.6 miles in length, traversing north from its headwater at the 7,700 feet altitude to the ocean. (Kopili‘ula IFSAR § 1.1, p. 1; § 3.3, p. 28.)

b. Diversions

390. EMI operates a diversion on Kopili‘ula Stream at the Koolau Ditch. (Kopili‘ula IFSAR § 13.1, p. 98.)

391. EMI operates a diversion on Pua‘aka‘a Stream at the Ko‘olau Ditch. (Kopili‘ula IFSAR § 13.1, p. 102.)

c. Gaging stations

392. Kopili‘ula Stream has one inactive USGS continuous-record stream gaging station (station 16516000), located upstream of Ko‘olau Ditch at the 1,292 feet altitude. The gage was active from 1914 to 1917 and 1922 to 1958. (Kopili‘ula IFSAR § 3.3, p. 29.)

393. Pua‘aka‘a Stream has not not been monitored by a continuous-record stream gaging station. (Kopili‘ula IFSAR § 3.3, p. 29.)

d. Streamflow values

394. According to USGS, the natural median baseflow at the upper reach of Kopili‘ula Stream directly downstream of the Koolau Ditch is 5.00 cfs (2.69 mgd); at the middle reach it is 6.50 cfs (3.50 mgd); and at the lower reach it is 9.50 cfs (5.11 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11).)

395. The natural median baseflow for Pua‘aka‘a Stream is 1.1 cfs (.71 mgd) at the upper reach and 2.2 cfs (1.42 mgd) at the middle reach. (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

396. For Kopili‘ula Stream, the Hawaii Stream Assessment classifies the aquatic resources as “moderate,” meaning a fair amount of native species were present. A number of native stream animals were observed in Kopili‘ula Stream, including ‘o‘opu nākea *(Awaous guamensis),* ‘o‘opu nōpili *(Sicyopterus stimpsoni),* ‘o‘opu akupa *(Eleotris sandwicensis),* ‘o‘opu alamo‘o *(Lentipes concolor),* ‘ōpae kala‘ole *(Atyoida bisulcata),* and hīhīwai *(Neritina granosa).* During the more recent surveys, the ‘ōpae kaleole was only observed in the upper reach above the ditch. The ‘o‘opu nākea, ‘o‘opu nōpili, and hīhīwai were observed in the middle and lower reaches, whereas the ‘o‘opu alamo‘o was observed in the upper and lower reaches. All these stream animals except the ‘o‘opu akupa were observed in the lower, middle, and upper reaches in past surveys. The estuary in Kopili‘ula was relatively small compared to other estuaries surveyed in East Maui, and not much estuarine habitat was available. A recent cast net sampling of the stream mouth resulted in only one specimen of Hawaii surf fish *(Iso hawaiiensis),* which usually inhabit areas with high salinity.

397. Kopili‘ula Stream which provides excellent instream habitats and a diversity of of native stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns Ha‘ipua‘ena a total watershed rating of 8 out of 10, a total biological rating of 7 out of 10, and a combined overall rating of 8 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis, Lentipes concolor, Kulhia xenura,* and *Sicyopterus stimpsoni*
Crustaceans — *Atyoida bisulcata*
Insects — *Telmatogen* sp.
Mollusks — *Neritina granosa*
Sponge — *Heteromeyenia baileyi*

(Kopiliʻula IFSAR § 4.2, pp. 41 and § 4.4, p. 46; DAR Report on Kopiliʻula Stream, Maui, Hawaii, October 2009, p. 6.)

398. Upstream of the Koʻolau Ditch, where there are no diversions, the stream has no reduction in flow and thus retains 100 percent of the natural habitat. Downstream from the ditch where Kopiliula Stream is diverted, the stream is dry (no available habitat) until more ground water is gained to provide about 50 percent of the expected natural habitat. Near the coast, enough base flow is maintained by ground water contribution to provide about 50 percent of the expected habitat for all species. If 50 percent of the natural base flow is in the stream, at least 70 percent of the natural habitat will be available. Overall, about 50 percent of the natural habitat for all species in Kopiula Stream was maintained below Koolau Ditch under diverted conditions. (Kopiliʻula IFSAR § 4.3, p. 43.)

399. Puaʻakaʻa Stream was not surveyed as part of the Hawaii Stream Assessment. (Kopiliʻula IFSAR § 4.2, p. 41.)

400. The habitat simulation model were extrapolated to estimate the stream habitat availability for Puaʻakaʻa Stream. Upstream from Koʻolau Ditch where there are no diversions, the stream has no reduction in flow and thus, retains 100 percent of the natural habitat. Downstream from the ditch where the stream is diverted, the stream is dry until more groundwater is gained to provide 75 to 100 percent of the expected natural habitat for all species. Overall, Puaʻakaʻa has already maintained over 50 percent of the natural habitat under diverted conditions. (Kopiliʻula IFSAR § 4.3, p. 45.)

ii. Outdoor recreational activities

401. The recreational resources of Kopili‘ula Stream were classified as substantial by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for fishing, hunting, swimming, and scenic views related to Kopili‘ula Stream. None were considered to be a high-quality experience. (Kopili‘ula IFSAR § 5.0, p. 54.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

402. Riparian resources of Kopili‘ula Stream were classified as outstanding by the Hawaii Stream Assessment. About 61% of the unit lies within the Ko‘olau Forest Reserve, 25% within the Hanawī Natural Area Reserve, 6% within Haleakala National Park, and only 2% within the Waikamoi Preserve. Approximately 62% of Kopili‘ula is classified as non-tidal palustrine wetlands occurring in the intermediate and upper slopes of the hydrologic unit. (Kopili‘ula IFSAR § 5.0, pp. 58, 59, and 61.)

iv. Aesthetic values

403. Kopili‘ula Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of Kopili‘ula Stream is predominately alien forests. The surrounding vegetation for Pua‘aka‘a Stream is also predominately alien forests. A number of waterfalls are located along the lower reaches of the Kopili‘ula and Pua‘aka‘a streams, and one of the waterfalls on Kopili‘ula Stream can be seen from Hana Highway. The hydrologic unit lies within four forest reserves, Haleakala National Park, Waikamoi Preserve, Ko‘olau Forest

Reserve, and Hanawī Natural Area Reserve. Located in the westernmost end of the hydrologic unit is Papiha Point, which offers a view of Makoloaka Island. (Kopiliʻula IFSAR § 7.0, p. 67.)

v. Navigation

404. There are no navigation values present. (Kopiliʻula IFSAR § 8.0, p. 69.)

vi. Instream hydropower generation

405. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Kopiliʻula Stream and Puaʻakaʻa Stream. (Kopiliʻula IFSAR § 9.0, p. 70.)

vii. Maintenance of water quality

406. Kopiliʻula Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Kopiliʻula Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of State of Hawaii Water Quality Standards or the applicable designated uses. Kopiliʻula Stream is classified as Class lb inland waters from its headwaters to approximately 1,300 feet elevation, as the surrounding land is in the conservation subzone "protective," and the stream also lies in the Koʻolau Forest Reserve, excepting the 0.2 miles at the west tributary headwater that lies in the Waikamoi Preserve and it is classified as Class la inland waters because, while not in the protective subzone, the stream lies in the Koʻolau Forest Reserve. From there to the sea, it is classified as Class 2 inland waters. Marine waters at the mouth of the hydrologic unit of Kopiliʻula are Class AA waters. (Kopiliʻula IFSAR § 10.0, pp. 75-76.)

viii. **Conveyance of irrigation and domestic water supplies to downstream points of diversion**

407. No non-EMI diversions divert water for domestic or irrigation purposes. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the hydrologic unit of Kopiliʻula. (Kopiliʻula IFSAR § 11.0, p. 78.)

ix. **Protection of traditional and customary Hawaiian rights**

408. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Kopiliʻula. (Kopiliʻula IFSAR § 12.0, p. 89.)

f. Kuleana users

409. CWRM records for the hydrologic unit of Kopiliʻula indicate that no registered diversions were declared for taro cultivation or other domestic purposes. (Kopiliʻula IFSAR § 12.0, p. 89.)

16. Waiohue (6060)

a. Physical features

410. The hydrologic unit of Waiohue is located northeast of Haleakala. It covers an area of 0.8 square miles from the lower slopes of Haleakala at 2,800 feet elevation to the sea. (Waiohue IFSAR § 1.1, p. 1.)

411. Waiohue Stream is 2.6 miles in length, traversing north from its headwater at the 2,250 feet altitude to the ocean. (Waiohue IFSAR § 1.1, p. 1.)

b. Diversions

412. EMI operates a diversion on Waiohue Stream at the Koʻolau Ditch. (Waiohue IFSAR § 13.1, p. 94.)

c. Gaging stations

413. There is one inactive USGS continuous-record stream gaging station located on Waiohue Stream upstream of Koʻolau Ditch at the 1,316 feet altitude. (Waiohue IFSAR § 3.3, p. 28.)

d. Streamflow values

414. According to USGS, the natural median baseflow at the upper reach of Waiohue Stream directly downstream of the Koʻolau Ditch is 5.00 cfs (2.69 mgd); at the middle reach it is 6.00 cfs (3.23 mgd); and at the lower reach it is 7.50 cfs (4.85 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

415. For Waiohue Stream, the Hawaii Stream Assessment classifies the aquatic resources as "outstanding," meaning a diversity of native species were present. A number of native stream animals were observed in Waiohue Stream, including ʻoʻopu nākea *(Awaous guamensis),* ʻoʻopu nōpili *(Sicyopterus stimpsoni),* ʻoʻopu akupa *(Eleotris sandwicensis),* ʻōpae kalaʻole *(Atyoida bisulcata),* and hīhīwai *(Neritina granosa).* During the most recent surveys, ʻoʻopu nōpili was observed near the stream mouth at a water temperature of 20.5° C. ʻOʻopu nākea and hīhīwai were observed in the upper reach near the ditch. The only species recorded in the upper reach above the ditch was ʻōpae kalaʻole. Water temperatures dropped by almost 3 degrees from the lower reach to the upper reach above the ditch. The poeciliid fishes dwell in the deep pools created above diversion structures and are known to transmit parasites to native fishes. A cast net sampling of the stream mouth and shoreline at Waiohue resulted in catches of aholehole *(Kuhlia xenura)* and kupipi *(Abudefduf sordidus).* The most dominant catch was

aholehole *(Kuhlia xenura),* which were found in areas with varying salinity. The stream had minimal flow entering the ocean during the survey. Waiohue Stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns Waiohue a total watershed rating of 7 out of 10, a total biological rating of 8 out of 10, and a combined overall rating of 7 out of 10. Native species observed in the stream include:

> Fish — *Awaous guamensis, Eleotris sandwicensis, Kuhlia sandwicensis, Kuhlia* sp., *Kulhia xenura, Lentipes concolor, Mugil cephalus, Sicyopterus stimpsoni, Stenogobius hawaiiensis*
> Crustaceans — *Amphipod asp., Atyoida bisulcata* and *Macrobrachium grandimanus* Insects — *Anax junius, Megalagrion* sp. and *Telmatogen* sp.
> Mollusks — *Ferrissia sharpi, Nerita picea, Neritina granosa, Neritid* sp. and *Neritina vespertina*

(Waiohue IFSAR § 4.2, pp. 42 and § 4.4, p. 46; DAR Report on Waiohue Stream, Maui, Hawaii, October 2009, p. 6.)

416. The estimated natural (undiverted) median baseflow of Waiohue Stream at its upper reach is 5.00 cfs (3.23 mgd). The amount of flow in Waiohue Stream needed to achieve H_{90} at this site is 3.20 cfs (2.07 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; Exh. HO-1.)

ii. Outdoor recreational activities

417. The recreational resources of Waiohue Stream were classified as outstanding by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for camping, hiking, fishing, swimming, parks, and scenic views related to Waiohue Stream. Of these six, only parks were not considered to be a high-quality experience. (Waiohue IFSAR § 5.0, p. 52.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

418. Riparian resources of Waiohue Stream were not classified by the Hawaii Stream Assessment. About 83% of the unit lies within the Koʻolau Forest Reserve, 10% within the Hanawī Natural Area Reserve, and less than 1% within the Puaa Kaa State Wayside. Approximately 32% of Waiohue is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. (Waiohue IFSAR § 6.0, pp. 56-58.)

iv. Aesthetic values

419. Waiohue Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of Waiohue Stream is predominately alien forests. A number of waterfalls are located along the lower reach of the Waiohue Stream, and one of the waterfalls can be seen from Hana Highway and one can be seen from the Puaa Kaa State Wayside. The hydrologic unit lies within two forest reserves, Koʻolau Forest Reserve and Hanawī Natural Area Reserve. Mokuhuki Island can be viewed from the coast. Waiohue Bay is a popular fishing location. (Waiohue IFSAR § 7.0, p. 64.)

v. Navigation

420. No navigation values are present. (Waiohue IFSAR § 8.0, p. 66.)

vi. Instream hydropower generation

421. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Waiohue Stream. (Waiohue IFSAR § 9.0, p. 67.)

vii. Maintenance of water quality

422. Waiohue Stream does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). Waiohue Stream is classified as Class lb inland waters from its headwaters to approximately 1,250 feet elevation, as the surrounding land is in the conservation subzone "protective." The stream also lies in the Koʻolau Forest Reserve and the Hanawī Natural Area Reserve in the headwaters. Between the 1,250 feet and 100 feet altitudes, the stream is classified as Class la inland waters because, while not in the protective subzone, the stream lies in the Koʻolau Forest Reserve. From there to the sea, it is classified as Class 2 inland waters. Marine waters at the mouth of the hydrologic unit of Waiohue are Class AA waters. (Waiohue IFSAR § 10.0, pp. 71-72.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

423. One non-EMI diversion registered by the State Division of State Parks provides non-potable water to the comfort station at the Puaa Kaa State Wayside. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the hydrologic unit of Waiohue. (Waiohue IFSAR § 11.0 pp. 74-75.)

ix. Protection of traditional and customary Hawaiian rights

424. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Waiohue. (Waiohue IFSAR § 12.0, p. 91.)

f. Kuleana users

425. CWRM records for the hydrologic unit of Waiohue indicate that no registered diversions were declared for taro cultivation or other domestic purposes. (Waiohue IFSAR § 12.0, p. 85.)

17. Pa‘akea (6061)

a. Physical features

426. The hydrologic unit of Pa‘akea is located northeast of Haleakala. It covers an area of 1 square mile from the lower slopes of Haleakala at 4, l00 feet elevation to the sea. (Pa‘akea IFSAR .§ 1.1, p. 1.)

427. Pa‘akea Stream is 1.8 miles in length, traversing north from its headwater at the 1,800 feet altitude to the ocean. (Waiohue IFSAR § 1.1, p. 1.)

b. Diversions

428. EMI operates a diversion on Pa‘akea Stream at the Ko‘olau Ditch. (Pa‘akea IFSAR § 13.1, p. 94.)

c. Gaging stations

429. There is one inactive USGS continuous-record stream gaging station (16514000) located on Pa‘akea Stream downstream of the Ko‘olau Ditch at the 650 feet altitude. The station has streamflow record for at least 14 years. (Pa‘akea IFSAR § 3.3, p. 30.)

d. Streamflow values

430. According to USGS, the natural median baseflow at the upper reach of Pa‘akea Stream directly downstream of the Ko‘olau Ditch is 0.90 cfs (0.48 mgd); at the middle reach it is 4.70 cfs (2.53 mgd); and at the lower reach it is 5.50 cfs (2.96 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

431. For Pa‘akea Stream, the Hawaii Stream Assessment classifies the aquatic resources as “moderate,” meaning a fair amount of native species were present. A number of native stream animals were observed in Pa‘akea Stream, including ‘o‘opu nākea *(Awaous guatnensis),* ‘o‘opu nōpili *(Sicyopterus stimpsoni),* ‘o‘opu akupa *(Eleotris sandwicensis),* ‘o‘opu alamo‘o *(Lentipes concolor),* ‘ōpae kaleole *(Atyoida bisulcata),* and hīhīwai *(Neritina granosa).* During the most recent surveys, only the ‘ōpae kala‘ole was observed in the upper reach above the ditch. The ‘o‘opu akupa, ‘o‘opu nōpili, hīhīwai, and postlarvae were observed inside the first plunge pool as well as in the lower reach leading to the ocean. Above the first waterfall, ‘o‘opu nākea, ‘o‘opu nōpili, ‘o‘opu alamo‘o, and hīhīwai were observed. Introduced species such as river prawns *(Macrobrachiutn lar)* were observed in the lower and middle reaches of the stream. The estuary in Pa‘akea was relatively small compared to other estuaries surveyed in east Maui, and not much estuarine habitat was available. A cast net sampling of the stream mouth resulted in a total of eight catches, including aholehole *(Kuhlia xenura),* Christmas wrasse *(Thalassoma trilobatum),* and ‘Iao *(Atherinomorus insularum).* The stream had minimal flow entering the ocean at the time of the survey. Pa‘akea Stream rates medium in comparison to other watersheds in Maui and statewide. DAR assigns Pa‘akea a total watershed rating of 6 out of 10, a total biological rating of 6 out of 10, and a combined overall rating of 5 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis, Kulhia xenura, Lentipes concolor, Mugil cephalus* and *Sicyopterus stimpsoni*
Crustaceans — *Atyoida bisulcata*
Snails — *Neritina granosa*

(Pa‘akea IFSAR § 4.2, pp. 41 and § 4.4, p. 46; DAR Report on Pa‘akea Stream, Maui, Hawaii, October 2009, p. 6.)

432. The estimated natural (undiverted) median baseflow of Pa‘akea Stream is 0.90 cfs (0.58 mgd). The amount of flow in Pa‘akea Stream needed to achieve H_{90} is 0.58 cfs (0.37 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; Exh. HO-1.)

ii. Outdoor recreational activities

433. The recreational resources of Pa‘akea Stream were classified as substantial by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for fishing, and it was considered to be a high-quality experience. (Pa‘akea IFSAR § 5.0, p. 52.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

434. Riparian resources of Pa‘akea Stream were not classified by the Hawai‘i Stream Assessment. About 54% of the unit lies within the Hanawī Natural Area Reserve, and 20% within the Ko‘olau Forest Reserve. Approximately 61% of Pa‘akea is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. (Pa‘akea IFSAR § 6.0, pp. 56-58.)

iv. Aesthetic values

435. Pa‘akea Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of Pa‘akea Stream is predominately alien forests. A number of springs are located along the intermediate and lower reaches of the stream. The hydrologic unit lies within two forest reserves, Ko‘olau Forest Reserve and Hanawī Natural Area Reserve.

Mokuhuki Island may be viewed from the coast. Waiohue Bay is a popular fishing location. (Paʻakea IFSAR § 7.0, p. 64.)

v. Navigation

436. No navigation values are present. (Paʻakea IFSAR § 8.0, p. 66.)

vi. Instream hydropower generation

437. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Paʻakea Stream. (Paʻakea IFSAR § 9.0, p. 67.)

vii. Maintenance of water quality

438. Paʻakea Stream does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). Paʻakea Stream is classified as Class lb inland waters from its headwaters to approximately 1,300 feet elevation, as the surrounding land is in the conservation subzone "protective" and the stream also lies in the Koʻolau Forest Reserve. Downstream from the 1,300 feet altitude, the stream is classified as Class 2 inland waters and the stream does not lie within any forest reserve. Marine waters at the mouth of the entire hydrologic unit of Paʻakea are Class AA waters. (Paʻakea IFSAR § 10.0, pp. 71-72.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

439. No non-EMI registered diversions divert water for domestic or irrigation purposes. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the hydrologic unit of Paʻakea. (Paʻakea IFSAR § 11.0, p. 74.)

ix. Protection of traditional and customary Hawaiian rights

440. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Paʻakea. (Paʻakea IFSAR § 12.0, p. 91.)

f. Kuleana users

441. CWRM records for the hydrologic unit of Paʻakea indicate that there no registered diversions that were declared for taro cultivation. (Paʻakea IFSAR § 12.0, p. 80.)

18. Waiaaka (6062)

a. Physical features

442. The hydrologic unit of Waiaaka is located northeast of Haleakala. It covers an area of about 0.2 square miles from the lower slopes of Haleakala at 1,600 feet elevation to the sea. (Waiaaka IFSAR § 1.1, p. 1.)

443. Waiaaka Stream is 0.9 miles in length, traversing north from its headwater at the 1,300 feet altitude to the ocean. (Waiaaka IFSAR § 1.1, p. 1.)

b. Diversions

444. EMI operates a diversion on Waiaaka Stream at the Koʻolau Ditch. (Waiaaka IFSAR § 13.1 at 89.)

c. Gaging stations

445. One inactive USGS continuous-record stream gaging station (station 16513000) is located on Waiaaka Stream downstream of Koʻolau Ditch at the 650 feet altitude. The station has streamflow record for at least 14 years. Since the station is located downstream of the Koʻolau Ditch, strearnflow records reflect flows under diverted conditions. (Waiaaka IFSAR § 3.3, p. 29.)

d. Streamflow values

446. According to USGS, the natural median baseflow at the middle reach of Waiaaka below the Ko'olau Ditch is 0.77 cfs (0.41 mgd); at the lower reach it is 1.10 cfs (0.59 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11) and p. 64 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

447. Waiaaka Stream was not assessed in the Hawaii Stream Assessment. (Waiaaka IFSAR § 4.2, p. 40.)

448. The estimated natural (undiverted) median baseflow of Waiaaka Stream is 0.77 cfs (0.50 mgd). The amount of flow in Waiaka Stream needed to achieve H_{90} is 0.49 cfs (0.32 mgd). (Table attached to Gingerich WDT 10/31/14, p. 2; Exh. HO-1.)

ii. Outdoor recreational activities

449. The Hawaii Stream Assessment identified opportunities for fishing only related to Waiaaka Stream and it was considered to be a high-quality experience. (Waiaaka IFSAR § 5.0, p. 47.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

450. Riparian resources of Waiaaka Stream were not classified by the Hawaii Stream Assessment. Only a small percent of the hydrologic unit lies within the Ko'olau Forest Reserve. There are no non-tidal palustrine wetlands occurring in the hydrologic unit. (Waiaaka IFSAR § 6.0, pp. 51-53.)

iv. Aesthetic values

451. Vegetation surrounding Waiaaka Stream is predominately alien forests and grasslands with scattered Ohia forests and Uluhe shrub lands. A number of springs are located along the stream, with one of the springs near Hana Highway and another in the headwaters. Although the hydrologic unit does not lie within any forest reserve or preserve, the Na Ala Hele trail is located in the lower basin and crosses the stream where the public can access. Waiohue Bay is a popular fishing location. (Waiaaka IFSAR § 7.0, p. 59.)

v. Navigation

452. No navigation values are present. (Waiaaka IFSAR § 8.0, p. 61.).

vi. Instream hydropower generation

453. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Waiaakea Stream. (Waiaaka IFSAR § 9.0, p. 62.)

vii. Maintenance of water quality

454. Waiaaka Stream does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). Waiaaka Stream is classified as Class lb inland waters from its headwaters to Hana Highway (approximately 1,240 feet elevation), as the surrounding land is in the conservation subzone "protective." Downstream from Hana Highway, the stream is classified as Class 2 inland waters. Marine waters at the mouth of the hydrologic unit of Waiaaka are Class AA waters. (Waiaaka IFSAR § 10.0, pp. 66-67.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

455. No non-EMI diversions divert water for domestic or irrigation purposes. (Waiaaka IFSAR § 11.0, p. 69.)

ix. Protection of traditional and customary Hawaiian rights

456. According to the 1990 Hawai‘i Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Waiaaka. (Waiaaka IFSAR § 12.0, p. 80.)

f. Kuleana users

457. CWRM records for the hydrologic unit of Waiaaka indicate that there are no registered diversions that were declared for taro cultivation. (Waiaaka IFSAR § 12.0, p. 86.)

19. Kapaula (6063)

a. Physical features

458. The hydrologic unit of Kapaula is located northeast of Haleakala. It covers an area of 0.8 square miles from the lower slopes of Haleakala at 2,700 feet elevation to the sea. (Kapaula IFSAR § 1.1, p. 1.)

459. Kapaula Stream is 2.6 miles in length, traversing north from its headwater at the 2,340 feet altitude to the ocean. (Kapaula IFSAR § 1.1, p. 1.)

460. There is a terminal waterfall at the lower end of Kapaula Stream. (Kapaula IFSAR § 4.4, p. 44.)

b. Diversions

461. EMI operates a diversion on Kapaula Stream at the Ko‘olau Ditch. (Kapaula IFSAR § 13.1, p. 92.)

c. Gaging stations

462. Two inactive USGS continuous-record stream gaging stations are on Kapaula Stream. Station 16510000 at the 1,346 feet elevation is upstream from Ko‘olau Ditch, and it has

streamflow recorded for 40 years. Station 16511000 at the 540 feet elevation is downstream from Ko'olau Ditch, and it has streamflow recorded for 14 years. (Kapaula IFSAR § 3.3, p. 29.)

d. Streamflow values

463. According to USGS, the natural median baseflow at the upper reach of Kapaula Stream directly downstream of the Ko'olau Ditch is 2.80 cfs (1.50 mgd); at the middle reach it is 5.10 cfs (2.74 mgd); and at the lower reach it is 5.70 cfs (3.07 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11) and p. 64 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

464. For Kapaula Stream, the Hawaii Stream Assessment classifies the aquatic resources as "limited," meaning a limited number of native species were present. Kapaula Stream had a poor diversity of native stream animals. A terminal waterfall, reduced streamflow, and overall substrate of the streambed in the lower reach of Kapaula Stream reduces the amount of available instream habitat and has restricted those native species that lack climbing ability from inhabiting the stream. Only the native 'ōpae kala'ole *(Atyoida bisulcata)* was recorded and it was observed in the upper reach. Kapaula Stream rates minimal in comparison to other watersheds in Maui and statewide. DAR assigns Kapaula a total watershed rating of 6 out of 10, a total biological rating of 4 out of 10, and a combined overall rating of 3 out of 10. Native species observed in the stream include:

Crustaceans — *Atyoida bisulcata*
Insect — *Anax junius, Anax* sp. and *Megalagrion* sp.

(Kapuala IFSAR § 4.2, pp. 40 and § 4.4, p. 44; Exh. C-144, p. 6.)

465. The estimated natural (undiverted) median baseflow of Kapaula Stream is 2.80 cfs (1.81 mgd). The amount of flow in Kapaula Stream needed to achieve H_{90} is 1.80 cfs (1.16 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; Exh. HO-1.)

ii. Outdoor recreational activities

466. The recreational resources of Kapaula Stream were classified as substantial by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for fishing related to Kapaula Stream and it was considered to be a high-quality experience. (Kapuala IFSAR §5 .0, p. 50.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

467. Riparian resources of Kapaula Stream were not classified by the Hawai 1 Stream Assessment. About 25% of the unit lies within the Hanawī Natural Area Reserve, and 12% within the Ko'olau Forest Reserve. Approximately 36% of Kapaula is classified as non-tidal palustrine wetlands occurring in the upper slopes of the hydrologic unit. (Kapuala IFSAR § 6.0, pp. 54-56.)

iv. Aesthetic values

468. Kapaula Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of Kapaula Stream is predominately alien forests. Several waterfalls are located along the lower reach near the mouth of the stream. Numerous spring are also located along the stream, and some are located near the Hana Highway. The hydrologic unit lies within two forest reserves, Ko'olau Forest Reserve and Hanawī Natural Area Reserve. The

body of water that the stream empties into is adjacent to Waiohue Bay, and both are used for fishing. (Kapuala IFSAR § 7.0, p. 62.)

v. Navigation

469. No navigation values are present. (Kapuala IFSAR § 8.0, p. 64.)

vi. Instream hydropower generation

470. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Kapuala Stream. (Kapuala IFSAR § 9.0, p. 65.)

vii. Maintenance of water quality

471. Kapaula Stream does not appear on the 2006 List of Impaired Waters in Hawai‘i, Clean Water Act § 303(d). Kapaula Stream is classified as Class lb inland waters from its headwaters to approximately 1,200 feet elevation, as the surrounding land is in the conservation subzone "protective." It should be noted that the conservation subzone map utilized for this interpretation is general and elevations are not exact. It should also be noted that there is no direct relationship between elevation and attainment of water quality standards. Marine waters at the mouth of the hydrologic unit of Kapaula are Class AA waters. (Kapuala IFSAR § 10.0, p. 70.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

472. No non-EMI diversions divert water for domestic or irrigation purposes. The DOH Safe Drinking Water Branch does not currently regulate any public water systems in the hydrologic unit of Kapaula. (Kapuala IFSAR § 11.0, p. 72.)

ix. **Protection of traditional and customary Hawaiian rights**

473. According to the 1990 Hawai'i Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Kapaula. (Kapuala IFSAR § 12.0, p. 89.)

f. **Kuleana users**

474. CWRM records for the hydrologic unit of Kapaula indicate that there are no registered diversions that were declared for taro cultivation. (Kapuala IFSAR § 12.0, p. 80.)

20. Hanawī (6064)

a. **Physical features**

475. The hydrologic unit of Hanawī is located northeast of Haleakala. It covers an area of 5.6 square miles from the upper slopes of Haleakala at 8,000 feet elevation to the sea. (Hanawī IFSAR § 1.1, p. 1.)

476. Hanawī Stream is about 7 miles in length, traversing north from its headwater at the 7,300 feet altitude to the ocean. (Hanawī IFSAR § 1.1, p. 1.)

b. **Diversions**

477. EMI operates a diversion on Hanawī Stream at the Ko'olau Ditch. (Hanawī IFSAR § 13.1, p. 97.)

c. **Gaging stations**

478. Two USGS continuous record stream gaging stations are on Hanawī Stream, one of which is currently in operation. Active station 16508000 is immediately upstream of the Ko'olau Ditch at the 1,318 feet altitude. Inactive station 16509000 is downstream of the Ko'olau Ditch at the 500 feet altitude. Streamflow record for the active station dates back to 1914. Since

the station is located upstream of the ditch, streamflow records reflect flows from natural (undiverted) conditions. (Hanawī IFSAR § 3.3, p. 30.)

d. Streamflow values

479. According to USGS, the natural median baseflow at the upper reach of Hanawī Stream directly downstream of the Koʻolau Ditch is 4.60 cfs (2.48 mgd); at the middle reach it is 24.00 cfs (12.92 mgd); and at the lower reach it is 26.00 cfs (13.99 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11) and p. 64 (Table 12).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

480. For Hanawī Stream, the Hawaii Stream Assessment classifies the aquatic resources as "outstanding," meaning a diversity of native species were present. A number of native stream animals were observed in Kopiliʻula Stream, including ʻoʻopu nākea *(Awaous guamensis),* ʻoʻopu nōpili *(Sicyopterus stimpsoni),* ʻoʻopu akupa *(Eleotris sandwicensis),* ʻoʻopu alamoʻo *(Lentipes concolor),* ʻōpae kalaʻole *(Atyoida bisulcata),* hīhīwai *(Neritina granosa),* and aholehole *(Kuhlia xenura).* During the most recent surveys, most of these native species were observed in the lower and middle reaches below the ditch level. ʻOʻopu alamoʻo was abundant in the middle reach. All these stream animals except the ʻoʻopu akupa were observed in the lower, middle, and upper reaches in past surveys. Hanawī has a small estuary; however, no estuary survey was conducted. Hanawī Stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns Hanawī a total watershed rating of 8 out of 10, a total biological rating of 8 out of 10, and a combined overall rating of 9 out of 10. Native species observed in the stream include:

Fish — *Awaous guamensis, Eleotris sandwicensis,* Gobiid sp. *Kuhlia sandwicensis, Kuhlia* sp., *Kulhia xenura, Lentipes concolor, Sicyopterus stimpsoni,* and *Stenogobius hawaiiensis*
Crustaceans —*Atyoida bisulcata*
Insects — *Anax junius, Anax* sp., *Megalagrion blackburni, Megalagrion calliphya, Megalagrion hawaiiense, Megalgrion nigrohamatum, Megalagrion pacificum, Megalagrion* sp., *Procanacae* sp., and *Telmatogen* sp.
Snails — *Neritina granosa*

(Hanawī IFSAR § 4.2, pp. 42 and § 4.4, p. 46; DAR Report on Hanawī Stream, Maui, Hawai'i, October 2009, p. 5.)

481. The estimated natural (undiverted) median baseflow of Hanawī Stream is 4.60 cfs (2.97 mgd). The amount of flow in Hanawī Stream needed to achieve H_{90} is 2.90 cfs (1.87 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; Exh. HO-1.)

482. Overall, close to 100 percent of the natural habitat for all species in Hanawī Stream was already maintained below Koolau Ditch under diverted conditions. (Hanawī IFSAR § 4.3, p. 44.)

ii. Outdoor recreational activities

483. The recreational resources of Hanawī Stream were classified as outstanding by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for camping, hiking, fishing, hunting, swimming, and scenic views related to Hanawī Stream. Only camping and hunting were not considered to be high-quality experiences. (Hanawī IFSAR § 5.0, p. 54.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

484. Riparian resources of Hanawī Stream were classified as outstanding by the Hawaii Stream Assessment. About 74% of the unit lies within the Hanawī Natural Area Reserve, and 6% within the Ko'olau Forest Reserve and the Haleakala National Park. Nearly 72% of

Hanawī is classified as non-tidal palustrine wetlands occurring in the intermediate and upper slopes of the hydrologic unit. (Hanawī IFSAR § 6.0, pp. 58-60.)

iv. Aesthetic values

485. Hanawī Stream is fed by lush native communities of Ohia forests and forested wetlands that dominate the upper and intermediate slopes of the hydrologic unit. Vegetation surrounding the lower reaches of the stream is predominately alien forests. A number of waterfalls are located along the lower reaches of the stream, most of which are followed by a plunge pool. One of the waterfalls can be viewed from Hana Highway, and another waterfall is located immediately downstream from the highway. The hydrologic unit lies within two forest reserves, Koʻolau Forest Reserve and Hanawī Natural Area Reserve. Hanawī Stream empties into Honolulu Nui Bay, which is a popular fishing location. (Hanawī IFSAR § 7.0, p. 61.)

v. Navigation

486. No navigation values are present. (Hanawī IFSAR § 8.0, p. 68.)

vi. Instream hydropower generation

487. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Hanawī Stream. (Hanawī IFSAR § 9.0, p. 69.)

vii. Maintenance of water quality

488. Hanawī Stream appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d). While some data exist for Hanawī Stream, there were not sufficient data for decision-making; therefore, no decision was made pertaining to the attainment of State of Hawaii Water Quality Standards or the applicable designated uses. Hanawī Stream is classified as Class lb inland waters from its headwaters to approximately 1,300 feet elevation, as the surrounding

land is in the conservation subzone "protective" and the steam also lies in the Hanawī Natural Area Reserve and the Ko'olau Forest Reserve. The rest of the stream is classified as Class 2 inland waters. Marine waters at the mouth of the entire hydrologic unit of Hanawī are Class AA waters. (Hanawī IFSAR § 10.0, pp. 74-75.)

viii. Conveyance of irrigation and domestic water supplies to downstream points

489. There are a total of six registered diversions, of which five are EMI diversions. The one remaining diversion is the Nahiku Pump which was registered by Maui Land & Pine (MLP) and which is used to pump water from the stream into the Koolau Ditch for transport to MLP's Upcountry fields via the EMI System. (Hanawī IFSAR § 11.0, p. 77.)

ix. Protection of traditional and customary Hawaiian rights

490. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Hanawī. (Hanawī IFSAR § 12.0, p. 94.)

f. Kuleana users

491. CWRM records for the hydrologic unit of Hanawī indicate that there are no diversions declared for taro cultivation or other domestic purposes. (Hanawī IFSAR § 12.0, p. 88.)

21. Makapipi (6065)

a. Physical features

492. The hydrologic unit of Makapipi is located northeast of Haleakala. It covers an area of 3.3 square miles from the intermediate slopes of Haleakala at 5, l50 feet elevation to the sea. (Makapipi IFSAR § 1.1, p. 1.)

493. Makapipi Stream is about 4.4 miles in length, traversing north from its headwater at the 3,300 feet altitude to the ocean. (Makapipi IFSAR § 1.1, p. 1.)

494. Makapipi Stream flows directly to the ocean through a cobble beach from a small waterfall. (DAR Report on Makapipi Stream, Aug. 2009, p. 6; Makapipi IFSAR § 7.0, p. 62.)

495. In 2001, during the dengue fever outbreak, EMI closed its Makapipi Stream diversion at the request of the State Department of Health (DOH), allowing all of the water to flow in the natural streambed in order to limit breeding opportunities for mosquitoes. The diversion was closed from September 20-21, 2001. EMI discovered from the release the existence of losing reaches below the diversion right below of the Hana Highway Bridge that caused most of the stream water to disappear into the ground, resulting in more pools of standing water instead of a continuous flowing stream. Because this defeated the purpose for the releases, the experiment was terminated and the diversion reopened after two days. (Exh. C-53, p. 1.)

b. Diversions

496. EMI operates a diversion on Makapipi Stream at the Ko‘olau Ditch. (Makapipi IFSAR § 13.1, p. 94.)

c. Gaging stations

497. Three USGS gaging stations are on Makapipi Stream, one of which is a continuous-record stream gaging station. Station 16507000 is located on Makapipi Stream upstream from Hana Highway. Station 16506000 measured the amount of water flowing from the development tunnels into Ko‘olau Ditch, and it had 17 years of complete record (1949-1965). Station 16506500 measured the spring discharge at Makapipi Spring. (Makapipi IFSAR § 3.3, p. 30.)

d. Streamflow values

498. According to USGS, the natural median baseflow at the upper reach of Makapipi is 1.30 cfs (0.70 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; USGS Regression Study, p. 60 (Table 11).)

e. Instream values

i. Maintenance of aquatic life and wildlife habitats

499. For Makapipi Stream, the Hawaii Stream Assessment classifies the aquatic resources as "outstanding," meaning a diversity of native species were present. A number of native stream animals were observed in Makapipi Stream, including ʻoʻopu naniha *(Stenogobius hawaiiensis),* ʻoʻopu nākea *(Awaous guamensis),* ʻoʻopu akupa *(Eleotris sandwicensis),* ʻoʻopu alamoʻo *(Lentipes concolor),* ʻōpae kalaʻole *(Atyoida bisulcata),* and aholehole *(Kuhlia xenura).* During the most recent surveys, ʻoʻopu alamoʻo was observed in the middle and upper reaches. ʻŌpae kalaʻole was only observed in the upper reach; although it was recorded to inhabit the lower and middle reaches of Makapipi Stream. Makapipi has a small estuary; however, no estuary survey was conducted. Makapipi Stream rates high in comparison to other watersheds in Maui and statewide. DAR assigns Makapipi a total watershed rating of 8 out of 10, a total biological rating of 6 out of 10, and a combined overall rating of 8 out of 10. Native species observed in the stream include:

> Fish — *Awaous guamensis, Eleotris sandwicensis,* Gobiid sp., *Lentipes concolor, Kuhlia sandwicensis, Kuhlia* sp., and *Sicyopterus stimpsoni*
> Crustaceans — *Atyoida bisulcata*
> Worms — Hirudinean sp.

(Makapipi IFSAR § 4.2, pp. 39 and § 4.4, p. 42; DAR Report on Makapipi Stream, Maui, Hawaiʻi, October 2009, p. 6.)

500. The estimated natural (undiverted) median baseflow of Makapipi Stream is 1.30 cfs (0.84 mgd). The amount of flow in Makapipi Stream needed to achieve H_{90} is 0.83 cfs (0.54 mgd). (Table attached to Gingerich WDT 10/31/14, p. 1; Exh. HO-1.)

ii. Outdoor recreational activities

501. The recreational resources of Makapipi Stream were classified as substantial by the Hawaii Stream Assessment's regional recreational committee. The Hawaii Stream Assessment identified opportunities for hiking, fishing, hunting, swimming, and scenic views related to Makapipi Stream. Of the four, fishing and scenic view were considered to be a high-quality experience. (Makapipi IFSAR § 5.0, p. 50.)

iii. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

502. Riparian resources of Makapipi Stream were not classified by the Hawaii Stream Assessment. About 38% of the unit lies within the Hanawī Natural Area Reserve, and 14% within the Ko‘olau Forest Reserve. Approximately 42% of Makapipi is classified as non-tidal palustrine wetlands occurring in the intermediate and upper slopes of the hydrologic unit. (Makapipi IFSAR § 6.0, pp. 54-56.)

iv. Aesthetic values

503. Makapipi Stream is fed by lush native communities of Ohia forests and forested wetlands that lie within the Hanawī Natural Area Reserve and Ko‘olau Forest Reserve. Vegetation surrounding the lower reach of the stream is predominately alien forests. Despite a relatively large number springs located along Makapipi Stream, the stream is intermittent for most of the year. However with sufficient rainfall, the stream can be seen flowing over a waterfall (i.e., Makapipi Falls) just below Hana Highway, and the public can only view the

waterfall from the top. At other times, the waterfall is usually only a trickle if not dry. Makapipi Stream empties into Honolulu Nui Bay, which offers opportunities for fishing, crabbing, and opihi and lobster catching. Nahiku is located off of Hana Highway. At the end of Lower Nahiku Road is Nahiku Cove. (Makapipi IFSAR § 7.0, p. 62.)

v. Navigation

504. No navigation values are present. (Makapipi IFSAR § 8.0, p. 64.)

vi. Instream hydropower generation

505. HC&S operates three run-of-river hydroelectric facilities on the Wailoa Ditch, which is supplied with water from several sources including Makapipi Stream. (Makapipi IFSAR § 9.0, p. 65.)

vii. Maintenance of water quality

506. Makapipi Stream does not appear on the 2006 List of Impaired Waters in Hawai‘i, Clean Water Act § 303(d). Makapipi Stream is classified as Class lb inland waters from its headwaters to approximately 1, l00 feet elevation, as the surrounding land is in the conservation subzone “protective” and the stream also lies in the Hanawī Natural Area Reserve in the headwaters and then the Ko‘olau Forest Reserve in the intermediate reach. Between the 1, l00 feet altitude and the coast, the stream is mostly classified as Class 2 inland waters excepting a short reach near the 1,000 feet altitude in which the stream lies within the Ko‘olau Forest Reserve and is classified as Class la inland waters. Marine waters at the mouth of the hydrologic unit of Makapipi are Class AA waters. (Makapipi IFSAR § 10.0, p. 70.)

viii. Conveyance of irrigation and domestic water supplies to downstream points of diversion

507. There are a total of three registered diversions, of which one is an EMI diversion. Of the two remaining registered diversions, one registrant declared water use for domestic

purposes, landscaping, and irrigation of three acres of rice, watercress, taro, and aquaculture. The other registered diversion declared water use for domestic purposes and irrigation of .577 acres of crops and landscaping. (Makapipi IFSAR § 11.0, p. 72.)

ix. Protection of traditional and customary Hawaiian rights

508. According to the 1990 Hawaii Coastal Zone Management Program's *Hawaiian Fishpond Study for the Islands of Hawaii, Maui, Lanai, and Kauai,* there are no fishponds present in the hydrologic unit of Makapipi. (Makapipi IFSAR § 12.0, p. 90.)

f. Kuleana users

509. CWRM records for the hydrologic unit of Makapipi indicate that there are a total of 3 registered diversions. Two of the diversions were declared for taro cultivation or other domestic purposes. (Makapipi IFSAR § 12.0, p. 84.)

510. Jeffrey Paisner is the owner of property designated as TMK (2) 1-2-001:018, which abuts Makapipi Stream. Mr. Paisner lived on the property from 1972 through 1979. In 1979, he moved to New York and entrusted the property to a caretaker. From 1979 until the present, Mr. Paisner has visited the property from time to time. (Paisner, WDT 12/30/14, 1 5.)

511. Mr. Paisner claims that taro was historically cultivated on his property. Mr. Paisner bases his claim on conversations with other Nahiku residents about the history of Nahiku. He has no firsthand knowledge that taro was cultivated on his property. He has never grown taro on his property. (Paisner, WDT 12/30/14, 1 6; Paisner, Tr., 3/11/15, p. 23, 1. 17 to p. 24, 1. 9.)

512. Mr. Paisner also stated that he has found walls and terraces on his property. He does not know when the walls and terraces on his property were built. (Paisner, tr., 3/11/15, p. 24, 1. 10 to p. 25, l. 2.)

513. Mr. Paisner did not submit evidence demonstrating that any portion of his property was in taro cultivation at the time of the Great Mahele.

514. Mr. Paisner did not submit evidence describing the size of the lo‘i that he claims were located on his property.

E. Stream Diversions

1. EMI's Ditch System

515. The Ditch system was constructed in phases, beginning in the 1870s and extending to the completion of the current system in 1923. (Hew, WDT, 12/30/14, ¶ 5.)

516. From mauka to makai, the major ditches that cross Honopou Stream (the western boundary of the state lease areas) are the Wailoa Ditch, the New Hamakua Ditch, the Lowrie Ditch, and the Haiku Ditch. The major ditches that cross Maliko Gulch, the border between EMI's ditch system and HC&S's sugarcane fields, are the Wailoa Ditch, the Kauhikoa Ditch, the Lowrie Ditch, and the Haiku Ditch. (*See* Exh. C-33.)

517. Water sold to MDWS from EMI's Haiku Uka watershed (collected through MDWS's Waikamoi Upper Flume and Waikamoi Lower Pipeline, *see* Exh. C-33, and described, infra, at FOF 71) is removed east of Honopou Stream and is therefore not captured by the gages at Honopou and need to be added to the amounts measured at Honopou for total license area yields. (Hew, WDT, 12/30/14, ¶ 12.)

518. EMI records the amount of water delivered to HC&S at gages in the four ditches that cross Maliko Gulch. Most of the recorded flows are from the four license areas, which end at

Honopou Stream, but some water is collected in streams between Honopou Stream and Maliko Gulch. (Hew, WDT, 12/30/14, ¶ 24.)

519. The delivery capacity of the EMI system is 450 mgd. The long-term average delivery by EMI to HC&S has been 165 mgd, but since 1999, deliveries have decreased significantly, and in the ten year period from 2004-2013, the average delivery was 126 mgd. (Hew, WDT, 12/30/14, ¶ 23, 30.)

520. The HC&S irrigation system is designed to operate at the maximum extent possible on gravity flow from higher to lower elevations, so it is critical that the maximum amount of water possible is taken into the HC&S system at the Wailoa Ditch, the ditch at the highest elevation, which has a capacity of 195 mgd. (Hew, WDT, 12/30/14, ¶ 28.)

521. When the Wailoa Ditch is filled to capacity, it overflows into the New Hamakua Ditch via the streams. Once the New Hamakua has reached capacity, it overflows via the streams into the Lowrie Ditch. And if the Lowrie is filled to capacity, it overflows into the Haiku Ditch via the streams. (Hew, Tr., 3/18/15, p. 144, ll. 9-21.)

522. Surface water flows from East Maui can fluctuate tremendously from day to day and cannot be relied on at times to meet the irrigation requirements of HC&S. When the Wailoa ditch flow is extremely low, the lower ditches have little or no water. (Hew, WDT, 12/30/14, ¶ 29.)

523. At Honopou:

a. for the Wailoa Ditch from 1922 to 1987, daily flows ranged from 1.8 to 328 cubic feet per second (cfs), or 1.16 to 212 mgd,[12] averaging 108.8 mgd, with flows less than 42.46 mgd for five days out of a year;

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[12] 1 cfs equals 0.6463 mgd.

b. for the New Hamakua Ditch from 1918 to 1985, daily flows ranged from zero to 120.2 mgd, averaging 2.89 mgd, with flows less than 0.27 mgd for four days out of a year;

c. for the Old Hamakua Ditch from 1918 to 1965, daily flows ranged from zero to 39.43 mgd, averaging 0.05 mgd, with flows lowest in June and averaging 0.03 mgd;

d. for the Lowrie Ditch from 1910 to 1985, daily flows ranged from zero to 74.97 mgd, averaging 16.23 mgd, with flows less than 2.72 mgd for five days out of a year; and

e. for the Haiku Ditch from 1910-1985, daily flows ranged from zero to135.1 mgd, averaging 2.84 mgd, with flows less than 0.36 mgd three days out of a year. (Exh. C-101, pp. 74-77.)

524. Thus, historically, the combined flows of these ditches at Honopou Stream, the end of the flows collected from the four license areas, *supra*, FOF 518, averaged 130.81 mgd, nearly all from the Wailoa Ditch (108.8 mgd). If we assume that the lowest and highest flows occurred in the ditches at approximately the same time, the lowest combined flow was 1.16 mgd (all from the Wailoa Ditch), and the highest flow was 581.52 mgd, *supra*, FOF 523.

525. There are primarily four ways to reduce the amount of water that is collected and transported in the EMI ditch system: 1) on streams that have controlled diversions, by closing or reducing the diversion intake gate openings; 2) on stream diversions that have sluice gates, by partially or completely opening the sluice gates; 3) on streams that have radial gates between the diversions and the ditch, by completely closing the radial gates; and 4) by partially or or completely closing the gates on the main control points on the ditches themselves to limit the amount of water that can pass each control point, the effect of which is to redirect any excess water into the stream crossed by the ditch where the control point is located. (Hew, WDT, 10/17/16, ¶ 3.) [HC&S on reopening, FOF 78.]

526. Controlled diversions have intake gate openings, which are typically constructed with wooden boards or metal plates, used to regulate how much water can flow from the stream into the diversion structure. (Hew, WDT, 10/17/16, ¶ 4.) [HC&S on reopening, FOF 79.]

527. Sluice gates are openings within the basin of the diversions that can be opened to discharge the water collected in the diversion back into the stream. Periodically opening sluice gates to flush out silt, gravel, and other debris that collects in the diversion structures is one of the normal means of maintaining the proper functioning of the ditch system. The effect of opening a sluice gate is to return water to the stream after it has entered the diversion structure. It may not always cause 100% of the water that entered the diversion to be discharged back into the stream, because during periods of heavy rainfall, water may back up in the diversion faster than it can be discharged through the sluice gate, in which case some water will still enter the ditch. During most flow conditions, however, completely opening the sluice gate will return practically all of the water to the stream. (Hew, WDT, 10/17/16, ¶ 5.) [HC&S on reopening, FOF 80.]

528. Radial gates are located along the tunnel reaches of the ditch and were designed to automatically open or close in relation to the water level in the tunnel. The gates are controlled by a float located in a float chamber in the tunnel that is connected to a cable that lifts or lowers the radial gate, depending on the water level in the tunnel. The operation of the gate can be adjusted by piping water to the float chamber and closing the drain valve on the chamber to raise the float to maintain the gate in the closed position. (Hew, WDT, 10/17/16, ¶ 6.) [HC&S on reopening, FOF 81.]

529. There are several main ditch control points on each of the ditches: 1) 6 on the Koolau Ditch; 2) 4 on the Spreckels Ditch; 3) 3 on the Manuel Luis/Center Ditch; 4) 2 on the

Wailoa Ditch/Tunnel; 5) 4 on the New Hamakua Ditch; 6) 3 on the Lowrie Ditch; and 7) 2 on the Haiku Ditch. (Hew, WDT, 10/17/16, ¶ 7.) [HC&S on reopening, FOF 82.]

530. EMI manages the reduction in diversions through a combination of measures that involve adjusting the intake control gates on the streams with controlled diversions, opening the sluice gates at the diversion on streams that have sluice gates, adjusting the operation of radial gates on the streams that have radial gates, and partially or completely closing the gates on main ditch control points. The precise combination of measures at any point in time depends on the amount of water to serve the needs of HC&S and MDWS, and the amount of rainfall that is occurring in the watersheds that span the ditch system. (Hew, WDT, 10/17/16, ¶ 8.) [HC&S on reopening, FOF 83.]

531. At the time of the hearing, EMI had closed the intakes on all of the streams with controlled diversions, opened the sluice gates on the majority of the diversions that have sluice gates, closed the radial gates on a couple of streams with radial gates, and has closed the 6 main ditch control points on the Koolau Ditch. The sluice gates have been opened on Nuaʻailua Stream, Alo Stream, and Waikamoi Stream on the Center Ditch, and three of the four sluice gates of the main intakes on Honomanū Stream. One of the sluice gates on Honomanū Stream cannot be opened because it is inoperable, but water is released into the west tributary of Honomanū Stream (Uluwini Stream) further down at a control gate in the Spreckels Ditch. (Hew, Tr., 2/6/17, p. 94, ll. 11-23, p. 95, l. 19 to p. 96, l. 12.) [HC&S on reopening, FOF 84.]

532. The effect of these measures is to rely principally on water entering the ditch system west of Piʻinaʻau Stream (i.e., from the Honomanū and Huelo license areas) to meet the current level of reduced needs of HC&S and MDWS. With these measures in place, water flows

in the Wailoa Ditch at Maliko Gulch have been reduced to 20-25 mgd. (Hew, WDT, 10/17/16, ¶ 9.) [HC&S on reopening, FOF 84.]

533. The Wailoa Ditch is the highest of EMI's ditches. Nearly all the flows from the four license areas are from the Wailoa Ditch (83%). When the flow in the Wailoa Ditch is extremely low, there are little or no flows in the lower ditches. FOF 516-520, *supra*.)

534. Under drought conditions, a different set of gate adjustments would be implemented, because EMI expects that it would not be possible to meet even the current lowered needs without importing water from further east, in the Nahiku and Ke'anae areas, where base flows are more reliable and there is a ground water contribution to the Koolau Ditch, in order to maintain a consistent flow in the Wailoa Ditch. (Hew, WDT, 10/17/16, ¶ 10.) [HC&S on reopening, FOF 85.]

535. As irrigation requirements increase from the ongoing implementation of diversified agriculture, EMI expects to implement a selective opening of board gates, readjusting the opening of sluice gates, resetting of radial gates, and readjusting of main ditch control gates to increase the amount of water brought into the ditch system. These measures will be dictated by the flow levels needed at Maliko Gulch and the rainfall patterns throughout the East Maui watersheds. (Hew, WDT, 10/17/16, ¶ 11.) [HC&S on reopening, FOF 86.]

536. With regard to the implementation of the restoration of the streams that A&B has stated it will permanently restore, EMI has: 1) closed the intakes and opened the sluice gates on the diversions on East and West Wailuanui Streams on the Koolau Ditch; 2) opened the sluice gate on Palauhulu Stream on the Koolau Ditch; 3) opened the sluice gates on the diversions on Hanehoi and Puolua Streams on the Haiku Ditch; and 4) opened the sluice gate and closed the radial gate on the Wailoa Ditch, made modifications to the intake on the New Hamakua Ditch,

opened the sluice gate and closed the intake diversion on the Lowrie Ditch, and modified the diversion on the Haiku Ditch on Honopou Stream. (Hew, WDT, 10/17/16, ¶ 12.) [HC&S on reopening, FOF 87.]

537. Further measures for restoration of these streams cannot be taken until EMI obtains all necessary permits and government approvals. On September 16, 2016, EMI submitted its applications to abandon the following stream diversions: Honopou, Hanehoi (Puolua), Waiokamilo, Kualani,[13] Pi‘ina‘au, Palauhulu, and East and West Wailuanui Streams. Other pending approvals and concurrences will be needed from the County of Maui, DLNR's Office of Conservation and Coastal Lands, and the U.S. Army Corps of Engineers. (Hew, WDT, 10/17/16, ¶¶ 13-14.) [HC&S on reopening, FOF 88.]

538. The reduction in diversions does not by itself compromise the structural integrity of the EMI ditch system so long as the complete system, including the open ditches and roadways, continues to be maintained as a single, coordinated system. Consistently reduced flows will increase the amount of maintenance required of the open ditches in the system, because it will increase the surface areas that will need to be periodically cleared of vegetation. (Hew, WDT, 10/17/16, ¶¶ 15.) [HC&S on reopening, FOF 90.]

2. MDWS

539. MDWS receives water from EMI through:

a. groundwater from a development tunnel in the Koolau Ditch for the Nahiku community;

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13 "Kualani" as used here refers to the easternmost tributary of Waiokamilo Stream, now known as East Waiokamilo Stream, which was mistaken for Kualani Stream, which is below the ditch system and not diverted, *supra*, FOF 57, *infra*, FOF 308.

b. streams in EMI's Haiku Uka watershed through the upper and lower Waikamoi flumes that MDWS maintains to serve its Olinda/Upper Kula and Piiholo water treatment plants;

c. water from the Wailoa Ditch after it enters HC&S's lands to serve its Kamole water treatment plant; and

d. non-potable water from HC&S's Hamakua Ditch at Reservoir 40 to serve the Kula Agricultural Park. (Hew, WDT, 12/30/14, ¶ 20; Hew, Tr., 3/18/15, pp. 192-193; David Taylor, WDT, ¶ 7; Exh. C-33.)

540. MDWS diverts stream water directly through its upper and lower Waikamoi flumes, and receives stream waters from EMI's Wailoa Ditch and its continuation as HC&S's Hamakua Ditch, *See* Exh. C-33.

541. The upper Waikamoi flume diverts water from the Waikamoi, Puohokamoa, and Haipuena Streams to the Olinda/Upper Kula water treatment facility. Water for this facility is stored in the 30-million gallon Waikamoi reservoirs and the 100-million gallon Kahakapao reservoirs, *see* Exh. C-33. The Olinda facility's average daily production is 1.6 mgd, with a capacity of 2 mgd. (David Taylor, WDT, ¶ 11; Exh. B-3, p. 25; David Taylor, Tr., March 11, 2015, pp. 47, 140.) [MDWS FOF 25.]

542. The lower Waikamoi flume diverts water from the Waikamoi, Puohokamoa, Ha'ipua'ena and Honomanū Streams to the Piiholo water treatment facility. Water for this facility is stored in the 50-million gallon Piiholo Reservoir, *see* Exh. C-33. The Piiholo facility's average daily production is 2.5 mgd, with a capacity of 5 mgd. (David Taylor, WDT, ¶ 10; Eh. B-3, p. 25; David Taylor, Tr., March 11, 2015, p. 47.) [MDWS FOF 24.]

543. The stream flows are variable, so the reservoirs provide storage so that there is a relatively constant amount of water available to the treatment facilities, regardless of streamflow. (David Taylor, Tr., March 11, 2015, p. 49.)

544. There are no gages on the Waikamoi flumes, so there is no way to measure the amount of water being diverted from the streams. Because the new upper Waikamoi flume isn't going to be leaking, MDWS assumes that everything that goes in will come out. MDWS measures the reservoir levels every day, so once the new flume is functional, MDWS will be able to calculate how much water is coming from the flume on days when the main intake from the dam is dry, which is most of the days. All of the water coming in will be from the flume. (David Taylor, Tr., March 11, 2015, pp. 59-60; *See* FOF 835, et seq.)

545. EMI's Wailoa ditch, which diverts multiple streams (*see* Exh. C-33 and FOF 60, *supra*), is the source of water for MDWS's Kamole water treatment facility. The Kamole facility's average daily production is 3.6 mgd, with a capacity of 6 mgd. This capacity could be expanded relatively quickly, should MDWS have assurances of greater access to water, as evidenced by recent upgrades to the ʻĪao Surface Water Treatment Plant. (David Taylor, WDT, ¶ 9; Exh. B-3, p. 24; David Taylor, Tr., March 11, 2015, p. 47; Taylor, Supplemental Declaration on Reopening, ¶¶ 3-9; Exhs. B-073, B-074.) [MDWS FOF 23; MDWS on reopening, FOF 77.]

546. MDWS owns the upper and lower Waikamoi flumes and has a contract with EMI to service the diversions to keep them clear. MDWS also takes water directly from the Wailoa ditch. (David Taylor, Tr., March 11, 2015, p. 53.)

547. HC&S's Hamakua ditch (the western extension of the Wailoa ditch), at reservoir 40 (*see* Exh. C-33), is the source of water for Kula Agricultural Park, where two reservoirs have a total capacity of 5.4 million gallons. The Park consists of 31 farm lots which range in size from 7 to 29 acres, and which are owned by the County of Maui. Individual lots are metered and billed by MDWS. (David Taylor, WDT, ¶ 13; Exh. B-4.) [MDWS FOF 27.]

548. MDWS pays EMI $0.06 per thousand gallons ($60/million gallons). (Hew, WDT, 12/30/14, ¶ 21.)

549. The original contract between MDWS and EMI was entered into in 1961, which was replaced by a 1973 “Memorandum of Understanding” with a term of 20 years. Since its expiration, there have been a total of 8 extensions. After the lapse of the most recent extension, EMI has continued to provide water to MDWS through a memorandum dated April 13, 2000. (David Taylor, WDT, ¶ 15; Exhs. B-5 to 15.) [MDWS FOF 29.]

550. The memorandum provides that MDWS will receive 12 mgd from the Wailoa ditch with an option for an additional 4 mgd, for a total of 16 mgd. During periods of low flow, no water will be diverted to lower-elevation ditches, and MDWS will receive a minimum allotment of 8.2 mgd and HC&S will also receive 8.2 mgd. If these minimum amounts cannot be delivered, MDWS and HC&S will receive prorated shares of the water available. (David Taylor, WDT, ¶ 15; Exh. B-5; David Taylor, Tr., March 11, 2015, pp. 53-54; Hew, Tr., March 18, 2015, pp. 146-147.) [MDWS FOF 30.]

551. Average daily use by MDWS from the Wailoa ditch is 7.1 mgd, which includes water for the Kamole facility, averaging 3.6 mgd (see FOF 545, *supra*), and the Kula Agricultural Park. (David Taylor, Tr., March 11, 2015, pp. 81-83.)

F. Estimates of Stream Flows

552. Prior to the partial restorations of twelve streams in 2008 and 2010 and subsequent installation of gages in these streams, there were only four active gages, one each in Hanawī Stream, West Wailuaiki Stream, Waiokamilo Stream, and Honopou Stream (which is outside the study area to be described, *infra*). (2005 Flow Study, p.4 and Table 1; Exh. C-101, p. 28; Exh. C-85, 47.)

553. Gages had been previously installed on a number of streams for various periods of time and for various years. For example, Makapipi Stream had a gage at 920 feet elevation between 1932-1945; Hanawī Stream had gages at 500 feet elevation between 1932-1947 and again between 1992-1995, and at 1,318 feet elevation between 1914-1915 and again between 1921-Present; and West Wailuaiki Stream had a gage at 1343 feet elevation between 1914-1917 and again between 1921-Present. (2005 Flow Study, Table 1.)

554. In 2002 to 2005, USGS conducted studies to: 1) assess the effects of existing diversions on flows of perennial streams in northeast Maui, 2) characterize the effects of diversions on instream temperature variations, and 3) estimate the effects that streamflow restoration (full or partial) would have on the availability of habitat for native stream fauna (fish, shrimp and mollusks) in northeast Maui. The study area contained 22 named streams from the drainage basins of Makapipi Stream in the east to Kōlea Stream to the west (Streams # 1 and #24 in FOF 58, *supra*). (2005 Flow Study, p. 3.) The first study is summarized in this section. The second and third studies are summarized in the next section.

555. Stream flows under natural (undiverted) and diverted conditions were estimated for 21[14] streams using a combination of continuous-record gaging-station data, low-flow measurements, and values determined from regression equations developed for the study. For the drainage basin for each continuous-record gaged site and selected ungaged sites, morphometric, geologic, soil, and rainfall characteristics were quantified. Regression equations relating the non-diverted streamflow statistics to basin characteristics of the gaged basins were developed.

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[14] No estimates were made for Piinau Stream because the regression equations were not valid for this stream and reliable flow measurements were lacking (2004 Flow Study, p. 63.)

Regression equations were also used to estimate stream flow at selected ungaged diverted and undiverted sites. (2005 Flow Study, p. 1.)

556. Estimates were made for 50 percent and 95 percent duration total flow (TFQ) and base flow (BFQ).[15] (2005 Flow Study, p. 1.)

557. A 50 percent duration flow (median streamflow; Q_{50}) means that, for a specific period of time, half of the measured stream flow was greater than the Q_{50} value, and half was less. For example, for measurements of total flows in a particular stream for the specified period of time: 1) if TFQ_{50} = 25 mgd, then total stream flow was above 25 mgd half of the time and below 25 mgd half of the time; and 2) if TFQ_{95} = 2 mgd, total stream flow was above 2 mgd 95 percent of the time and below 2 mgd 5 percent of the time. (2004 Flow Study, p. 4.) [HC&S FOF 2.]

558. Relative errors between observed and estimated flows ranged from 10 to 20 percent for the 50-percent duration total flow and base flow, and from 29 to 56 percent for the 95-percent duration total flow and base flow. (2004 Flow Study, p. 1.) Errors are higher for lower flows because, for the same absolute error in flow, the relative error in percent increases as the actual flow decreases. (2005 Flow Study, p. 43.) [HC&S FOF 11.]

559. East of Keanae Valley, the 95-percent duration discharge equation generally underestimated total flow (TFQ_{95}), due to gains in flow from groundwater discharge, and within and west of Keanae Valley, the equation generally overestimated total flow, due to loss of water at lower elevations. (2005 Flow Study, pp. 1, 58.) [HC&S FOF 6.B.]

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15 Base flow is the groundwater contribution to flow; total flow includes all sources; i.e., ground, freshet (“normal” rainfall) and storm waters.

560. An extreme example of the limitations of the model is Pi‘ina‘au Stream:

> Estimates of flow-duration statistics for Pi‘ina‘au Stream determined from the regression equations are the highest of any sites in the study area...yet the flow observations, although scarce, indicate that flows are much lower than estimated. The stream channel was dry between 1,200 ft and 600 ft altitude...and only a trickle of flow was observed upstream of the 1,300-ft diversion. A recent (2001) large landslide, which covered the stream at about 1,000 ft altitude and filled most of the stream channel downstream to 600 ft altitude with gravel, cobbles, and boulders, complicates flow in the stream. This basin has the highest rainfall and MAXELEV (maximum elevation) in the study area and both are above the range of characteristics used to develop the flow-duration equations. Because the regression equations are not valid for this stream and reliable flow measurements are lacking, no estimates of stream statistics were made for Piinau Stream. (2005 Flow Study, p. 63.)

561. Reduction in 50- and 95-percent flows in stream reaches affected by the diversions throughout the study area averaged 58-60 percent. (2005 Flow Study, p. 1.) Average reduction in the low flow of streams due to diversions ranged from 55 to 60 percent. (2005 Flow Study, p. 70; Stephen B. Gingerich, WDT, p. 2.) [Nā Moku/MTF FOF 235.]

G. Habitat Restoration Potential

1. The 2005 Habitat Study

562. The purposes of the second and third studies in 2002 to 2005, *supra*, FOF 554, were to characterize the effects of diversions on instream temperature variations, and to estimate the effects that streamflow restoration (full or partial) would have on the availability of habitat for native stream fauna (fish, shrimp and mollusks). (Exh. E-69: Gingerich, S.B. and Wolff, R.H., 2005, “Effects of Surface-Water Diversions on Habitat Availability for Native Macro-Fauna, Northeast Maui,” Hawaii: U.S. Geological Survey Scientific Investigations Report 2005-

5213, 93 pp., referenced by Stephen B. Gingerich, Transcript, March 3, 2015, p. 49 (*hereinafter*, "2005 Habitat Study").)

563. In general, the stream temperatures measured at any of the monitoring sites were not elevated enough to adversely affect the growth or mortality of native fish, shrimp, and mollusks or to cause wetland taro to be susceptible to fungi and associated rotting diseases. (2005 Habitat Study, p. 1.)

564. The Physical Habitat Simulation System (PHABSIM), which incorporates hydrology, stream morphology and microhabitat preferences, was used to simulate habitat/discharge relations for various species and life stages, and to provide quantitative habitat comparisons at different streamflows of interest. Estimates were made of the availability of aquatic habitat for diverted and undiverted conditions and to produce a relation between discharge and habitat availability. Habitat-duration curves show the percentage of time that indicated habitat conditions would be equaled or exceeded and are based on the available estimates of flow duration at each stream reach developed in the 2005 Flow Study for Q_{50} and Q_{95} of total and base flows. (2005 Habitat Study, pp. 1, 51-52.)

565. The area of usable bed habitat was estimated over a range of streamflows that includes the diverted and natural base-flow estimates. The results are also presented as habitat relative to natural conditions with 100 percent of natural habitat at natural median base flow (BFQ_{50}) and 0 percent of habitat at 0 streamflow. In general, the models show a decrease in habitat for all species as streamflow is decreased from natural conditions. (2005 Habitat Study, pp. 51-52.) [Nā Moku/MTF FOF 250.]

566. The relative amount of expected natural habitat (H) expected at 50 percent of natural median base flow ranges from 70 to 92 percent (H_{70-92}) and maintaining 90 percent of

natural median base flow results in 94 to 101 percent of expected natural habitat (H_{94-101}) in the stream reaches. (2005 Habitat Study, p. 52.)

567. For East Maui streams, it is estimated that 64 percent of natural median base flow ($0.64xBFQ_{50}$) is required to provide 90 percent of the natural habitat (H_{90}). The flow requirements for each stream reach were provided by the USGS in terms of cubic feet per second (cfs) for all petitioned streams except for Pi‘ina‘au, Honopou, and Hanehoi streams. (Stephen B. Gingerich, WDT, Summary Table.) [Nā Moku/MTF FOF 258.]

568. Many factors that affect the presence of native aquatic species in northeast Maui were beyond the scope of the USGS study and were not addressed, including:

a. What is the effect of alien species on the migration and living conditions of the native species?

b. What is the fate of animals upon reaching a dry stream reach during upstream migration?

c. At what rate and at what locations will native species populations return to natural levels if diversions were removed?

d. Why were ōpae seen in abundance above the major diversions but oopu alamoo were not observed at all?

e. To what extent do native and alien species use the diversion ditches and tunnels for migration between streams?

f. What is the effect of taro lo‘i on the migration and life cycles of native species?

g. What are the effects of stream diversions on native aquatic insect species?

(Stephen B. Gingerich, WDT, pp. 4-5.) [Nā Moku/MTF FOF 256.]

2. The 2009 Habitat Availability Study

569. After release of the two USGS reports, USGS provided Commission staff with relative estimates of the change in aquatic habitat due to surface-water diversions. (Stephen B. Gingerich, WDT, October 31, 2014, p. 4.)

570. The resulting "2009 Habitat Availability Study" (Glenn R. Higashi, WDT, Appendix A: Parham, J.E. *et al.*, "The Use of Hawaiian Stream Habitat Evaluation Procedure to Provide Biological Resource Assessment in Support of Instream Flow Standards for East Maui Streams," Bishop Museum and Division of Aquatic Resources, Department of Land and Natural Resources, November 20, 2009) had four goals:

1. explain the influence of stream diversions on the distribution and habitat availability of native stream animals;
2. provide documentation of the model's design, underlying data structure, and application;
3. show changes in habitat availability for native amphidromous animals on a stream-by-stream basis; and
4. prioritize habitat and passage restoration actions among the streams of concern in East Maui.

(Glen R. Higashi, WDT, ¶ 3.) [Nā Moku/MTF FOF 269.]

571. Of the 27 streams that were the subject of this contested case, the 2009 Habitat Availability Study addressed only the 19 streams remaining after the Commission's September 25, 2008 order amending the IIFS for 6 of 8 streams, where instream flow for taro cultivation was the main concern, *supra*, FOF 8. (Glen R. Higashi, WDT, ¶ 19.) [Nā Moku/MTF FOF 271.]

572. The Study stated that the 19 streams comprised 16 distinct streams and their tributaries, but only explained that Waiaaka Stream was left out because it was not in DAR's stream codes, database, or GIS coverages. Pua'aka'a Stream is a tributary of Kopiliula Stream,

supra, FOF 58, ft. 9. Wahinepeʻe Stream was left out without explanation. (2009 Habitat Availability Study, Table 1.)

573. Minimum viable habitat flow (H_{min}) for the maintenance of suitable instream habitat was defined as 64% of Median Base Flow ($0.64xBFQ_{50}$) (also defined as H_{90} by USGS studies, *supra*, FOF 567), which was expected to produce suitable conditions for growth, reproduction, and recruitment of native stream animals. (Glen R. Higashi, WDT, Appendix D, p. 4.)

574. Habitat less than H_{90} was not expected to result in viable flow rates for the protection of native aquatic biota. There is no linear relationship between the amount of habitat and the number of animals. H_{70}, or twenty percent less habitat than H_{90}, would not result in only 20 percent less animals; nor would H_{50}, which is twenty percent less than H_{70}, result in only an additional 20 percent less animals. (Glen R. Higashi, WDT, Appendix D, p. 2.)

575. The 16 streams in the study, with their corresponding numbers in FOF 58, *supra*, were:

a. Makapipi Stream,

b. Hanawī Stream,

c. Kapaula Stream,

d. Paʻakea Stream,

e. Waiohue Stream,

f. Kopiliula Stream (and its tributary, Puaʻakaʻa Stream)

g. East Wailuaiki Stream,

h. West Wailuaiki Stream,

i. Ohia Stream,

j. Nua‘ailua Stream,

k. Honomanū Stream,

l. Punalau Stream,

m. Ha‘ipua‘ena Stream,

n. Puohokamoa Stream,

o. Waikamoi Stream,

p. Kōlea Stream.

(Glen R. Higashi, WDT, Appendix A, Table 1.)

576. The Division of Aquatic Resources (“DAR”), recommended the restoration of the following eight streams, in descending order of habitat units restored:

a. Honomanū Stream: 11.6 kilometers (km) of Habitat Units;

b. Puohokamoa Stream: 7.6 km of Habitat Units;

c. Waikamoi Stream: 5.8 km of Habitat Units;

d. Kopiliula Stream (and its tributary, Pua‘aka‘a Stream): 5.1 km of Habitat Units;

e. East Wailuaiki Stream: 4.4 km of Habitat Units;

f. West Wailuaiki Stream: 4.0 km of Habitat Units;

g. Makapipi Stream: 3.8 km of Habitat Units; and

h. Hanawī Stream: 3.5 km of Habitat Units.

(Glen R. Higashi, WDT, Appendix B, pp. 3-4.)

577. Flow restoration for these eight streams would result in 45.8 km out of a total of 67.3 km, or 68 percent of the 16 streams. (Glen R. Higashi, WDT, Appendix B, p. 4.)

578. Restoration of fish passage and restoration of suitable habitat forming flows at a small number of key locations can result in large amounts of potential habitat to become available for native animals. (Glen R. Higashi, WDT, Appendix A, p. 77.)

579. Restoration of an upstream diversion is not useful without first improving diversions downstream. (*Ibid*.)

580. DAR recommended that all existing diversions on these eight streams be modified to increase suitable instream habitat, minimize the entrainment of larvae, and to allow for animal passage for the recruiting post-larvae. (Glen R. Higashi, WDT, ¶ 8.) [Nā Moku, FOF 278.]

581. DAR also commented that:

a. The restoration of suitable flows to a single stream is more appropriate than the return of inadequate flows to multiple streams.

b. Restoration of streams should be spread out in a geographic sense. This will provide greater protection against localized habitat disruptions, a wider benefit to estuarine and nursery habitat for nearshore marine species, and result in more comprehensive ecosystem function across the entire east Maui sector.

(Glen R. Higashi, WDT, Appendix D, p. 3.)

582. DAR later reconsidered its initial list of 8 streams on the basis of:

a. the amount of habitat currently lost to diversions;

b. seasonality (wet versus dry seasons) was considered by setting minimum connectivity flows in the dry season and minimum habitat flow in the wet season;

c. issues relating to losing reaches, which eliminated Honomanū and Makapipi streams;

d. streams most biologically impacted by dewatering;

e. the number and difficulty of modifying diversions;

f. the efficient use of water in terms of habitat units restored per cfs of water returned;

g. whether restoration of stream flow along a given segment of a stream involved the comingling of stream and ditch waters; and

h. to geographically distribute the streams proposed for restoration across the entire East Maui ecosystem.

(Glen R. Higashi, WDT, Appendix C, p. 2.)

583. Honomanū and Makapipi streams were eliminated after consultation with CWRM, USGS and Bishop Museum on the basis of concerns over losing reaches and replaced with Waiohue and Haipuena streams. DAR's estimates of the undiverted BFQ_{50} flows and 64 percent of BFQ_{50} (H_{90}) flows for the revised list of eight streams were as follows, in order of DAR's priority ranking:

	Median undiverted base stream flow below lower most diversion (Undiverted BFQ_{50})	64 percent of BFQ_{50}, or H_{90} flows
East Wailuaiki Stream	7.0 cfs (4.52 mgd)	4.5 cfs (2.91 mgd)
West Wailuaiki Stream	7.0 cfs (4.52 mgd)	4.5 cfs (2.91 mgd)
Puohokamoa Stream	10.5 cfs (6.79 mgd)	6.7 cfs (4.33 mgd)
Waikamoi Stream	6.9 cfs (4.46 mgd)	4.4 cfs (2.84 mgd)
Kopiliula Stream	8.0 cfs (5.17 mgd)	5.1 cfs (3.30 mgd)
Ha'ipua'ena Stream	5.2 cfs (3.36 mgd)	3.3 cfs (2.13 mgd)
Waiohue Stream	6.8 cfs (4.39 mgd)	4.3 cfs (2.78 mgd)
Hanawī Stream	no flow recommended, only modification of diversion for passage	

(Glen R. Higashi, WDT, Appendix D, p. 5.)

584. For these eight streams, the amounts that would be needed to bring stream flows under diverted conditions to 64 percent of BFQ_{50}, or the minimum habitat needed for growth, reproduction, and recruitment of native stream animals, were as follows:

East Wailuaiki Stream:	3.2 cfs (2.07 mgd)
West Wailuiki Stream:	3.5 cfs (2.26 mgd)
Puohokamoa Stream:	5.4 cfs (3.49 mgd)
Waikamoi Stream:	2.6 cfs (1.68 mgd)
Kopiliula Stream:	3.0 cfs (1.94 mgd)
Ha‘ipua‘ena Stream:	2.5 cfs (1.62 mgd)
Waiohue Stream:	2.7 cfs (1.75 mgd)
Hanawī Stream:	modification only of diversion for passage
Total:	22.9 cfs (14.81 mgd)

(Glenn R. Higashi, WDT, Appendix C, Table 1.)

585. Commission staff noted that there was an estimated 35 acres cultivable for taro, and that Honopou residents do not receive water from a county water system. (Exh. C-85, pp. 11, 13.) There was no explanation on how the 0.82 mgd for taro and domestic diversions would meet these needs.

586. Nā Moku members claim 6.17 acres for taro cultivation and an additional 17.82 acres for cultivable agriculture, for a total of 23.99 acres fed by Honopou Stream, claiming either appurtenant or traditional and customary native Hawaiian rights to a sufficient amount of stream water to irrigate the taro lo‘i contained within this acreage. (Exh. A-173.) [Nā Moku FOF 554-556.]

587. Teri Gomes, Nā Moku’s expert witness, was not able to quantify the portion of a parcel that was actually farmed in taro nor the percentage of each parcel actually contained in lo‘i or farmed in taro at the time of the Mahele and put the entire parcel in taro when she couldn’t

tell what portion was in taro. (Teri Gomes, Tr., March 4, 2015, p. 137; Tr., April 1, 2015, pp. 18, 40.)

588. Gomes also placed the parcel in the cultivable agriculture category when land was awarded without specificity of use. (Teri Gomes, Tr., April 1, 2015, pp. 19, 32.)

589. On the other hand, HC&S contended that specific locations for properties currently being used or planned to be used for taro cultivation amounted to only two acres. The total of 23.99 acres that Nā Moku members claimed was simply the parcels that Lurlyn Scott described in her Declaration as parcels in which her family has an interest, and are the same properties that her cousins referenced in their Declarations. (Lurlyn Scott, WDT, ¶ 30; Tr., March 4, 2015, p. 193.) [HC&S FOF 111-112.]

590. While not identifying specific acres, Nā Moku contends that insufficient water and lands that have either appurtenant or riparian rights require that both Hanehoi and Puolua Streams be returned to their natural base flows (BFQ_{50}): 1) for Hanehoi Stream, 1.64 mgd (2.54 cfs) at the selected ungaged site between the Lowrie and Haiku Ditch; and 2) 0.95 mgd (1.47 cfs) at the selected ungaged site below the Haiku Ditch for Puolua Stream. This would increase the IIFS for Hanehoi Stream from 0.74 mgd to 1.64 mgd, and for Puolua Stream, from 0.57 mgd to 0.95 mgd. (Exh. C-85, p. 26.) [Nā Moku/MTF FOF 783-784, 806, 810, 819, 840.]

591. On the other hand, HC&S noted that CWRM identified an estimated cultivable area of 2.3 acres, and identified two parties who are or who would like to cultivate taro on four acres, as well as one person who has a parcel adjacent to Hanehoi Stream and would like to exercise her riparian rights. (Exh. C-85, p. 21; Ernest Schupp, WDT, ¶¶ 3, 9, 13; *See generally,* Neola Caveny, WDT; *See generally,* Solomon Lee, WDT.) [HC&S FOF 154-161.]

592. Commission staff identified eight diversions for domestic use, irrigation of taro and other crops and for livestock, for an estimated cultivable area of 106 acres. The Keanae complex, with about 107 lo‘i, which has decreased by half since 1903, is fed by Palauhulu Stream. The Keanae Arboretum complex, with 14 lo‘i, is fed by Pi‘ina‘au Stream. (Exh. C-85, p. 31.)

593. Nā Moku claimed that Palauhulu Stream was the water source for 27.195 acres, 24.595 for taro in Keanae, and an addditional 2.6 acres in cultivable acreage. (Exh. A-173, Teri Gomes, Tr., April 1, 2015, p. 7.) [Nā Moku/MTF FOF 571-573.]

594. HC&S contends that no person came forth to assert a claim for water from Pi‘ina‘au Stream, and that the entire Keanae lo‘i complex comprises only 10.53 acres. (Garret Hew, WDT, 1/27/15, ¶ 29; Exh. C-108, figure 3, p. 57; Exh. C-109; Exh. C-110.) [HC&S FOF 318-320.]

595. What was thought to be Kualani Stream served as a conduit for the Lakini auwai system. Water from Waiokamilo Stream was diverted into the Lakini system and joined Kualani Stream before reaching Dam 1, after which it is diverted for taro cultivation in the Lakini taro patches and in Wailua Valley further downstream. (Exh. C-85, pp. 45, 47.)

596. After investigation, what was thought to be Kualani Stream is actually the most eastern tributary of Waiokamilo Stream. (Hew, Tr., April 1, 2015, p. 126; Dean Uyeno, Tr. March 2, 2015, p. 43.).)

597. The IIFS at Dam 3 was the total flow in the stream without diversions at the Koolau Ditch, yet the TFQ_{50} of 3.17 mgd was only half of the 6 mgd that BLNR had ordered released at the same point in March 2007. (Exh. C-83, p. 46.)

598. EMI claimed that it had sealed up all its diversions on Waiokamilo Stream, including the intake on what was thought was Kualani Stream, and thereby was no longer diverting any water from Waiokamilo Stream. Dean Uyeno of the Commission staff also stated that what was thought was Kualani Stream, but now is known as East Waiokamilo Stream, was not being diverted. (Hew, Tr., March 17, 2015, pp. 125, 128-129; Dean Uyeno, Tr., March 2, 2015, pp. 41-43.)

599. Commission staff estimated that there were 515 cultivable acres with Waiokamilo Stream as its source. (Exh. C-85, p. 41.)

600. The Wailuanui lo‘i complex relies on three different sources of water, two of which are associated with Waiokamilo Stream and one with Wailuanui Stream. (Exh. C-85, p. 52.)

601. Nā Moku claimed that 60.767 acres, 44.474 acres in taro and 16.293 cultivable acres, are fed by Waiokamilo and Kualani Streams; 22.448 cultivable taro acres are fed by Wailuanui and Kualani Streams; and 5 acres in Waianu Valley, between Wailuanui and Keanae, are fed by Waiokamilo Stream. (Exh. A-173; Isaac Kanoa, WDT, ¶ 6.) [Nā Moku/MTF FOF 595, 606.]

602. Because what was thought was Kualani Stream is actually the east branch of Waiokamilo Stream, Nā Moku’s revised claim is that 65.767 acres are fed by Waiokamilo Stream, and 22.448 acres are fed by Wailuanui and Waiokamilo Streams.

603. HC&S states that EMI is no longer diverting Waiokamilo Stream. (Hew, WDT, 1/27/15, ¶ 35; Tr., March 17, 2015, pp. 128-129; Exh. C-52, pp. 56-67; Exh. C-147, pp. 84-96.) [HC&S FOF 365.]

604. There are two declared diversions for taro cultivation with an estimated cultivable area of 350 acres, but the Wailuanui lo‘i complex relies on water from both Waiokamilo and Wailuanui Streams, and Commission staff had estimated that there were 515 cultivable acres with Waiokamilo Stream as its source, *supra*, FOF 599. Therefore, these two areas have undetermined overlaps, and the total would be less than the sum of the two. (Exh. C-85, p. 52.)

605. As noted earlier, *supra*, FOF 601, Nā Moku contends that 22.448 acres are fed by Wailuanui and Waiokamilo Streams.

606. HC&S contends that “the Wailua (Waikani) complex” is the lo‘i system that is irrigated solely with water from Wailuanui Stream, and as of the summer of 2006, it comprised 2.80 acres. Furthermore, HC&S contends that it is now substantially, if not entirely, removed from taro production despite an increased, consistent flow of 2 to 3 mgd since the Commission’s 2008 decision. (Garret Hew, WDT, 1/27/15, ¶¶ 36-38; Exh. C-108; Norman “Bush” Martin, Tr., March 9, 2015, pp. 185-189; Dan Clark, Tr., March 10, 2015, pp. 113-117; Uyeno, December 18, 2014 written report, p. 30.) [HC&S FOF 387-389, 393.]

607. HC&S further contends that the record does not include an adequate breakdown of the parcels and acreage that Nā Moku has identified as owned by its members in the vicinity of Wailuanui Stream that may have been previously irrigated with Wailuanui Stream water. [HC&S FOF 391.]

b. Taro Water Requirements

608. Paul Reppun, a taro farmer who testified as an expert on taro cultivation in the Nā Wai ‘Ehā proceeding as well as in the instant proceeding, had opined that the water requirements of kalo lo‘i ranges from 100,000 to 300,000 gad. (Paul Reppun, WDT, Exh. A, p. 5; Tr., March 4, 2015, p. 43.) [HC&S FOF 84.]

609. In the contested case hearing on petitions to amend the IIFS for Nā Wai ʻEhā streams, the Commission had concluded that on kuleana lands, 130,000 to 150,000 gad of flow-through water was sufficient for proper kalo cultivation, with 15,000 to 40,000 gad of net loss between loʻi inflow and outflow from evaporation, transpiration, and percolation through the bottoms and leakage through the banks, with most of the loss through percolation and leakage. (Exh. C-120, p. 120, COL 54-56; p. 168, COL 219 (citations omitted).) [HC&S FOF 83.]

610. The Commission's estimate was based on its finding that the kuleana lands in the Nā Wai ʻEhā case receive more than 130,000 to 150,000 gad for their kalo loʻi, including the 50 percent of time that no water is needed to flow into the loʻi. This would be equivalent to 260,000 to 300,000 gad for the 50 percent of the time that water is flowing, amounts that would be sufficient to meet even Reppun's estimate of 100,000 to 300,000 gad for sufficient flow. (Exh. C-120, p. 120, COL 56.)

611. In the instant proceeding, Reppun stated that his estimate of 100,000 to 300,000 gad took into account the 50 percent of time that no water is needed (but see FOF 215, 236, infra) and that any figure can be assumed to be an average resulting from such parameters as percolation rates, weather, season, location on the stream relative to other diversions, initial water temperature, and rate of dilution of used water. In addition, it is difficult to estimate the percentage of time loʻi may not need water as it is dependant on growing phases, water temperature, weather conditions, and site specific cultivation practices, as such, 50 percent is an estimation as loʻi cultivation requires continued access to water for all phases of cultivation. (Paul Reppun, Tr., March 4, 2015, p. 43; WDT, Exh. A, p. 6.)

612. However, the utility of using a general water requirement is questionable, as even Reppun opined, "there is no one definitive answer." (Paul Reppun, Tr., March 4, 2015, p.19.)

613. Reppun's use of the 100,000 to 300,000 gad figure is predicated on when the taro needs the most water, not an average over the course of the entire crop cycle, which he had claimed: "but the important thing is that when it does need the most water, it can be severely--the crop can be severely damaged if it doesn't get that. And so it's that peak period of time, which during the summer months, during the hottest times, the longest days, also happens to be the time that everybody else needs the most water, and also the stream needs the most water." (Paul Reppun, Tr., March 4, 2015, p. 19.)

614. The temperature of 25°C (77.0°F) is the threshold point at which wetland kalo becomes more susceptible to fungi and rotting diseases. (Paul Reppun, Tr., March 4, 2015, pp. 27-28; Exh. C-108, p. 1.) [HC&S FOF 86.]

615. Water temperature in a lo‘i complex is dependent on variables such as the amount and temperature of the inflow, the amount of foliage cover, and the size of the complex, and different factors in a lo‘i can contribute to how soon and how quickly taro rot occurs. (Paul Reppun, Tr., March 4, 2015, pp. 31-33.) [HC&S FOF 88-89.]

616. Reppun participated in a 2007 USGS study designed to collect baseline flow--what the farmers were actually using--and temperature data from kalo cultivation areas on Kauai, Oahu, Maui, and Hawaii. "All we did was look at quantities of water and correlate that to temperature." (Paul Reppun, Tr., March 4, 2015, p. 26; Exh. C-108.)

617. The area of a lo‘i complex included the cultivated and fallow lo‘i banks, pathways, and auwai inside the perimeter of each complex. (Exh. C-108, pp. 5-6.)

618. Water need for kalo cultivation depends on the crop stage, and in order to assure consistency of the data collected at the various sites, only lo‘i with crops near the harvesting stage (continuous flooding of the mature crop) were selected for water-temperature data

collection. Data was collected in the dry season (June - October), when water requirements for cooling kalo approach upper limits. Flow measurements generally were made during the warmest part of the day, and temperature measurements were made every 15 minutes at each site for about a 2-month period. (Exh. C-108, p. 1.)

619. The Maui part of the study measured three areas, all on the windward side: 1) Waihee, 2) Wailua, and 3) Keanae. (Exh. C-108, p. 43.)

620. Three lo‘i complexes in Wailua were studied: Lakini, Wailua, and Waikani. Lakini and Wailua receive diverted water from Waiokamilo Stream, and Waikani receives diverted water from Wailuanui Stream. All the active lo‘i in Keanae were treated as one complex, which receives diverted water from Palauhulu Stream. (Exh. C-108, p. 43.)

621. The acreage for these complexes were:

Lakini:	0.74 acres
Wailua:	3.32 acres
Waikani:	2.80 acres
Keanae:	10.53 acres (Exh. C-108, p. 44, Table 5.)

622. The average inflow value for the 19 lo‘i complexes across the four islands that were studied was 260,000 gad, and the median inflow value was 150,000 gad. The average inflow value for the 17 windward lo‘i complexes was 270,000 gad, and the median inflow value was 150,000 gad. (Exh. C-108, p. 1.)

623. Inflow measurements on July 30, 2006 and on September 21, 2006 were:

Lakini:	750,000 gad and 550,000 gad (for 0.74 acres)
Wailua:	180,000 gad and 140,000 gad (for 3.32 acres)
Waikani:	190,000 and 93,000 gad (for 2.80 acres)
Keanae:	180,000 gad and 150,000 gad (for 10.53 acres) (Exh. C-108, p. 44.)

624. Of the 17 (of 19) lo‘i complexes where water inflow values were measured, only three had inflow temperatures that rose above 27°C. (Exh. C-108, pp. 1.)

625. Lakini, Wailua, Waikani, and Keanae had inflow temperatures well below 27°C, with Keanae having the lowest inflow temperature of all lo‘i complexes in the study at 20.0°C. (Exh. C-108, pp. 1, 51, 53, 56, 58.)

626. Outflow temperature was not measured for Wailua, and there was an equipment malfunction at Keanae. For Lakini, temperatures exceeded 27°C 16.9 percent of the time, with the earliest time of day at 1015 hours and the latest, at 1800 hours; peak temperatures occurred between 1300 and 1815 hours. For Waikani, temperatures exceeded 27°C 29.1 percent of the time, with the earliest time of day at 0000 hours and the latest, at 2345 hours; peak temperatures occurred between 1400 and 2045 hours. (Exh. C-108, p. 45.)

627. The time that 27°C was exceeded did not occur every day. Although the study did not summarize these data, the graphs indicate that one-half to two-thirds of the time, temperatures exceeded 27°C for several hours a day. (Exh. C-108, pp. 51, 56.)

628. Reppun is of the opinion that 77°F is the point at which rot begins to accelerate. (Paul Reppun, Tr., March 4, 2015, pp. 27-28.)

629. Reppun is of the opinion that the percent of the time that outflows exceed 27°C is the most important factor. (Paul Reppun, Tr., March 4, 2015, p. 69.)

630. Reppun also opines that the cooler the water that comes into the lo‘i, the better, and the water flowing out of the lo‘i should be 25°C or 77°F or less. (Paul Reppun, Tr., March 4, 2015, pp. 51, 62.)

631. Aside from such things as the stage of the crop, temperature of the inflows, the amount of sunlight, etc., there are management practices that the farmer can engage in to

maximize the cooling effect of the water. The main one is to increase the depth of the water, which would increase the cooling capacity of the water. That takes more water. (Paul Reppun, Tr., March 4, 2015, p. 59.)

632. If you begin to have rot, then you rest your field and change it from a wetland ecosystem to a dry land ecosystem. (Paul Reppun, Tr., March 4, 2015, p. 33.)

633. Questioned on the 0.74-acre Lakini lo‘i complex using 550,000 to 750,000 gad, *supra*, FOF 621, 623, Reppun was of the opinion that the capacity of that amount of water was enormous relative to the size of the area, that the water was not going to heat up very much at all, and that the amount was more than adequate. (Paul Reppun, Tr., March 4, 2015, p. 73.)

634. Reppun's opinion that taro water requirements are approximately 100,000 to 300,000 gad does not mean that these amounts are daily averages during a crop cycle, but an approximation of the amount required when maximum inflow is required to prevent rot. Nor is 100,000 to 300,000 gad the maximum of the amount so required. Reppun's principal point is that when lo‘i waters are most susceptible to reach temperatures that accelerate rot, sufficient inflow waters need to be available to keep water temperatures below the threshold for rot.

c. Acreage in Taro

635. In total, the acreage claimed by Nā Moku as being either in taro or cultivable agriculture was 136.18 acres for Honopou, Palauhulu, Waiokamilo, and Wailuanui Streams, *supra*, FOF 586, 593, 601, and 602.[16] (Teri Gomes, Tr., April 1, 2015, p. 11, 13.)

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[16] The total acreage under FOF 586, 593, 601, and 602 is 139.4 acres, but there is some overlap because some acres are fed by both Waokamilo and Wailuanui Streams, *supra*, FOF 601-602.

636. Nā Moku identified no acreage for Hanehoi and Puolua Streams, but contended that insufficient water and lands that have either appurtenant or riparian rights require that both Hanehoi and Puolua Streams be returned to their natural base flows (BFQ_{50}), *supra*, FOF 590; while HC&S noted that the Commission identified an estimated cultivable area of 2.3 acres, and identified two parties who are or who would like to cultivate taro on four acres, as well as one person who has a parcel adjacent to Hanehoi Stream and would like to exercise her riparian rights, *supra*, FOF 591.

637. Teri Gomes, Nā Moku's expert witness, put the entire parcel in taro when she couldn't tell what portion was in taro. In her previous testimony, before the BLNR, she had reduced the acreage by 10 percent, but was not instructed to do so in the present contested case. (Teri Gomes, Tr., April 1, 2015, pp. 14, 18, 40.)

638. Gomes also placed the parcel in the cultivable agriculture category when land was awarded without specificity of use, because most parcels awarded at the time of the Mahele were used for agricultural purposes and she had already eliminated house lots, cemeteries, and churches. (Teri Gomes, Tr., April 1, 2015, pp. 19, 32.)

639. Therefore, Nā Moku's own expert witness conceded that these acreages are overstated by an unknown amount for taro cultivation and cultivable agriculture.

d. Revised IIFS to Meet Taro Water Needs

640. The Commission's order identified the acreage of taro for each stream through the undocumented declarations of registered diverters, with a total of 1,006 acres plus water for domestic needs, *supra*, FOF 585, 132, 592, 599 and 604, but did not attempt to evaluate these claims nor relate these acres to the amount of water added to the streams in the revised IIFS.

641. Different reference flows were used to amend the IIFS. (Exhs. C-85 and C-90.)

642. Commission staff stated that their efforts were based on looking at the lower Q values, the low flow values, in order to make sure that it would always be met, to make sure that the downstream users would always have a set amount of water, and conceded that such an approach could amend the IIFS lower than what taro farmers might need. (Dean Uyeno, Tr., March 2, 2015, p. 122.)

e. Habitat Improvement

643. For East Maui streams, it is estimated that 64 percent of natural median base flow (BFQ_{50}) would be required to provide 90 percent of the natural habitat (H_{90}), *supra*, FOF 567, which is expected to produce suitable conditions for growth, reproduction, and recruitment of native stream animals, *supra*, FOF 573.

644. Habitat less than H_{90} would not result in viable flow rates for the protection of native aquatic biota. There is no linear relationship between the amount of habitat and the number of animals. H_{70}, or twenty percent less habitat than H_{90}, would not result in only 20 percent less animals; nor would H_{50}, which is twenty percent less than H_{70}, result in only an additional 20 percent less animals, *supra*, FOF 574.

H. Instream Uses

645. Beneficial instream uses for significant purposes are located in the stream and achieved by leaving the water in the stream. They include, but are not limited to:

a. maintenance of fish and wildlife habitats

b. outdoor recreational activities;

c. maintenance of ecosystems such as estuaries, wetlands, and stream vegetation;

d. aesthetic values such as waterfalls and scenic waterways;

e. navigation;

f. instream hydropower generation;

g. maintenance of water quality;

h. the conveyance of irrigation and domestic water supplies to downstream points of diversion; and

i. the protection of traditional and customary Hawaiian rights.

(HRS § 174C-3.)

646. "Navigation" and "instream hydropower generation (emphasis added)" are not relevant to the East Maui streams. (*Supra*, FOF 107, 108, 144, 145, 173, 174, 190, 191, 208, 209, 225, 226, 242, 243, 258, 259, 276, 277, 301, 302, 319, 320, 341, 342, 365, 366, 381, 382, 404, 405, 420, 421, 436, 437, 452, 453, 469, 470, 486, 487, 504, 505.)

647. "Maintenance of fish and wildlife habitats" has been addressed, *supra*, in section I.F (habitat restoration potential). (*Supra*, FOF 101, 102, 103, 138, 139, 140, 167, 168, 169, 185, 186, 203, 204, 220, 221, 237, 238, 253, 254, 271, 272, 296, 297, 314, 315, 336, 337, 360, 361, 376, 377, 396, 397, 398, 399, 400, 415, 416, 431, 432, 447, 448, 464, 465, 480, 481, 482, 499, 500, 501.)

648. That portion of stream flows to satisfy appurtenant rights is included in "the conveyance of irrigation and domestic water supplies to downstream points of diversion," and is an instream use. The exercise of appurtenant rights is a noninstream use, because it is carried out on appurtenant lands and not within the streams from which those appurtenant rights are derived. (*Supra*, FOF 110, 147, 176, 193, 211, 228, 245, 261, 279, 304, 322, 344, 368, 384, 407, 423, 439, 455, 472, 489, 507.)

649. "Outdoor Recreational Activities": From east to west, Makapipi, Hanawī, Waiohue, East Wailuaiki, West Wailuaiki, Wailuanui, Waiokamilo, Ohia, Honomanū, Waikamoi, Hanehoi, and Honopou streams have significant outdoor recreational activities,

including in some cases swimming and/or fishing, and nearly all including scenic views for recreational and sometimes for educational purposes. (Makapipi IFSAR § 5.0, p. 50; Exh. A-1; Hanawī IFSAR § 5.0, p. 54; Lucien De Naie, WDT; East Wailuaiki IFSAR § 5.0, p. 52; West Wailuaiki IFSAR § 7.0, p. 56; Wailuanui IFSAR § 5.0, pp. 43-44; Waiokamilo IFSAR § 5.0, p. 40; Ohia IFSAR § 5.0, p. 43; Honomanū IFSAR § 5.0, p. 56; Camp, WDT; Exh. E-71; Neola Caveny, WDT; Exh. E-24; Lurlyn Scott, WDT, ¶¶ 24-25; Julien P. Allen Jaccintho, WDT ¶ 9. [HC&S FOF 264, 334, 354, 378, 406, 427, 553, 576; Nā Moku FOF 387, 396, 404, 405, 414, 416, 420-423, 428, 435, 438, 440.]

650. "Maintenance of Ecosystems Such as Estuaries, Wetlands, and Stream Vegetation": From east to west, all of the streams except Waiaaka and Ohia Streams have seasonal, non-tidal palustrine wetlands, in the upper watershed of the hydrologic unit. East Wailuaiki, West Wailuaiki, and Waiohue Streams also have estuaries. (Waiaaka IFSAR § 6.0, pp. 51-53; Ohia IFSAR § 6.0, pp. 46-48; Exh. C-103, p. 19.) [HC&S FOF 421, 433, 466, 513.)

651. "Aesthetic Values Such as Waterfalls and Scenic Waterways": Waterfalls, some including plunge pools at their base, and to a lesser extent, springs, constitute the principal aesthetic values in the East Maui streams. From east to west, the streams include Makapipi, Hanawī, Kapaula, Waiaaka, Pa'akea, Waiohue, Kopiliula, West Wailuaiki, East Wailuaiki, Wailuanui, Waiokamilo, Palauhulu, Pi'ina'au, Honomanū, Punalau, Ha'ipua'ena, Puohokamoa, Waikamoi, and Honopou. (Makapipi IFSAR § 7.0, p. 62; Hanawī IFSAR § 7.0, p. 61; Kapaula IFSAR § 7.0, p. 62; Waiaaka IFSAR § 7.0, p. 59; Paakea IFSAR § 7.0, p.64; Waiohue IFSAR § 7.0, p. 64; Kopiliula IFSAR § 7.0, p. 67; East Wailuaiki IFSAR § 7.0, p. 64; West Wailuaiki IFSAR § 7.0, p. 63; Wailuanui IFSAR § 7.0, p. 56; Waiokamil59;o IFSAR § 7.0, p. 52; Palauhulu IFSAR § 7.0, p. 55; Honomanū IFSAR § 7.0, p. 69; Punalau IFSAR § 7.0, p. 59;

Ha‘ipua‘ena IFSAR § 7.0, p. 65; Puohokamoa IFSAR § 7.0, p. 66; Waikamoi IFSAR § 7.0, p. 72; Exh. C-101, p. 48.) [HC&S FOF 103, 182, 203, 226, 246, 266, 309, 356, 380, 408, 429, 453, 474, 494, 514, 535, 555, 578.]

652. "Maintenance of Water Quality": Streams that appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d), include, from east to west, Hanawī, Pua‘aka‘a, East Wailuaiki, West Wailuaiki, Ohia, Honomanū, Punalau, Ha‘ipua‘ena, Puohokamoa, and Waikamoi streams. (Hanawī IFSAR § 10.0, pp. 74-75; Pua‘aka‘a IFSAR § 10.0, pp. 75-76; East Wailuaiki IFSAR § 10.0, pp. 71-72;West Wailuaiki IFSAR § 10.0,pp. 70-71; Ohia IFSAR § 10.0, pp. 57-58; Honomanū IFSAR § 10.0, pp. 76-78; Punalau IFSAR § 10.0, pp. 65-66, 74; Ha‘ipua‘ena IFSAR § 10.0, pp. 72-74; Puohokamoa IFSAR § 10.0, p. 4; Waikamoi IFSAR § 10, pp. 80-81.) [HC&S FOF 185, 206, 229, 249, 269, 339, 411, 432, 456, 558.]

653. "Conveyance of irrigation and domestic water supplies to downstream points of diversion." Commission staff identified Puohokamoa, Ha‘ipua‘ena, and Kopiliula as streams being used for conveyance. (Exh. C-91, p. 20.)

654. During the contested case hearing, Garrett Hew of EMI testified that there is no identification of particular conveyance streams. If storm waters overflow a ditch, the water goes into the stream and then hits the next ditch downstream. There are no actual conveyance ditches or designated conveyance streams in the system. (Hew, Tr. March 18, 2015, pp. 144-45.)

655. The conveyance of irrigation and domestic water supplies to downstream points of diversion includes water conveyed for use within the hydrologic unit for domestic and irrigation uses. This does not include the diversion of water by EMI or MDWS. This use was identified through registered diversions for the stated purpose of domestic or irrigation use.

Streams identified on this basis include: Honopou, Hanehoi, Waikamoi, Haʻipuaʻena, Honomanū, Nuaʻailua, Piʻinaʻau, Ohia, Waiokamilo, Waiohue, and Makapipi. (Honopou IFSAR § 11, p. 62; Hanehoi IFSAR § 11, p. 59; Waikamoi IFSAR § 11, p. 83; Haʻipuaʻena IFSAR § 11, p. 75; Honomanū IFSAR § 11, p. 80; Nuaʻailua IFSAR § 11, p. 72; Piʻinaʻau IFSAR § 11, p. 71; Ohia IFSAR § 11, p. 60; Waiokamilo IFSAR § 11, p. 66; Waiohue IFSAR § 11, p. 74; and Makapipi IFSAR § 11, p. 72.)

1. Protection of Traditional and Customary Native Hawaiian Rights

656. Maintenance of fish and wildlife habitats to enable gathering of stream animals and increased flows to enable the exercise of appurtenant rights constitute the instream exercise of "traditional and customary native Hawaiian rights."

a. Gathering and fishing

657. Nā Moku members and their ʻohana traditionally gathered ʻawapuhi, bamboo shoot, ferns, frogs, goldfish, guava, haha, hau, hibiscus, hīhīwai, java plum, kalo, lilikoi, lūʻau, maiʻa, mango, medicinal plants, mountain apple, olena, ʻoʻopu, ʻōpae, oranges, pakalana, pipi, pohole, plumeria, puakenikeni, pupu loʻi, rosy apple, strawberry guava, tamarind, tī leaf, ʻuala (sweet potato), ʻulu, watercress, pepeiau and other fish in Honopou, Waikamoi, Alo, Wahinepeʻe, Puohokamoa, Haʻipuaʻena, Punalau/Kōlea, Honomanū, Nuaʻailua, Piʻinaʻau, Palauhulu, ʻŌhiʻa/Waianu, Waiokamilo, Kualani, Wailua, Waikani (Wailuanui), West Wailuaiki, East Wailuaiki, Kopiliula, Puaʻakaʻa, Paʻakea, Waiaaka, Kapaula, Hanawī, Makapipi, and Waiohue. (Aja Akuna, WDT, 12/30/14, ¶¶ 6, 7; ʻAwapuhi Carmichael, WDT, 12/30/14, ¶¶ 9, l0; Carl Wendt, WDT, 12/30/14, ¶¶ 6,7; Charles Barclay, WDT, 12/30/14, ¶ 5; Darrell Aquino, WDT, 12/30/14, ¶¶ 9, 11; Earl Smith, Sr., WDT, 12/30/14, ¶ 5; Edward Wendt, WDT, 12/30/14, ¶¶ 7, 8; Emily Wendt, WDT, 12/30/14, ¶¶ 14, 15, 17; Harry Hueu, WDT, 12/30/14, ¶¶ 9, 10;

Healoha Carmichael, WDT, 12/30/14, ¶¶ 6, 7; Ire Kimokeo, WDT, 12/30/14, ¶¶ 6,7; Isaac Kanoa, WDT, 12/30/14, ¶¶ 8, 9; James Kimo Kaaa, WDT, 12/30/14, ¶ 7; Jerome K. Kekiwi, Jr., WDT, 12/30/14, ¶¶ 7, 8; Joseph "Jojo" Young, WDT, 12/30/14, ¶¶ 7, 8; Jonah Kuponoikeauea Hueu, WDT, 12/30/14, ¶¶ 6, 7; Jonah Jacintho, WDT, 12/30/14, ¶¶ 6, 7; Joseph Kimo Day, WDT, 12/30/14, ¶¶ 7, 8; Juliana P. Allen Jacintho, WDT, 12/30/14, ¶¶ 6, 7; Leonora Barclay, WDT, 12/30/14, ¶¶ 8, 9; Lezley Jacintho, WDT, 12/30/14, ¶¶ 7, 8; Lurlyn Scott, WDT, 12/30/14, ¶¶ 10, 11, 12; Norman "Bush" Martin, WDT, 12/30/14, ¶¶ 8, 9; Pualani Kimokeo, WDT, 12/30/14, ¶¶ 11, 12; Sanford Kekahuna, WDT, 12/30/14, ¶¶ 5, 6; Solomon Kaauamo, WDT, 12/30/14, ¶¶ 8, 9; Steven Hoʻokano, WDT, 12/30/14, ¶¶ 9, 10; Terrance P.K. Akuna, WDT, 12/30/14, ¶¶ 8, 9.)

658. Nā Moku members and their ʻohana traditionally fished for aholehole, aku, akule, ʻanae, ʻawa, aweoweo, crab, enenue, haʻukeʻuke, heʻe, hinālеʻa, honu, kala, kole, kumu, kūpeʻe puʻu, kūpīpī, lae, lobster, menpachi, moanakali, moi, nikiniki, nohu, ʻōʻio, ʻopihi, ʻōmilu, paananu, pakaawa, pala, pīlali, pāpio, pipipi, poʻopaʻa, puhi, uau, ūhā, uhu, ʻuku, ulua, ʻuʻu, wana, and weke, in or near the mouths of in Honopou, Waikamoi, Alo, Wahinepeʻe, Puohokamoa, Haʻipuaʻena, Punalau/Kōlea, Honomanū, Nuaʻailua, Piʻinaʻau, Palauhulu, ʻŌhiʻa/Waianu, Waiokamilo, Kualani, Wailua, Waikani (Wailuanui), West Wailuaiki, East Wailuaiki, Kopiliula, Puaʻakaʻa, Paakea, Waiaaka, Kapaula, Hanawī, Makapipi, and Waiohue. (Aja Akuna, WDT, 12/30/14, ¶¶ 6, 7; ʻAwapuhi Carmichael, WDT, 12/30/14, ¶¶ 9, l0; Carl Wendt, WDT, 12/30/14, ¶¶ 6,7; Charles Barclay, WDT, 12/30/14, ¶ 5; Darrell Aquino, WDT, 12/30/14, ¶¶ 9, 11; Earl Smith, Sr., WDT, 12/30/14, ¶ 5; Edward Wendt, WDT, 12/30/14, ¶¶ 7, 8; Emily Wendt, WDT, 12/30/14, ¶¶ 14, 15, 17; Harry Hueu, WDT, 12/30/14, ¶¶ 9, 10; Healoha Carmichael, WDT, 12/30/14, ¶¶ 6, 7; Ire Kimokeo, WDT, 12/30/14, ¶¶ 6,7; Isaac Kanoa, WDT,

12/30/14, ¶¶ 8, 9; James Kimo Kaaa, WDT, 12/30/14, ¶ 7; Jerome K. Kekiwi, Jr., WDT, 12/30/14, ¶¶ 7, 8; Joseph "Jojo" Young, WDT, 12/30/14, ¶¶ 7, 8; Jonah Kuponoikeauea Hueu, WDT, 12/30/14, ¶¶ 6, 7; Jonah Jacintho, WDT, 12/30/14, ¶¶ 6, 7; Joseph Kimo Day, WDT, 12/30/14, ¶¶ 7, 8; Juliana P. Allen Jacintho, WDT, 12/30/14, ¶¶ 6, 7; Leonora Barclay, WDT, 12/30/14, ¶¶ 8, 9; Lezley Jacintho, WDT, 12/30/14, ¶¶ 7, 8; Lurlyn Scott, WDT, 12/30/14, ¶¶ 10, 11, 12; Norman "Bush" Martin, WDT, 12/30/14, ¶¶ 8, 9; Pualani Kimokeo, WDT, 12/30/14, ¶¶ 11, 12; Sanford Kekahuna, WDT, 12/30/14, ¶¶ 5, 6; Solomon Kaauamo, WDT, 12/30/14, ¶¶ 8, 9; Steven Hoʻokano, WDT, 12/30/14, ¶¶ 9, 10; Terrance P.K. Akuna, WDT, 12/30/14, ¶¶ 8, 9.)

659. Currently, Nā Moku members and their ʻohana gather achote, avocado, bamboo shoots, ferns, flowers, goldfish, guava, haha, hīhīwai, kalo, maiʻa (banana), limu, lūʻau, mango, mountain apple, ʻoʻopu, ʻōpae, oranges, papaya, pohole, prawns, puakenikeni, pupu loʻi, sugar cane, tī leaf, ʻulu, watercress, pepeiau and other fish in Honopou, Waikamoi, Alo, Wahinepeʻe, Puohokamoa, Haʻipuaʻena, Punalau/Kōlea, Honomanū, Nuaʻailua, Piʻinaʻau, Palauhulu, ʻŌhiʻa/Waianu, Waiokamilo, Kualani, Wailua, Waikani (Wailuanui), West Wailuaiki, East Wailuaiki, Kopiliula, Puaʻakaʻa, Paakea, Waiaaka, Kapaula, Hanawī, Makapipi, and Waiohue. (Aja Akuna, WDT, 12/30/14, ¶¶ 9, 10; ʻAwapuhi Carmichael, WDT, 12/30/14, ¶ 13; Darrell Aquino, WDT, 12/30/14, ¶¶ 13, 15; Earl Smith, Sr., WDT, 12/30/14, ¶¶ 8, 9; Edward Wendt, WDT, 12/30/14, ¶ 10; Emily Wendt, WDT, 12/30/14, ¶ 27; Harry Hueu, WDT, 12/30/14, ¶¶ 13, 14; Healoha Carmichael, WDT, 12/30/14, ¶¶ 9, 10; Ire Kimokeo, WDT, 12/30/14, ¶¶ 9, 10; Isaac Kanoa, WDT, 12/30/14, ¶¶ 10, 11; Jerome K. Kekiwi, Jr., WDT, 12/30/14, ¶¶ 10, 11; Joseph "Jojo" Young, WDT, 12/30/14, ¶ 10; Jonah Kuponoikeauea Hueu, WDT, 12/30/14, ¶¶ 9, 10; Jonah Jacintho, WDT, 12/30/14, ¶¶ 10, 11; Joseph Kimo Day, WDT, 12/30/14, ¶¶ 10, 11; Juliana P. Allen Jacintho, WDT, 12/30/14, ¶¶ 12, 13; Leonora Barclay, WDT, 12/30/14, ¶ 11; Lezley

Jacintho, WDT, 12/30/14, ¶¶ 10, 11; Lurlyn Scott, WDT, 12/30/14, ¶¶ 20, 21; Norman "Bush" Martin, WDT, 12/30/14, ¶¶ 11, 12; Pualani Kimokeo, WDT, 12/30/14, ¶ 14; Sanford Kekahuna, WDT, 12/30/14, ¶¶ 9, 10; Solomon Kaauamo, WDT, 12/30/14, ¶¶ 11, 12; Steven Hoʻokano, WDT, 12/30/14, ¶ 13; Terrance P.K. Akuna, WDT, 12/30/14, ¶¶ 11, 12.)

660. Currently, Nā Moku members and their ʻohana fish for aholehole, aku, akule, ʻahi, ʻanae, aweoweo, enenue, haʻukeʻuke, heʻe, hināleʻa, kala, kole, kumu, kūpeʻe, kūpīpī, lae, lobster, mahimahi, manini, menpachi, moi, mullet, nikiniki, noho, ʻōʻio, omilu, ʻopihi, paananui, palani, pāpio, pipipi, poʻopaʻa, puhi, uouoa, ūhā, uhu, and ulua, in or near the mouths of in Honopou, Waikamoi, Alo, Wahinepeʻe, Puohokamoa, Haʻipuaʻena, Punalau/Kōlea, Honomanū, Nuaʻailua, Piʻinaʻau, Palauhulu, ʻŌhiʻa/Waianu, Waiokamilo, Kualani, Wailua, Waikani (Wailuanui), West Wailuaiki, East Wailuaiki, Kopiliula, Puaʻakaʻa, Paakea, Waiaaka, Kapaula, Hanawī, Makapipi, and Waiohue. (Aja Akuna, WDT, 12/30/14, ¶¶ 9, 10; ʻAwapuhi Carmichael, WDT, 12/30/14, ¶ 13; Darrell Aquino, WDT, 12/30/14, ¶¶ 13, 15; Earl Smith, Sr., WDT, 12/30/14, ¶¶ 8, 9; Edward Wendt, WDT, 12/30/14, ¶ 10; Emily Wendt, WDT, 12/30/14, ¶ 27; Harry Hueu, WDT, 12/30/14, ¶¶ 13, 14; Healoha Carmichael, WDT, 12/30/14, ¶¶ 9, 10; Ire Kimokeo, WDT, 12/30/14, ¶¶ 9, 10; Isaac Kanoa, WDT, 12/30/14, ¶¶ 10, 11; Jerome K. Kekiwi, Jr., WDT, 12/30/14, ¶¶ 10, 11; Joseph "Jojo" Young, WDT, 12/30/14, ¶ 10; Jonah Kuponoikeauea Hueu, WDT, 12/30/14, ¶¶ 9, 10; Jonah Jacintho, WDT, 12/30/14, ¶¶ 10, 11; Joseph Kimo Day, WDT, 12/30/14, ¶¶ 10, 11; Juliana P. Allen Jacintho, WDT, 12/30/14, ¶¶ 12, 13; Leonora Barclay, WDT, 12/30/14, ¶ 11; Lezley Jacintho, WDT, 12/30/14, ¶¶ 10, 11; Lurlyn Scott, WDT, 12/30/14, ¶¶ 20, 21; Norman "Bush" Martin, WDT, 12/30/14, ¶¶ 11, 12; Pualani Kimokeo, WDT, 12/30/14, ¶ 14; Sanford Kekahuna, WDT, 12/30/14, ¶¶ 9, 10; Solomon

Kaauamo, WDT, 12/30/14, ¶¶ 11, 12; Steven Hoʻokano, WDT, 12/30/14, ¶ 13; Terrance P.K. Akuna, WDT, 12/30/14, ¶¶ 11, 12.)

661. If there was more water in the streams Nā Moku members and their ʻohana would gather and fish as their families traditionally did. (Aja Akuna, WDT, 12/30/14, ¶¶ 17, 18; ʻAwapuhi Carmichael, WDT, 12/30/14, ¶ 17; Carl Wendt, WDT, 12/30/14, ¶ 14; Darrell Aquino, WDT, 12/30/14, ¶¶ 21, 22; Edward Wendt, WDT, 12/30/14, ¶ 16; Harry Hueu, WDT, 12/30/14, ¶ 23; Healoha Carmichael, WDT, 12/30/14, ¶¶ 16, 18; Ire Kimokeo, WDT, 12/30/14, ¶¶ 17; 18; Isaac Kanoa, WDT, 12/30/14, ¶ 18; James Kimo Kaaa, WDT, 12/30/14, ¶ 17; Jerome K. Kekiwi, Jr., WDT, 12/30/14, ¶ 18; Joseph "Jojo" Young, WDT, 12/30/14, ¶ 15; Jonah Kuponoikeauea Hueu, WDT, 12/30/14, ¶ 12; Jonah Jacintho, WDT, 12/30/14, ¶ 19; Joseph Kimo Day, WDT, 12/30/14, ¶¶ 18, 19; Juliana P. Allen Jacintho, WDT, 12/30/14, ¶ 19; Leonora Barclay, WDT, 12/30/14, ¶ 18; Lezley Jacintho, WDT, 12/30/14, ¶¶ 20, 21; Lurlyn Scott, WDT, 12/30/14, ¶ 66; Norman "Bush" Martin, WDT, 12/30/14, ¶ 21; Pualani Kimokeo, WDT, 12/30/14, ¶ 22; Sanford Kekahuna, WDT, 12/30/14, ¶ 17; Solomon Kaauamo, WDT, 12/30/14, ¶¶ 19, 20; Steven Hoʻokano, WDT, 12/30/14, ¶¶ 20, 21; Terrance P.K. Akuna, WDT, 12/30/14, ¶ 19.)

b. Exercise of Appurtenant Rights

662. In total, the acreage claimed by Nā Moku as being either in taro or cultivable agriculture was 136.18 acres for Honopou, Palauhulu, Waiokamilo, and Wailuanui Streams, *supra*, FOF 635.

663. Nā Moku identified no acreage for Hanehoi and Puolua Streams but contended that sufficient water and lands that have either appurtenant or riparian rights require that both Hanehoi and Puolua Streams be returned to their natural base flows (BFQ_{50}), *supra*, FOF 636.

664. Teri Gomes, Nā Moku's expert witness, conceded that these acreages are overstated by an unknown amount for taro cultivation and cultivable agriculture, *supra*, FOF 639. She put the entire parcel in taro when she couldn't tell what portion was in taro. In her previous testimony before BLNR, she had reduced the acreage by 10 percent, but was not instructed to do so in the present contested case, *supra*, FOF 637. She also placed the parcel in the cultivable agriculture category when land was awarded without specificity of use, because most parcels awarded at the time of the Mahele were used for agricultural purposes and she had already eliminated house lots, cemeteries, and churches, *supra*, FOF 638.

665. The 136.18 acres claimed by Nā Moku for Honopou, Palauhulu, Waiokamilo, and Wailuanui Streams were comprised of the following areas:

a.	Keanae (Palauhulu Stream):	27.195 acres;
b.	Wailua: (Waiokamilo and	27.73 acres
	Wailuanui Streams)	33.035 acres
		24.227 acres
c.	Honopou: (Honopou Stream)	23.99 acres
	Total:	136.18 acres

(Teri Gomes, WDT, pp. 3-36, 38-39.)

666. Nā Moku had claimed that 60.767 acres, 44.474 acres in taro and 16.293 cultivable acres, are fed by Waiokamilo and Kualani Streams, 22.448 cultivable taro acres are fed by Wailuanui and Kualani Streams, and 5 acres in Waianu Valley, between Wailuanui and Keanae, are fed by Waiokamilo Stream. *supra*, FOF 601. Because what was thought was Kualani Stream is actually the east branch of Waiokamilo Stream, Nā Moku's revised claim is that 65.767 acres are fed by Waiokamilo Stream, and 22.448 acres are fed by Wailuanui and Waiokamilo Streams, *supra*, FOF 602. The total of 88.22 acres (65.767 plus 22.448 acres) is

slightly larger than the total of the three Wailua areas of 84.99 acres (27.73 + 33.035 + 24.227), *supra*, FOF 665, which is likely due to some overlap of acres ascribed to both Wailuanui and Waiokamilo Streams.

667. The breakdown of each of the four groups in FOF 665, *supra*, is:

Keanae:		22 taro lots:	13.475 acres	(0.07 to 2.27[17] acres in size)
		4 agriculture lots	7.00 acres	
		5 ili (land area)	5.49 acres	
		1 conservation	0.18 acres	
		1 wetland	1.05 acres	
	Total	33 parcels	27.195 acres	

Wailua:		10 taro lots:	8.02 acres	(0.125 to 2.75[18] acres in size)
		7 agriculture lots	11.86 acres	
		1 ili (land area)	0.42 acres	
		4 mo‘o (narrow strip of land)	7.43 acres	
	Total	22 parcels	27.73 acres	

Wailua:		10 taro lots	9.22 acres	(0.162 to 2.67[19] acres)
		9 agriculture lots	11.23 acres	
		5 mo‘o (narrow strip of land)	12.03 acres	
		1 kula (plain) and home lot	0.216 acres	
		1 pond	0.338 acres	
	Total:	26 parcels	33.035 acres	

Wailua:	24 taro lots	12.92 acres	(0.08 to 0.83[20] acres in size)
	9 agriculture lots	5.006 acres	
	4 mo‘o (narrow strip of land)	4.98 acres	
	1 ili (land area)	1.32 acres	

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17 described as a poalima, or chief's terraced plantation, with 6 lo‘i.

18 described as containing 26 lo‘i.

19 described as containing 10 lo‘i.

20 described as a taro lot.

	Total: 38 parcels	24.227 acres

Honopou:	1 lot, consisting of 22.81 acres that included:	
	taro lot	3.32 acres
	unspecified	8 acres
	poalima (chief's terraced plantation)	1.67 acres[21]
	land along three streams	9.82 acres
	poalima (chief's terraced plantation)	0.08 acres
	taro lot and kula	1.10 acres
Total:	3 parcels	23.99 acres

(Teri Gomes, WDT, pp. 3-36, 38-39.)

668. The lots, whether for taro, agriculture, ili, or mo‘o, are relatively small. The largest of the taro lots was 3.32 acres, and the great majority of the taro lots were less than one acre in size.

669. Counting only the taro lots and the poalima:

Keanae:	13.475 out of 27.195 acres	less 10%:	12.13 acres
Wailua:	8.02 out of 27.73 acres	less 10%:	7.22 acres
Wailua:	9.22 out of 33.035 acres	less 10%:	8.30 acres
Wailua:	12.92 out of 24.227 acres	less 10%:	11.63 acres
Honopou:	6.17 out of 23.99 acres	less 10%:	5.55 acres

670. However, all except one of these 69 parcels were identified as only taro lots, with the exception being 1.10 acres in Honopou, described as a taro lot and kula, *supra*, FOF 667.

671. Gomes also placed the parcel in the cultivable agriculture category when land was awarded without specificity of use, because most parcels awarded at the time of the Mahele were used for agricultural purposes and she had already eliminated house lots, cemeteries, and churches, *supra*, FOF 638, 664.

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[21] The quantity arrived at was the remainder, because lot sizes were identified for only 3 of the 4 lots in the grant.

672. However, cultivable agriculture is not equivalent to wetland taro: 1) taro lots were specified as so; and 2) there were other types of agriculture at the time of the Mahele, which used much less water for growing crops. Therefore, while the cultivable agriculture category was entitled to water from the time of the Mahele, that amount would be much less than for taro.

673. Counting the agricultural lots:

Keanae:	7.00 acres
Wailua:	11.86 acres
Wailua:	11.23 acres
Wailua:	5.00 acres

674. The Honopou acreage of 23.99 acres also included 9.82 acres along three streams, *supra*, FOF 667, which were probably agricultural, as it ran along streams (*See, infra*, FOF 675).

675. Nā Moku also submitted other exhibits for:

Keanae, consisting of 397.41 acres:

Taro and house lot along Hamau (Kualani) Stream:	9.20 acres
Agricultural lot running along Palauhulu Stream:	13.70 acres
Agricultural lot running along Wailua(nui) Stream:	103.82 acres
Agricultural lot running along the Ditch of Wailua:	151.65 acres

Waianu, consisting of 160.50 acres:

Agricultural lot running from the mountain to the sea:	107 acres
Agricultural lot running from the government road to the sea:	53.50 acres

Honopou, consisting of 2.07 acres, although the total of the parcels is 0.624 acres:

Taro and pasture:	0.154 acres
Taro and pasture:	0.47 acres

Makapipi, consisting of 4.17 acres:

Agricultural lot running along Haiha Stream:	4.17 acres

(Teri Gomes, WDT, pp. 36-40.)

676. For Keanae, HC&S contends that there are only 10.53 acres, *supra*, FOF 594, referring to the USGS study, *supra*, FOF 621, compared to the 13.475 acres as estimated in FOF 669, *supra*.

677. For Wailua, HC&S contends that it no longer diverts Waiokamilo Stream, *supra*, FOF 603, that Wailuanui Stream is the sole water source for only 2.80 acres, *supra*, FOF 606, but does not address the acreage that is watered by both streams.

678. For Honopou, HC&S contends that there are only 2 acres in taro, *supra*, FOF 589, compared to 6.17 acres as estimated in FOF 669, *supra*.

679. Nā Moku had identified no acreage for Hanehoi and Puolua Streams, but contended that insufficient water and lands that have either appurtenant or riparian rights require that both Hanehoi and Puolua Streams be returned to their natural base flows (BFQ_{50}), *supra*, FOF 236. HC&S noted that CWRM identified an estimated cultivable area of 2.3 acres and identified two parties who are or who would like to cultivate taro on four acres, as well as one person who has a parcel adjacent to Hanehoi Stream and would like to exercise her riparian rights, *supra*, FOF 591.

680. Nā Moku submitted one exhibit for Makapipi Stream on a 4.17-acre lot for agricultural purposes running along Haiha Stream, *supra*, FOF 675. HC&S noted that CWRM had records for two diversions for taro cultivation, and that Jeffrey Paisner owns property that abuts Makapipi Stream but has no firsthand knowledge that taro was cultivated on his property. (Makapipi IFSAR § 12.0, p. 84; Jeffrey Paisner, WDT, §§ 5-6.) [HC&S FOF 584-586.]

I. Noninstream Uses

1. HC&S

a. Agriculture Requirements

681. HC&S has approximately 30,000 acres of agricultural land in central Maui that have historically depended on surface water from the EMI Ditch system. (Volner WDT 10/17/16, ¶ 10.)

682. Of the 30,000 acres, approximately 22,254 acres of land irrigated with water from the EMI Ditch have been designated as Important Agricultural Lands ("IAL") pursuant to HRS chapter 205, Part III. The IAL designation "is a commitment to keep these lands in productive agriculture over the long term." (Volner WDT 10/17/16, ¶ 12.)

683. Consistent with the IAL designation, HC&S is engaged in furthering a plan to transition the former sugarcane lands to the cultivation of diversified agriculture by A&B and other that would be sustainable and economically viable and consistent with the IAL designation (the "Diversified Agricultural Plan"). (Volner WDT 10/17/16, ¶ 13.)

684. Approximately 30,000 acres (the "East Maui Fields") of HC&S's 35,000-acre sugarcane plantation can be serviced by surface water from EMI or brackish groundwater pumped from within the boundaries of the plantation, but not water from the West Maui ditch system. From 2008-2013, HC&S actively cultivated sugarcane on an average of 28,941 acres of its East Maui Fields. (Volner, WDT, ¶ 2; Garret Hew, WDT, 12/30/14, ¶ 25; Volner, Tr., March 23, 2015, p. 27; Exhs. C-35 and C-137.) [HC&S FOF 590-592.]

685. From 2008 to 2013, HC&S received 113.71mgd[22] from surface water deliveries and 69.90 mgd in pumped groundwater for a combined total of 183.61 mgd (62 percent from surface water and 38 percent from groundwater). (Exh. C-137, columns B and C.) [HC&S FOF 629.A.]

686. The use of those waters as reported by HC&S was as follows:

a. Sugarcane irrigation: 132.45 mgd
b. MDWS: 2.83 mgd

[22] HC&S reports its water deliveries and usage in millions of gallons per year, and those numbers have been divided by 365 to arrive at daily totals. For example, the 113.71 mgd in surface water deliveries was reported as 41,505 million gallons per year.

c.	HC&S Industrial:	6.25 mgd	
d.	Other:	0.41 mgd	
	Total:	141.94 mgd	
	Remainder:	41.67 mgd	(183.61 - 141.94 mgd)

(Exh. C-137; Volner, Tr., March 23, 2015, pp. 23-30.)

687. MDWS' usage is at the Kamole Weir and Kula Agricultural Park. Industrial usage at HC&S was used in the factory, power plant, mixing fertilizer solutions, and anything else to support the farming and factory operations, one of the largest uses being cane cleaning. "Other" was water for tenants that were on the HC&S property, such as Ameron and for a period of time, Monsanto. (Volner, Tr., March 23, 2015, pp. 23-26.))

688. After these three user categories, all of the remaining water was used for sugarcane irrigation. The unaccounted for remainder was ascribed to system losses, consisting of seepage, evaporation, and miscellaneous losses, such as back-flushing of filters, drip tube ruptures or breaks, animal damage, pipeline breaks, misreported irrigation (if they are not applying the correct hours to the amount that they ran), testing of systems prior to planting, or where water is taken out of the system but not accounted for in daily irrigation. (Volner, Tr., March 23, 2015, pp. 26, 30-31, 140.) [HC&S FOF 637.]

689. The 132.45 mgd for sugarcane irrigation, divided by the 28,941 irrigated acres, *supra*, FOF 684, was the gallons per acre per day, or 4,577 gad. (Exh. C-137.)

690. Compared to the actual irrigation of 4,577 gad that HC&S was able to deliver to its fields, it had contended that irrigation requirements were 5,l46 gpad, resulting in 89 percent of irrigation requirements being met from 2008 to 2013. (Exh. C-137.)

691. The 1/15/16 Proposed Decision had concluded that 4,844 gad was a reasonable estimate of irrigation requirements for HC&S's East Maui fields. (1/15/16, Proposed Decision, FOF 337, 346.)

692. On January 6, 2016, A&B announced its decision to cease sugarcane cultivation upon completion of the 2016 harvest and that it was transitioning HC&S to a diversified farm model, the goal of which is to retain as much of the plantation in agricultural use as possible with a mix of crops and agricultural activities that will be economically viable. The sugar plantation ceased operations as of December 30, 2016. (Exh. C-153; Volner, Tr., 2/8/17, p. 245, ll. 6-9.) [HC&S on reopening, FOF 337-339.]

693. Under its Diversified Agricultural Plan, HC&S is seeking large-scale agricultural uses as well as smaller agricultural uses and considering how the various uses impact one another rather than putting relatively small amounts of acreage into use in an expedient, ad hoc fashion. (Volner, Tr. 2/6/17, p. 210, ll. 14-18, p. 214, l. 15 to p. 215, l. 5.) [HC&S on reopening, FOF 340.]

694. In siting the differing uses throughout the former sugar lands, HC&S considered, among other things, varying soil types, rainfall, solar radiation, elevation, and the relative tolerance of the different crops to irrigation with brackish water. Thus, in general, crops with a lower tolerance for irrigation with brackish water are sited in the higher elevations which do not have access to well water. On the other hand, grasses, bioenergy crops, and crops raised for animal feed, which have a suspected relatively higher tolerance for irrigation that is supplemented with brackish water, are sited in the lower elevations where HC&S has historically used its brackish water wells to supplement surface water imported from EMI, in the east, and the Nā Wai ʻEhā streams, in the west, to meet the irrigation needs of approximately 35,000 acres

of sugar cultivation. (Volner, WDT, 10/17/16, ¶ 16; Volner, Tr., 2/6/17, p. 181, ll. 15-21.) [HC&S on reopening, FOF 343.]

695. The Diversified Agricultural Plan envisions irrigating 26,996 acres (28,941 acres had been previously irrigated in sugar cane, *supra*, FOF 684) of former sugar fields that were previously irrigated with a combination of surface water delivered by EMI and brackish water pumped from HC&S's brackish water wells. An additional 3,954 acres are planned for unirrigated livestock pastures on the eastern edge of the plantation where there is expected to be sufficient rainfall to support this use, plus 227 acres of unirrigated forestry, for a total of 31, l77 acres. (Exh. C-156-A; Volner, WDT, 10/17/16, ¶ 17.) [HC&S on reopening, FOF 344.[23]]

696. The irrigation requirement for each crop is determined by applying the appropriate crop co-efficient to the average daily evapotranspiration rates for the fields in question, crediting average rainfall, and expressing the remaining requirement in gallons per acre per day ("gpad"). The data used to calculate the water requirements for the crops is drawn from 14 weather stations strategically located throughout the plantation by representative region that have been consistently operated for many years. (Exhs. C-156-A at 1, C-157-A; Volner, WDT, 10/17/16, ¶ 18; Volner, WRT, 1/20/17, ¶ 8.) [HC&S on reopening, FOF 345.]

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[23] As explained below, HC&S's proposed FOF are in error on a number of mathematical calculations. For example, the 3,954 acres planned for unirrigated livestock pasture and 227 acres of unirrigated forestry are in addition to—not subtracted from—the 26,996 acres. See, *infra*, FOF 697.

697. HC&S's forecast of the irrigation requirements for 26,996 acres of its East Maui fields is as follows:[24]

use	acres	gpad	mgd	% total water
pasture, unirrigated	3,954	---		0.0
pasture, irrigated	3,037	1,704	5.18	5.8
dairy, irrigated (surface only)	2,483	1,384	3.44	3.9
dairy, irrigated	1,972	2,297	4.53	5.1
forestry, unirrigated	227	---		0.0
agricultural park (surface only)	717	2,448	1.76	2.0
diversified agriculture (surface only)	2,830	2,510	7.10	8.0
diversified agriculture	2,000	2,753	5.51	6.2
orchard crops (surface only)	2,212	5,154	11.40	12.8
orchard crops	1,554	5,765	8.96	10.0
beverage crops (surface only)	901	5,096	4.59	5.1
pongamia	2,113	4,478	9.46	10.6
biogas feedstock area	820	3,565	2.92	3.3
mechanically harvested row crops	6,357	3,835	24.38	27.3
Total acres:	31,177			
Irrigated acres:	26,996	3,305	89.23	100%

(Exhs. C-156-A at 1, C-157-A; Volner, WDT, 10/17/16, ¶ 18; Volner, WRT, 1/20/17, ¶ 8.) [HC&S on reopening, FOF 345.[25]]

698. The forecasted water requirements continue to evolve and will not become final "until every acre has been planted back in another agricultural use." Diversified agricultural uses will also be subject to change, because some of HC&S's potential partners and lessees are expected to rotate multiple crops that could potentially have different crop coefficients. And it is unknown whether every single one of these diversified agricultural uses will come to fruition

[24] HC&S does not explain the higher requirements for trees, ranging from 4,478 gad for pongamia to 5,765 gad for orchard crops, compared to diversified agriculture, ranging from 2,448 gad for the agricultural park to 3,835 gad for row crops.

[25] Table in FOF 699 has been corrected for mathematical errors: 1) total acreage is 31,177, not 26,996; 2) irrigated acres is 26,996, not 23,042 as stated in HC&S on reopening, FOF 344; and 3) mgd is 89.23, not 32.587.

because so many basic questions about the company's potential agricultural operations remain unanswered. (Volner, Tr., 2/6/17, p, 160, l. 21 to p. 161, l. 2, p. 175, ll. 2-4.) [Nā Moku on reopening, FOF 63, 65-66.]

699. MTF's report, "Mālama ʻĀina: A Conversation About Maui's Farming Future," claims that water use can be reduced by 10 to 50 percent through the use of regenerative agricultural methods, including: a) rebuilding the soil to increase its water holding capacity; b) reducing water use by selection of crops that are adapted to the local climate; c) reducing evapotranspiration and harvesting atmospheric moisture by planting multi-function windbreaks; d) adjusting the shape and orientation of fields and grading the site to maximize rainwater harvesting, promote soil infiltration, increase groundwater recharge, and allow storage of storm-water runoff. (Exh. E-160.) [Nā Moku on reopening, FOF 83-84.]

700. The Diversified Agricultural Plan is broken down loosely into uses that A&B plans to self-perform and uses that A&B is hoping to partner with others. (Schreck, Tr., 2/8/17, p. 289, ll. 5-9.) [HC&S on reopening, FOF 349.]

701. Of the 26,996 acres, they are willing to look at a number of different arrangements from leases all the way to being completely vertically integrated in whatever crop or production they decide to pursue. At this time, in addition to the 3,954 acres in livestock unirrigated, HC&S intends to retain for itself: a) the 3,037 acres in livestock irrigated, b) the 6,357 acres in mechanically harvested row crops, c) the 2,113 acres of pongamia orchards, and d) the 820 acres of biogas feedstock crops. (Volner, Tr., 2/6/17, p. 192, l. 22 to p. 193, l. 17.) (Nā Moku on reopening, FOF 72.]

702. The aggregate irrigation requirement for the 26,996 acres is 3,305 gpad, or an average daily requirement of 89.23 mgd, *supra*, FOF 697. Accounting for estimated losses of

22.7% due to seepage, evaporation, and other system losses, the gross amount of water to yield the net irrigation requirement of 89.23 mgd is 115.46 mgd (1.294[26] x 89.23). (Exhs. C-137, C-156-A; Volner, WDT, 10/17/16, ¶ 19.) [HC&S on reopening, FOF 346.]

703. The gross irrigation requirement for acreage that is 100 percent dependent on surface water breaks down as follows:

Agricultural Park	717 acres @ 2,448 gpad	1.75 mgd
Dairy	2,483 acres @ 1,384 gpad	3.44 mgd
Diversified Ag.	2,830 acres @ 2,510 gpad	7.10 mgd
Orchard Crops	2,212 acres @ 5, 154 gpad	11.40 mgd
Beverage Crops	901 acres @ 5,096 gpad	4.59 mgd
Total acres:	9, 143 acres	
Total Irrigation Requirement		28.28 mgd
Gross Irrigation Requirement		36.59 mgd (1.294 x 28.28 mgd)[27]

(Exhs. C-156-A, C-157-A.) [HC&S on reopening, FOF 347.]

704. The gross irrigation requirement for acreage with access to well water breaks down as follows:

Irrigated Pasture	3,037 acres @ 1,704 gpad	5.17 mgd
Irrigated Dairy	1,972 acres @ 2,297 gpad	4.53 mgd
Diversified Agriculture	2,000 acres @ 2,753 gpad	5.51 mgd
Orchard Crops	1,554 acres @ 5,765 gpad	8.96 mgd
Pongamia	2,113 acres @ 4,478 gpad	9.46 mgd
Biogas Feedstock	820 acres @ 3,565 gpad	2.92 mgd
Row Crops	6,357 acres @ 3,835 gpad	24.38 mgd
Total acres:	17,853 acres	
Total Irrigation Requirement		60.93 mgd
Gross Irrigation Requirement		78.84 mgd (1.294 x 60.93 mgd)

26 The system loss is 22.7%, meaning that the efficiency - the part that makes it through - is 77.3%, or 0.773. To figure out how much water you need to send, you need to multiply by the reciprocal of the efficiency, or 1/0.773 which works out to roughly 1.294.

27 36.59 mgd includes 22.7% in losses, or 8.31 mgd. Therefore, 36.59 mgd (28.28 + 8.31) is the gross irrigation amount.

(Exhs. C-156-A, C-157-A.) [HC&S on reopening, FOF 348.]

705. A&B has performed a high-level analysis of potential markets available for Hawai‘i farmers and focused on markets for Hawai‘i-produced products that are imported widely, including, for example, beef and energy, which is why it has focused so far on the pasturing project and the renewable energy bioenergy projects. It has also looked at the general farming community in Hawai‘i and production markets and tried to assess what may be viable as future lessees take these lands into diversified agriculture production. (Schreck, Tr. 2/8/17, p. 289, l. 12 to p. 290, l. 4.) [HC&S on reopening, FOF 350.]

706. HC&S has received approximately 250 inquiries about leasing former sugar lands for agricultural activities since the cessation of sugar cultivation. Of these 250 inquiries, HC&S is investigating over 60 that it has determined to be possible prospects meriting further review. If all of the possible lease projects were successfully sited on former sugar lands and mutual agreements were reached on lease terms, the aggregate acreage required would roughly total 19,500 acres. (Schreck, WRT, 1/20/17, ¶ 8.) [HC&S on reopening, FOF 351.]

707. HC&S states that virtually every prospective lessee has raised the topic of water for irrigation, and A&B's current inability to provide assurances regarding whether and how much irrigation water can be made available to lessees from the EMI ditch system is a major obstacle to procuring commitments from prospective lessees who need some assurance in order to justify committing the necessary capital to develop a new agricultural operation. HC&S states that no farmers have been willing to commit to cultivation absent some assurance as to the quantity and quality of water and cost. (Schreck, WRT, 1/20/17, ¶ 9; Voner, Tr., 2/8/17, p. 268, l. 25 to p. 269, l. 20; Schreck, Tr., 2/8/17, p. 295, l. 20 to p. 296, l. 5.) [HC&S on reopening, FOF 352.]

708. At this time, HC&S's water use is limited to irrigation of diversified agricultural test crops, irrigation of cover crops to minimize soil erosion, and miscellaneous uses such as industrial wash water, firefighting, and dust control. (Volner, WDT, 10/17/16, ¶¶ 3, 11; Volner, Tr., 2/6/17, p. 182, l. 21 to p. 183, l. 1.) [HC&S on reopening, FOF 353.] [HC&S on reopening, FOF 89.]

709. EMI is currently diverting approximately 20 mgd: approximately 6-8 mgd is used by the County of Maui for its Kula Agricultural Park and Kamole Treatment Plant; 1 mgd is used for HC&S's cattle operation; 2 mgd is used for HC&S's bioenergy crops; and 6 mgd is used for maintenance of HC&S's reservoirs for fire protection. Seepage loss accounts for the balance of approximately 4 mgd (Hew, Tr., 2/6/17, p. 107, ll. 11-20.)

710. HC&S is currently cultivating test crops, has completed harvesting of over 180 acres of bioenergy crops, and is preparing for the cultivation of approximately 500 acres for large-scale row testing. (Volner, Tr., 2/6/17, p. 168, ll. 8-23.) [HC&S on reopening, FOF 354.]

711. HC&S is also moving the cultivation of bioenergy crops into the commercialization phase. For example, it has entered into a commercial feedstock agreement to provide biogas feedstock to a company under contract with the County to provide power for the Kahului Wastewater Treatment Facility. The expansion to 500 acres of row-crop testing supports this initiative. (Volner, Tr., 2/6/17, p. 179, l. 25 to p. 180, l. 6; Volner, Tr., 2/8/17, p. 265, l. 14 to p. 267, l. 11.) [HC&S on reopening, FOF 355.]

712. The projects currently planned for 2017 at the time of the reopened hearing include:

a. A pasturing agreement with Maui Cattle Co. to populate the 4,000 acres being converted to grazing pasture by fencing, seeding with signal grass, and—in certain areas—installing supplemental irrigation;

b. responding to a utility-issued RFI designating lands that are suitable for renewable energy development (solar, wind, bioenergy), and making those lands available in any subsequent RFPs for the siting of renewable generating assets on Maui;

c. the sale of approximately 850 acres of land to the County for an agricultural park (originally estimated as 717 acres, *supra*, FOF 697);

d. the establishment of approximately 100 acres of oilseed orchards—the first phase of a planned 250 acres (out of a total 2,113 acres in the Diversified Agricultural Plan, *supra*, FOF 697; and

e. the execution of a commercial feedstock agreement for anaerobic digestion crop feedstocks and the associated use of innovative farming techniques to expand HC&S's bioenergy and grain crop rotation on up to 500 acres.

(Schreck, WRT, 1/20/17, ¶ 6.) [HC&S on reopening, FOF 342.]

713. Albert Perez, Executive Director of MTF and recognized during the hearing as an expert in planning, was of the opinion that "at a minimum, a plan consists of steps that you are going to take in the future, you have to declare what your goal is and have some steps that you're going to take, identify the resources with which you're going to take those steps...(W)hen you're talking about a business plan, you have to do market analysis, you have to figure out what the landed cost of the product is going to be when you produce that." (Perez, Tr., 2/8/17, p. 423, l. 20 to p. 427, l. 2.) [Nā Moku on reopening, FOF 59.]

714. Volner of HC&S stated that they do not have any formal steps to implement the plan, have various timelines associated with projects they are currently working on, and that it is very difficult to put timelines on potentially leasing property to other diversified agriculture farmers and getting people on the property without some certainty regarding water. They have no timelines other than on the ones they are actively managing, and the potential tenants would be the ones who would set timelines for their projects. They have internal financing models on how

they will executive their own plans, but other operators and tenants are best suited to execute the other portions of the plan. (Volner, Tr., 2/8/17, p. 255, l. 14 to p. 258, l. 2.)

b. Losses

i. EMI

715. From March to October 2011, USGS conducted a field study of the EMI ditch system to document the location of tunnels and open-ditch sections and to determine seepage losses and gains along selected reaches. (Cheng, C.L., 2012, "Measurements of Seepage Losses and Gains, East Maui Irrigation Diversion System, Maui, Hawaii," US Geological Survey Open-File Report 2012-1115, 23 p. ("USGS 2012 Seepage Report"), presented at the CWRM meeting of January 23, 2013. ("USGS 2013 Presentation") [Nā Moku/MTF FOF 1064.]

716. The EMI diversion system begins at Makapipi Stream in the east and ends at Maliko Gulch in the west. It consists of four primary ditches known as the Wailoa, New Hamakua, Lowrie, and Haiku ditches. Additional ditches that connect to the four primary ditches include the Koolau, Spreckels, Kauhikoa, Spreckels at Papaaea, Manuel Luis, and Center ditches. (USGS 2012 Seepage Report, p. 1.)

717. Ditch characteristics for about 63 miles of the EMI system, excluding abandoned ditches and stream conveyances, were characterized. About 46 miles (73%) of the surveyed diversion system are tunnels, and 17 miles (27%) are open ditches, of which 3.5 miles (6%) are lined, 2.5 miles (4%) are partially lined, and 11 miles (17%) are unlined. (*Id.*)

718. Tunnels, covered and/or underground, include culverts, siphons and pipes. Lined ditches have concrete ditch bottom and walls, steel ditch bottoms and walls, or concrete ditch bottoms and armored cut-stone walls. Partially lined ditches have earthen material on the ditch bottom and one wall and lined on the other wall; earthen material on the ditch bottom and lined

on both walls; or a lined ditch bottom and earthen material on both walls. Unlined ditches have earthen material on bottom and both walls. (USGS 2013 Presentation.)

719. The Wailoa, Kauhikoa, and Haiku ditches have greater than 96 percent of their total length as tunnels, whereas more than half of the Lowrie ditch and Spreckels ditch at Papaaea are open ditches. About 70 percent of the total length of lined open ditches in the EMI diversion system is located along the Koolau ditch, whereas about 67 percent of the total length of unlined open ditches is located along the Lowrie ditch. Less than 4 percent is partially lined open ditches, of which about half is in the Spreckels ditch. (USGS 2012 Seepage Report, p. 1.)

720. Discharge measurements were made along 26 seepage-run measurement reaches that are about a total of 15 miles in length. The seepage run measurement reaches represent 23 percent of the total length of ditches in the EMI system. (*Id.*)

721. The results were as follows:

Range of ditch flows (mgd)	seepage losses and gains (mgd)	seepage losses and gains, in percentage of ditch flows
>19	-0.39 to 2	-1.6% to 4%
9.7 to 19	-0.26 to 1.4	-3.7% to 11%
1.3 to 5.2	-0.78 to 0.17	-20% to 8%
0 to 1.3	-0.13 to 0.21	-71% to 41%

Measurement reach lengths range from 0.15 to 2.23 miles. (USGS 2013 Presentation.)

722. Koolau and Spreckels ditches generally had seepage losses. Wailoa, Kauhikoa, and New Hamakua ditches had seepage gains. The Manuel Luis, Center, Lowrie, and Haiku ditches had variable seepage losses and gains. Open ditch measurement reaches generally had seepage losses that ranged from 0.1 cfs (0.06 mgd) per mile at the Lowrie ditch to 3.0 cfs (1.94 mgd) per mile at the Koolau ditch. Tunnel measurement reaches generally had seepage gains that

ranged from 0.1 cfs (0.06 mgd) per mile at the Manuel Luis ditch to 5.2 cfs (3.36 mgd) per mile at the Wailoa ditch. (USGS 2012 Seepage Report, p. 1.)

723. Thus, because both open ditches and tunnels in the EMI diversion system not only incur seepage losses but also gains from groundwater, especially in the tunnels, it is not clear whether net seepage losses even occur in the EMI diversion system. At low flows, the USGS study results show that losses are greater than gains, but at higher flows, gains are greater than losses, *supra*, FOF 721.

ii. HC&S

724. For 1986 to 2013, HC&S accounted for "system inefficiencies, installation, and terrain inconsistencies" separately from "system losses due to seepage and evaporation of transportation and storage system." "System inefficiencies, etc." assumed that "effective water needed" was 80 percent of "gross water needed" and were incorporated into HC&S's irrigation requirements, which used an 80 percent efficiency factor in calculating its water requirements. (Exh. C-74.) The 1/15/16 Proposed Decision had concluded that, for purposes of estimating HC&S's irrigation needs, an 85 percent efficiency factor should be used instead. (1/15/16 Proposed Decision, FOF 328-337.) "System losses, etc." was estimated at 10 percent of the water needed to irrigate 30,000 acres, but no analysis was provided for this estimate. (Exh. C-74.)

725. Based on this information, *supra*, FOF 724, system losses would be 10 percent of the water required to irrigate 28,941 acres, or 4,844 gad x 28,941 acres x 0.1 = 14.02 mgd. (The information provided by HC&S identified water requirements as 7,396 gad and acreage as 30,000, but reasonable water requirements had been found to be 4,844 gad, *supra*, FOF 691, and irrigated acres—as opposed to the total East Maui fields of 30,000 acres—had been assumed to be the 28,941 acres identified by HC&S in its 2008 to 2013 data.)

726. For 1986 to 2009, all water needs were lumped together in a single number of 9,019 gad, not only including irrigation requirements but also system losses, irrigation inefficiencies, and industry (factory) needs, so system losses cannot be estimated. (1/15/16 Proposed Decision, FOF 322.)

727. For 2008 to 2013, HC&S characterized all water that could not be accounted as "seepage, evaporation and miscellaneous system losses." Total surface and ground water deliveries were 183.61 mgd and unaccounted water was 41.67 mgd, or 22.7 percent of surface water delivered and ground water pumped. (1/15/16 Proposed Decision FOF 312-313, 315; Exh. C-137.)

728. Estimating seepage and evaporation losses by way of direct measurement would require closing sections of the ditches and reservoirs, allowing the water to remain in those structures for a period of time, and taking before and after readings. This is impractical to do on a large scale because it would have interrupted plantation operations. (Garret Hew, WDT, 2/10/15, ¶ 10; Garret Hew, Tr., March 17, 215, pp. 184, 186.) [HC&S FOF 636.]

729. As an alternative to direct measurement, HC&S calculated the amount of water that cannot be accounted for, *supra*, FOF 727.

730. To obtain a benchmark against which the estimated 22.7 percent loss rate could be compared, HC&S consulted the National Engineering Handbook published by the Soil Conservation Service of the U.S. Department of Agriculture ("USDA"), which provides seepage rate factors that can be applied to various sections of HC&S's system. HC&S calculated the average surface area under water for each type of material that holds or conveys the water (i.e., lined or unlined ditches or reservoirs). For each type of material, HC&S selected a relatively low seepage factor along with a relatively high seepage factor from the USDA Handbook and applied

each factor to the estimated surface area under water to calculate what would represent low seepage loss and high seepage loss in the HC&S system per USDA's standards. Based on the foregoing calculations, a low seepage loss per day was estimated to be 30.75 mgd, or 16.76 percent of average daily water deliveries of surface and ground water of 183.61 mgd; a high seepage loss per day was estimated to be 65.06 mgd, or 35.46 percent of average daily water deliveries. (Garret Hew, WDT, 2/10/15, ¶¶ 11-12; Exh. C-138, Figure 2-50; Exh. C-139.) [HC&S FOF 638.]

731. To account for loss due to evaporation, HC&S estimated the average daily amount of evaporation from the surface of the water contained in the same ditches and reservoirs as those considered in estimating the seepage losses. The average daily evaporation rate of 0.40 acre-inches was multiplied by the average daily surface area of the water in the system (243.48 acres), which yielded an average daily evaporation loss rate of 2.64 mgd. Added to the high and low seepage calculations, an estimated range of losses from both seepage and evaporation was 33.40 mgd, or 18.20 percent of average daily water deliveries, to 67.70 percent, or 36.90 percent of average daily water deliveries. (Garret Hew, WDT, 2/10/15, ¶ 13; Exh. C-139.) [HC&S FOF 639.]

732. The average of the high and low estimated losses from seepage and evaporation is 27.55 percent, and HC&S's losses of 22.7 percent fell below this average. (Exh. C-139.) [HC&S FOF 640.]

733. HC&S' losses of 22.7 percent included not only seepage and evaporation losses, but also miscellaneous losses such as back-flushing of filters, drip tube ruptures or breaks, animal damage, pipeline breaks, misreported irrigation (if they are not applying the correct hours

to the amount that they ran), testing of systems prior to planting, or where water is taken out of the system but not accounted for in daily irrigation. (1/15/16 Proposed Decision, FOF 315.)

734. In the Nā Wai ʻEhā contested case hearing, the Commission identified a number of other factors that could contribute to miscellaneous losses, describing such losses in HC&S's field operations as "plausible and reasonable factors that would significantly increase their actual irrigation requirements" and ascribing such losses as the equivalent of 5 percent of irrigation requirements. (Exh. C-120.)

735. Five percent of irrigation requirements would be 7.01 mgd (4,844 gad x 28,941 acres x 0.05 = 7.01) mgd, losses that are "plausible and reasonable."

736. Of HC&S unaccounted water of 41.67 mgd, or 22.7 percent of surface water delivered and ground water pumped, *supra*, FOF 727, 34.66 mgd (41.67 mgd minus 7.01 mgd), or 18.9 percent, would be ascribed to seepage and evaporation losses. This percentage is nearly equal to the low seepage rate of 18.20 percent as calculated under USDA's standards, *supra*, FOF 731.

737. Thus, HC&S's system losses of 22.7 percent (41.67 mgd of 183.61 mgd of surface water delivered and ground water pumped) were reasonable losses under sugarcane cultivation. Because the same distribution system would be used for diversified agriculture, the same rate of 22.7 percent losses should be applicable.

c. Alternate Sources

i. Ground Water

738. HC&S's irrigation structure includes 15 brackish water wells and associated pumps with a total pumping capacity of 228 mgd, which may be used to supplement surface water to irrigate 17,200 acres of the approximately 30,000 acres serviced by waters from the

EMI Ditch system. (Exh. C-33; Exh. C-35; Exh. E-76 at 3 (PDF); Garret Hew, WDT, 12/30/14, ¶ 25-26.) [HC&S FOF 606; Nā Moku/MTF FOF 997.]

739. The remaining 12,800 acres cannot be serviced by pumped ground water on a consistent basis. Ground water can be delivered to 7,000 acres via a shared pipeline that served as a penstock line for a hydroelectric unit for the majority of the year. This pump system was designed and built to be an emergency water source for high-elevation fields in the event of extreme drought, rather than a primary source of water. The system consists of a booster pump system that diverts primary ground water at the Lowrie Ditch level to a higher elevation. (Volner, WDT, ¶ 19.) [HC&S FOF 645.]

740. The maximum instantaneous pumping capacity of wells that can service the East Maui fields is 215 mgd. However, the true instantaneous pumping capacity of the wells—i.e., the most HC&S can pump over 3 to 5 days—was 115 mgd to 120 mgd. Sump levels in the wells start to drop when pumping reaches 115 mgd to 120 mgd, especially in the summer months where there is little recharge. Further lowering of the sump levels could cause severe mechanical damage to the pumps. (Volner, Tr., March 23, 2015, pp. 16-19.) [HC&S FOF 611.]

741. From 2008 to 2013, HC&S pumped an annual average of 25,512 million gallons, or 69.90 mgd, for use on the East Maui fields, including mill use. (Exh. C-137, Column C.) [HC&S FOF 619.]

742. From 1986 to 2013, HC&S pumped an average of 71 mgd. Compared to surface water deliveries during these times, the amounts and percentage of totals were as follows:

	Total	Surface water/percent	Ground water/percent
1986-2013:	224 mgd	153 mgd (68%)	71 mgd (32%)
1986-2009:	239 mgd	167 mgd (70%)	72 mgd (30%)
2008-2013:	184 mgd	114 mgd (62%)	70 mgd (38%)

(Exhs. C-74; C-103, pp. 14-15 and Ex. C, App. G; C-137.)

743. Under sugarcane cultivation, ground water contributions to total irrigation uses had remained constant at or near 70 mgd. The percent of total water contributions from ground water rose from 30 percent in 1986 to 2009 to 38 percent in 2008 to 2013, because surface water contributions decreased from 167 mgd to 114 mgd, while ground water contributions remained the same*supra*, FOF 742.

744. While HC&S was engaged in sugarcane cultivation, by using about 70 mgd of a ground-water usable capacity of 115 mgd to 120 mgd, HC&S had an additional ground water source of up to 45 to 50 mgd for a period of 3-5 days before sump levels in the wells start to drop, *supra*, FOF 740.

745. This potential capacity might have been less because a reduction in surface water importation coupled with an increase in ground water pumping would have likely increased aquifer salinity levels, especially in the summer months when pumping was highest. (Exh. C-71, Appendix A, p. E-2 and E-3.) [HC&S FOF 646.]

746. It is unclear what the direct relationship is of recharge from surface water importation to the underlying groundwater aquifer. HC&S historically supplemented surface water with pumped groundwater on a seasonal basis, and on an aggregate basis, constituted between 20 to 30 percent of total water use when HC&S was cultivating sugarcane. The amount of groundwater historically used was far in excess of the published sustainable yields of the underlying aquifers, which was made possible by the large volumes of surface water. (Volner, WDT, 10/17/16, ¶ 23; Volner, Tr., 2/6/17, p. 161, ll. 9-21, p. 163, ll. 16-21.) [HC&S on reopening, FOF 387, 394.]

747. Although the crops conceptually planned for the area that can access groundwater are known to be tolerant to some levels of brackish water irrigation, the precise tolerance levels and the impacts of prolonged uses of brackish water on these crops are presently unknown. Sugarcane was by far the most tolerant crop to brackish water. When these fields were planted in sugarcane, well water was being applied during dry periods to a crop with a twenty-four-month crop cycle. The crops currently planned for those acres will generally have much shorter crop cycles than sugarcane, so they will have less time to recover from sustained periods of reliance upon brackish water during dry periods, and thus will generally be more vulnerable to the negative impacts on crop growth associated with prolonged exposure to brackish water. As with sugarcane cultivation, the prolonged or primary use of brackish water could have additional negative impacts on soil health with the buildup of minerals and salts without adequate surface water to flush these constituents. (Volner, WDT, 10/17/16, ¶ 24; Volner, Tr., 2/6/17, p. 162, ll. 8-14.) [HC&S on reopening, FOF 389.]

748. The transition to diversified agriculture will bring several key changes that will impact the utility and reliability of brackish groundwater resources in the future—reduced recharge from lower levels of irrigation of the overlying lands, uncertain tolerance of diversified agriculture crops to heavy reliance on brackish water, the higher costs associated with well water versus surface water, and the higher economic hurdles related to higher costs of investment in new agricultural ventures versus ongoing sugar operations where the major investments had already been made. (Volner, WDT, 10/17/16, ¶ 22.) [HC&S on reopening, FOF 388.]

749. Given that the future crops will generally be less tolerant to brackish water than sugarcane and that the amount of surface water imported from East Maui is expected to be reduced to meet the amended IIFS, HC&S believes that it is not reasonable to assume that use of

groundwater will be within the historical range of 20 to 30 percent of total water use and believes that a sustainable level of groundwater use will more likely be within the range of 0 to 20 percent of total water use. However, HC&S has not commissioned any expert to ascertain the brackish water tolerance or the impact of prolonged use of brackish water for any of its proposed uses. (Volner, Tr., 2/6/17, p. 163, l. 21 to p. 164, l. 1, p. 202, ll. 2-24, p. 221, l. 23 to p. 222, l. 7.) [HC&S on reopening, FOF 395; Nā Moku on reopening, FOF 97-98, 103-105.]

750. Taking into consideration the factors identified in FOF 745-749, *supra*, an analysis of what would be reasonable estimates of the groundwater alternative from HC&S's wells to EMI ditch surface water is provided in the section on "Economic Impacts," infra, with an estimate of 17.84 mgd or less of brackish well water, infra, FOF 795. This would comprise 20 percent of the estimated irrigation requirements of 89.21 mgd for the 26,996 acres of diversified agriculture, *supra*, FOF 703-704.

ii Additional Reservoirs

751. Reservoirs would be most valuable as a water source in the summer months, when it's dry and HC&S's daily irrigation needs would be at their maximum. (Volner, Tr., March 23, 2015, p. 33.)

752. Storing water in the existing reservoirs or lining them to reduce or eliminate seepage would not provide large amounts of new water, because in the summer months the water is not being put in the reservoirs, and if it is, it's put in and taken out relatively quickly. (Volner, Tr., March 23, 2015, p. 35.)

753. The 36 reservoirs located throughout the plantation range in size from 4 million gallons to 80 million gallons, which are a total of 862 million gallons at full capacity, only a five- to ten-day supply for the approximately 12,800 acres that are serviced by these reservoirs. The

reservoirs are primarily holding ponds where water is collected and distributed for irrigation or other uses on a daily basis. Only when ditch flows are high do they have the ability to store additional water. (Exh. C-68, pp. 5-6.)

754. A reservoir would need to have an extremely large storage capacity to meet demands for a prolonged period of time during the summer months when water would be the most valuable. To be of most value, a large reservoir would need to be located at the highest elevation at the head of the Wailoa Ditch, above Paia or Haliimaile, which supplies the greatest amount of water to HC&S, so as to maximize the ability of the reservoir to supply water to various parts of the plantation during dry periods. (Volner, Tr., March 23, 2015, pp. 32-33.) [HC&S FOF 659.]

755. In the 1960s, HC&S internally considered building such a large reservoir, but decided not to pursue it after a study indicated that a billion-gallon reservoir would provide only a 10-day supply of water. HC&S's daily water needs at that time were in the range of 200 mgd to 300 mgd, and even a billion-gallon reservoir would provide 200 mgd for only five days. (Garret Hew, Tr., March 18, 2015, p. 236; Volner, Tr., March 23, 2015, P. 33.) [HC&S FOF 658.]

756. Assuming that there is a reduction of stream water and not a total cessation, smaller deficits would mean that a billion-gallon reservoir could provide, for example, 40 mgd for 25 days.

757. However, there are some complexities with how you would fill such a large reservoir. Even if the Wailoa Ditch were flowing at capacity in the summertime, it would make more sense to apply that water as quickly as possible to the fields to avoid having system losses or to reduce system losses instead of trying to store it and meter it out. (Volner, Tr., March 23, 2105, pp. 34-35.)

758. Ever since the Kaloko Dam incident on Kauai, all dam structures are highly scrutinized by the state. Constructing a large dam today will require much more scrutiny, much more oversight, than previously constructed reservoirs, and community opposition would also be expected. Any dam that would be sited would be at the highest elevation possible, and that would be above either Paia or Haliimaile. (Volner, Tr., March 23, 2015, p. 34.)

759. A billion-gallon reservoir is approximately 3,800 acre-feet. If the reservoir is 10 feet deep, it would occupy approximately 30 acres. It would be very difficult to site a reservoir that large at the highest elevation on the plantation. (Garret Hew, Tr. March 18, 2015, p. 98; Volner, Tr., March 23, 2015, p. 33.) [HC&S FOF 660.]

760. The cost of building a billion-gallon reservoir would depend on a number of factors, including terrain, acquisition of land, and permitting. In 2009, HC&S estimated that building a billion-gallon reservoir on Maui would cost well in excess of $150 million. (Exh. C-68, p. 6.) [HC&S FOF 663.]

761. HC&S has not considered building a large number of small reservoirs at the top of the plantation, because they wouldn't have the benefit that a large reservoir at the highest elevation, the most eastward end of the plantation, would have. This would be where the largest supply comes in, the Wailoa ditch. (Volner, Tr., March 23, 2015, pp. 142-143.)

iii. Recycled Wastewater

762. The Kahului Wastewater Reclamation Facility ("Kahului WWRF") currently produces R-2 recycled water. (Exh. E-88, p. 2.)

763. While the Hawaii Department of Health has approved the use of R-2 water for sugarcane irrigation, HC&S prefers R-1 water due to its user flexibility and concerns about

workers coming in direct contact with the recycled water. R-1 water is recycled water that is at all times oxidized, filtered, and then exposed to a high level of disinfection. (Exh. E-88, pp. 2, 6.)

764. In 2010, the Maui County Council published the "Central Maui Recycled Water Verification Study" ("Verification Study") to analyze future alternatives for the transmission and optimization of R-1 recycled water from Kahului WWRF in order to provide a source of irrigation water for existing and planned future projects, and to provide alternatives to the use of injection wells. (Exh. E-88, p. 2.)

765. Seed cane is the best use of recycled water because nitrogen present in recycled water can reduce sugar yields in mature cane if recycled water is used at 100% concentration. Blending recycled water with ditch water can reduce nitrogen levels, but there are constraints on HC&S' ability to blend recycled water using its distribution system. Some of the distribution systems owned by HC&S are considered Hawaii State waterways, and the DOH does not permit recycled water of any quality to enter state waterways. Thus, the use of recycled water by HC&S is limited to areas where it has distribution systems that would be dedicated only to recycled water. (Exh. E-88A, pp. 12-13.)

766. The most desirable location for HC&S to use recycled water would be in the vicinity of Maui Lani towards Maalaea where seed cane is cultivated. (Exh. E-88A, p. 6.)

767. According to the Verification Study, the equipment that would be needed to be installed to upgrade the Kahului WWRF to R-1 water capability includes a coagulation system, a filtration system, a turbidity monitoring system, an automatic diversion system for use when R-1 turbidity systems are not met, and an ultra violet disinfection system. The estimated cost of the upgrades is $4.97 million. (Exh. E-88A, p. 6.)

768. The Verification Study analyzed three options for distribution of R-1 water after the upgrade of the Kahului WWRF to R-1 water capability is complete:

- Option 1: Develop distribution system from Kahului WWRF to Maui Lani where R-1 water could be used for landscape irrigation at commercial properties in the Kaahumanu Avenue vicinity. The estimated cost of Option 1 is $24.02 million.

- Option 2: Develop distribution system from Kahului WWRF to Kanaha Beach Park and Kahului Airport where R-1 water could be used for landscape irrigation. The estimated cost of Option 2 is $3.97 million.

- Option 3: Develop distribution system from Kahului WWRF to HC&S where R-1 water could be used for agricultural irrigation. This option could connect to an existing non-potable water distribution system previously constructed and utilized by Maui Land & Pineapple Company ("MLP") to deliver cannery wastewater to HC&S where it was used for seed cane irrigation. The Verification Study also analyzed an abbreviated version of Option 3 (Option 3A), which would create a dedicated system that would only serve HC&S by constructing only enough R-1 pipe along Kaahumanu Avenue to reach the existing MLP pipe lines. The estimated cost of Option 3 is $1.85 million, and the estimated cost of Option 3A is $11.38 million.

(Exh. E-88A, p. 7-8, 10.) None of these options would entail distributing recycled wastewater for use by HC&S on its East Maui Fields.

769. The Verification Study does not provide a timeline for when any of the three options for developing a recycled water distribution system from the Kahului WWRF to the Central Maui region would be completed, but because the upgrade of the Kahului WWRF to R-1 water capability is a prerequisite to developing any of the options, none of the options will be completed, if at all, until sometime after 2020.

770. HC&S retained Austin Tsutsumi & Associates, Inc. (“ATA”) to address the feasibility of utilizing treated effluent from the Kahului WWRF as an alternative source to Nā Wai ‘Ehā stream water in the Nā Wai ‘Ehā IIFS contested case proceeding. Exhibit C-119 is a copy of the resulting report dated January 22, 2014. The fields that could be served by such a

project are on the western side of the plantation, i.e., on the opposite side of the HC&S plantation from the HC&S infrastructure that distributes water received from EMI. (Volner, WDT 1/27/15, ¶ 2; Exh. C-119.)

771. According to the ATA Report, there is approximately 2.95 mgd of R-2 treated effluent that could potentially be reliably made available to HC&S 365 days a year from the WWRF upon a definitive agreement being reached between HC&S and the County of Maui and the construction of improvements at an estimated capital cost of approximately $16.9 million associated with making the water accessible to HC&S for its Nā Wai ʻEhā fields. Upon completion of the improvements, projected to be sometime in 2020 at the earliest, there would then be an additional annual operating and maintenance ("O&M") cost to HC&S of approximately $ 521,000, which includes $161,512.50 in fees that the County of Maui would charge for treated effluent at the rate of $ 0.15/1,000 gallons as stated in the County of Maui's letter to ATA dated January 15, 2014 (attached as Appendix A to the ATA Report). (Volner, WDT 1/27/15, ¶ 3; Exh. C-119, p. 35.)

772. The ATA Report, like the Verification Study, was focused on the potential use of reclaimed water on fields that are in relatively close proximity to the Kahului WWRF utilizing existing pipelines formerly operated to transport cannery wastewater from the now closed Maui Land & Pineapple Company, Inc. facility in Kahului. It would be much more difficult and costly to design and construct a system to transport reclaimed water to irrigate the East Maui fields that would be most impacted by reductions in EMI water since they are located much farther away from the Kahului WWRF and at much higher elevations. (Volner, WDT 1/27/15, ¶ 4; Exh. C-119.)

773. Nā Moku/MTF proposed a number of FOF on the use of wastewater for sugarcane irrigation, based on the December 20, 2010, Verification Study. (Nā Moku/MTF Proposed FOF 973-985.)

774. Nā Moku/MTF contended that "(f)unds in the County budget have been set aside for an R-1 upgrade and transmission lines at the Kahului plant. What remains to be decided is where these lines would be placed." (Nā Moku/MTF Proposed FOF 974.)

775. What is in the record is the response of Irene Bowie, Executive Director of MTF:

> A. There has been ongoing conversation, and I've talked with staff in the Department of Environmental Management about funding for that, and the county has looked to put money into the budget. I believe in the 2015 budget there is money set aside.
>
> And also Department of Transportation Airports Division was willing to put money into a line that would go to the airport.

(Irene Bowie, Tr., March 23, 2015, p. 167.)

776. Irene Bowie, Executive Director of MTF, makes a number of statements that do not distinguish the use of wastewater from the Kahului WWRF on HC&S' West Maui versus East Maui fields. (*Infra*, FOF 777-781.)

777. Nā Moku/MTF contends that "Option 2 on page 8 of the Central Maui Recycled Water Verification Study proposes a distribution system from the Kahului WWRF to Kanaha Beach Park and Kahului Airport that could be extended to HC&S fields north of the airport." (Exhs. E-88, E-88-A, E-126.) (Nā Moku/MTF FOF 975.)

778. However, Option 2 was for a distribution system to Kanaha Beach Park and Kahului Airport only, and it was Irene Bowie that stated that it was MTF's suggestion "that it could conceivably go on out to fields in the north side of HC&S's plantation." (Irene Bowie, Tr., March 23, 2015, p. 166.)

779. The HC&S fields on the north side of HC&S' plantation are irrigated by either EMI ditch water or HC&S wells. (Exh. C-35.)

780. The other options identified by Irene Bowie pertain to HC&S's West Maui fields: 1) a proposed pipeline along Kaahumanu Avenue to reach existing Maui Land and Pine ("ML&P") pipe lines that used to carry wastewater from its cannery operations to HC&S's seed cane fields; and 2) pumping R-1 water from the WWRF directly to HC&S's reservoir, are all in the West Maui fields. (Exh. C-120, p. 86, FOF 506; Exh. C-119, p. 36.)

781. In order to realize the use of WWRF R-1 water on HC&S's East Maui fields on the north side of HC&S' plantation the following must be completed: 1) upgrade of the Kahului WWRF to R-1 water capability, with an estimated cost in December 2010 of $4,965,000 (Exh. E-88, p.6); 2) a pipeline to Kahului Airport, and 3) a dedicated HC&S pipeline from that point to its East Maui fields adjacent to the airport.

782. The current dry weather capacity flow of the WWRF is 7.9 mgd for R-2 water. The minimum average daily flow of effluent produced over the last 10 years was approximately 3.2 mgd during the months of August and September 2012. There is presently only 2.95 mgd to 4.2 mgd of R-2 available on a consistent basis. (Exh. C-119, p. 36; Exh. E-88, pp. 2, 6.)

iv. Maui Land and Pine

783. Nā Moku/MTF contends that Maui Land and Pine (MLP) relied on EMI for irrigation water for 2,800 acres of its 6,000 acres, or approximately 4.5 mgd, and that 4.5 mg can be deducted from any determination of actual need for HC&S because MLP has gone out of business. (Exh. C-85, p. 32.) [Nā Moku/MTF FOF 1108-1113.]

784. However, MLP and HC&S had a transportation agreement, and not a water-use agreement, for use of the EMI transmission system to transport water MLP pumped into the EMI

ditch at Nahiku for use on its pineapple fields. Furthermore, EMI/HC&S does not intend to use water from the well in the future, because the pump is small, and the cost of electricity outweighs the use of that water. (Exh. E-107; Garret Hew, Tr., March 18, 2015, pp. 165-166.) [Nā Moku/MTF FOF 1109-1110, 113.]

d. Economic Impact

785. Under sugarcane cultivation, of the approximately 30,000 acres served by the EMI Ditch system, approximately 12,800 acres were entirely dependent on surface water—except for 7,000 acres that can be irrigated with brackish well water in the event of extreme drought through a booster pump system—while the remaining approximately 17,200 acres could also be served from brackish water wells, *supra*, FOF 738-739.

786. Under full buildout of the Diversified Agricultural Plan, approximately 9,143 acres will only have access to surface water, and 17,853 acres to both surface and brackish well water, *supra*, FOF 703-704.

787. Under sugarcane cultivation, brackish well water had contributed about 70 mgd, representing about 30 percent of total irrigation, from 1986 to 2009, rising to 38 percent of total irrigation, from 2008 to 2013, because surface water contributions had decreased from 167 mgd to 114 mgd during the same time periods, *supra*, FOF 742-743.

788. But the percent of brackish water on the approximately 17,200 acres of sugarcane fields that had access to well water would have been much higher than 38 percent. Of the 132

mgd total irrigation water, *supra*, FOF 686, 44 percent[28], or 58 mgd, would have been used on the approximately 12,800 acres that had access only to surface water, leaving 74 mgd of surface water to be used together with 70 mgd of brackish well water on the remaining 16, l41 acres. Thus, although brackish well water comprised 38 percent of the total irrigation requirement,[29] it comprised 48 percent[30] of the water applied on the acres which could use both surface and well water.

789. The estimated requirements under full buildout of the Diversified Agricultural Plan are 28.28 mgd for the 9,143 acres with access only to surface water, and 60.93 mgd for the 17,853 acres with access to both surface and well water, *supra*, FOF 703-704, for a total of 89.21 mgd.[31]

790. If we assume that the same historical use of 70 mgd of brackish well water is used, that would require only 19.21 mgd of surface water, or 60.6 percent brackish well water and 39.4 percent surface water, about double the percent of brackish well water used for sugarcane cultivation, *supra*, FOF 787.

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[28] This percentage is based on the number of acres that had access only to surface water (12,800) multiplied by the actual amount of irrigation delivered to HC&S fields (4,544 gad). FOF 689, 690, and 738.

[29] The amount of pumped brackish well water divided by the total irrigation requirement (70 mgd/132 mgd).

[30] This percentage is determined by dividing the amount of pumped water (70 mgd) by the amount of total available water (total = surface water (74 mgd) plus pumped water (70 mgd) = 144 mgd).

[31] The estimated gross irrigation requirement was 115.43 mgd, but that included system losses.

791. Moreover, only 19.21 mgd of surface water would be available for the 28.28 mgd required on the 9,143 acres with access only to surface water, leaving none for the remaining 17,853 acres. As a result, a large percent of the 9,143 acres would not be irrigated, and while 70 mgd of brackish water would be available for the 60.93 mgd required for the 17,853 acres, 100 percent of irrigation requirements would come from brackish well water.

792. If the same proportion of brackish well water is used as was historically applied in sugarcane cultivation, or 30-38 percent of the total estimated irrigation requirements of 89.21 mgd, at 30 percent brackish water, 26.76 mgd would be brackish water and 62.45 mgd would be surface water. At 38 percent, brackish water would be 33.90 mgd and surface water would be 55.31 mgd. However, again, 28.28 mgd of the surface water would have to be applied to the 9,143 acres with access only to surface water. At 30 percent brackish water there would only be 34.17 mgd[32] of surface water available for use together with 26.76 mgd of brackish water on the remaining 17,853 acres. This would result in 44 percent brackish water being applied to the 17,853 acres with access to both surface and well water. At 38 percent brackish water, there would be 27.03 mgd[33] of surface water available for use together with 33.90 mgd of brackish water, resulting in 61 percent brackish water being applied to the 17,853 acres with access to both surface and well water.

793. Volner of HC&S was of the opinion that, given that the future crops will generally be less tolerant to brackish water than sugarcane and that the amount of surface water imported from East Maui is expected to be reduced to meet the amended IIFS, it is not

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32 62.45 mgd (surface water) – 28.28 mgd (water for 9,143 acres) = 34.17 mgd

33 55.31 mgd (surface water) – 28.28 mgd (water for 9,143 acres) = 27.03 mgd

reasonable to assume that use of groundwater will be within the historical range of 20 to 30 percent of total water use and believes that a sustainable level of groundwater use will more likely be within the range of 0 to 20 percent of total water use, *supra*, FOF 750.

794. At 20 percent of total water use, brackish water would comprise 17.84 mgd of the total requirement of 89.21 mgd. 28.28 mgd of surface water would be used on the 9,143 acres with access only to surface water, and 43.09 mgd[34] would be left for the 17,853 acres with access to both surface and well water. Thus, of the 60.93 mgd required for the 17,853 acres, 17.84 mgd, or 29 percent, would be brackish water and 55.75 mgd, or 71 percent, would be surface water. This is compared to 48 percent brackish water when sugarcane was being irrigated, *supra*, FOF 788.

795. To summarize:

a. Total sugarcane irrigation used 70 mgd of brackish water, which was 30 percent of total irrigation from 1986-2009, rising to 38 percent in 2008-2013. On those fields with access to both surface and brackish water, the percent of brackish water was 48 percent from 2008-2013, *supra*, FOF 788.

b. For diversified agriculture:

i. If 70 mgd of brackish water is used, as was historically used for sugarcane irrigation, of the 89.21 mgd water requirements for diversified agriculture, the percent of brackish water for total requirements would be 78 percent, leaving only 19.21 mgd of surface water required for total water requirements. All of that surface water would be used for the 28.28 mgd required on the 9, l43 acres with access only to surface water, leaving no surface water for the remaining 17,853 acres. As a result, a large percent of the 9, l43 acres would not be irrigated, and while 70 mgd of brackish water would be available for the

[34] 89.21 mgd (total water) – 17.84 mgd (brackish water) – 28.28 mgd (water for 9,143 acres) = 43.09 mgd.

60.93 mgd required for the 17,853 acres, 100 percent of irrigation requirements would come from brackish well water, *supra*, FOF 790-791.

ii. For fields with access to both surface and brackish water, the amounts of brackish water that would represent lower percentages than the 33.90 mgd, which represents 38 percent of total water and 48 percent on fields with access to surface and well water when sugarcane was being irrigated would be: 1) 26.76 mgd, which represents 30 percent of total water and 44 percent on fields with access to both surface and well water; and 2) 17.84 mgd, which represents 20 percent of total water and 29 percent on fields with access to both surface and well water, *supra*, FOF 792-794.[35]

2. MDWS

a. Uses

796. MDWS is the sole municipal water provider for the County of Maui. The MDWS Upcountry Water System serves the communities of Kula, Haiku, Makawao, Pukalani, Haliimaile, Waiakoa, Keokea, Waiohuli, Ulupalakua, Kanaio, Olinda, Omaopio, Kula Kai, and Pulehu. (David Taylor, WDT, David Taylor, Tr., March 11, 2015, p. 41.) [MDWS FOF 13.]

797. The population served by the MDWS upcountry system is projected at 35,251 people and includes several businesses, churches, Kamehameha Schools, Hawaiian Homelands, and government facilities. By 2030, the population is anticipated to grow by about 8,424 to a total of 43,675. (Michele McLean, WDT, ¶5; Exh. B- David Taylor, WDT, ¶ 6; David Taylor, Tr., March 11, 2015, p. 41; Michele McLean, Tr., March 12, 2015, pp. 120-127; Exhs. B-1, B-18, B-58.) [MDWS FOF 15, 34.]

798. Approximately 60 percent of MDWS's system is used domestically, and the remaining 40 percent for agricultural purposes. (David Taylor, WDT, ¶ 17; Exh. B-2, pp. 1-2; David Taylor, Tr., March 11, 2015, pp. 44-47.) [MDWS FOF 21.]

[35] These estimates do not include system losses.

799. Approximately 80 to 90 percent of the water delivered within the upcountry system comes from surface water sources, either directly or by way of various raw water storage facilities. (David Taylor, WDT, ¶¶ 7-8, 18; Exh. B-2, Table 2; David Taylor, Tr., March 11, 2015, p. 44.) [MDWS FOF 20.]

800. MDWS relies on three surface water sources, one of which is delivered by EMI through the Wailoa Ditch, and the other two through two MDWS higher-elevation aqueducts maintained by EMI that transport water to Olinda and Kula, under a contractual agreement originated under the 193 East Maui Water Agreement and subsequent agreements. (Exhs. B-5, B-6, B-7, C-3.) [Nā Moku/MTF FOF 844.]

801.

Water Treatment Plant ("WTP")	Elevation	Conveyance System	Production Capacity	Average Production
Olinda	4,200 feet	Upper Kula Flume	2.0 mgd	1.6 mgd
Piiholo	2,900 feet	Lower Kula Flume	5.0 mgd	2.5 mgd
Kamole-Weir	1, l20 feet	Wailoa Ditch	6.0 mgd	3.6 mgd

(David Taylor, WDT, ¶ 9-11; David Taylor, Tr., March 11, 2015, p. 47; Exh. B-3, pp. 24-25; Exh. B-16, pp. 6-7.) [MDWS FOF 23-25; Nā Moku/MTF FOF 844.]

802. The Olinda facility diverts water from the Waikamoi, Puohokamoa, and Haʻipuaʻena streams. Water is stored in the 30-million gallon Waikamoi Reservoirs (two, at 15 million gallons each) and the 100-million gallon Kahakapao Reservoir. (David Taylor, WDT, ¶ 11; Exh. B-3, p. 25; David Taylor, Tr., March 11, 2015, p. 47.) [MDWS FOF 25.]

803. The Piiholo facility diverts water from the Waikamoi, Puohokamoa, Haʻipuaʻena, and Honomanū streams into the 50-million gallon Piiholo Reservoir. (David Taylor, WDT, ¶ 10; David Taylor, Tr., March 11, 2015, p. 47; Exh. B-3, p. 25.) [MDWS FOF 24.]

804. The Kamole-Weir facility, which has no reservoir, relies on water from the Wailoa Ditch, which diverts water from Honopou, Hanehoi, Puolua, Alo, Waikamoi, Puohokamoa, Ha‘ipua‘ena, Kōlea, Punalau, Honomanū, Nua‘ailua, Pi‘ina‘au, Paluhulu, East and West Wailuanui, West Wailuaiki, East Wailuaiki, Kopiliula , Pua‘aka‘a, Waiohue, Pa‘akea, Waiaaka, Kapaula, Hanawī, and Makapipi streams. (David Taylor, WDT, ¶ 9; David Taylor, Tr., March 11, 205, p. 47; Exh. B-3, p. 24.) [MDWS FOF 23.]

805. Besides its customers on the Upcountry Water System, *supra*, FOF 796, MDWS also provides non-potable water to the Kula Agricultural Park (“KAP”) through diversions from the same streams which serve the Kamole-Weir WTP through the Wailoa Ditch. Water is stored in two reservoirs with a total capacity of 5.4 million gallons. KAP consists of 31 farm lots ranging in size from 7 to 29 acres, and which are owned by the County of Maui. The individual lots are metered and billed by MDWS. (David Taylor, WDT, ¶ 13; Exh. B-4.) [MDWS FOF 27.]

806. MDWS receives its surface water under a series of contracts with EMI. The original contract was entered into in 1961, and the “Master Water Agreement” was replaced by a 1973 “Memorandum of Understanding” as the primary contract, which had a term of 20 years. Since its expiration, there have been a total of 8 extensions, and after the lapse of the most recent extension, water has continued to be provided through a “Memorandum of Understanding Concerning Settlement of Water and Related Issues” dated April 13, 2000 (“MOU”). (David Taylor, WDT, ¶15; Exhs. B-5 to B-15.) [MDWS FOF 29.]

807. The MOU provides that MDWS will receive 12 mgd with an option for an additional 4 mgd, for a total of 16 mgd. During low-flow periods, the County and HC&S will both receive a minimum allotment of 8.2 mgd. If these minimum amounts cannot be delivered,

MDWS and HC&S will receive prorated shares of the water that is available. (David Taylor, WDT, ¶ 15; David Taylor, Tr., March 11, 2015, pp. 53-54; Exh. B-15.) [MDWS FOF 30.]

808. Approximately 80 to 90 percent of the water delivered within the upcountry system comes from surface water sources, *supra*, FOF 799, with the remaining 10 to 20 percent coming from a series of basal aquifer wells. The Haiku Well can produce 0.5 mgd, the Pookela Well, 1.3 mgd, and the two Kaupakalua wells, 1.6 mgd, for a total of 3.4 mgd. (Exh. B-16, p. 8.) [Nā Moku/MTF FOF 850.]

809. In times of emergency, MDWS may also draw 1.5 mgd from the Hamakuapoko Wells. This water, however, is only available during times of emergency due to concerns over pesticides from former pineapple production. (David Taylor, Tr., March 11, 2015, pp. 61-62.)

810. The combined surface and ground water sources have a production capacity of 17.9 mgd: 13.0 mgd from surface water, *supra*, FOF 801, and 4.9 mgd from ground water (including 1.5 mgd in emergencies from the Hamakuapoko wells), *supra*, FOF 808-809.

811. However, due to occasional maintenance requirements and limitations on the use of the Hamakuapoko Wells, reliable capacity stands at 9.1 mgd. This is premised on the following sources not being available: 1) the largest surface-water facility, the Kamole-Weir at 6.0 mgd production capacity; 2) the Pookela Well at 1.3 mgd production capacity; and 3) Hamakuapoko Wells at 1.5 mgd, which is only available at times of emergency. These three sources total 8.8 mgd, potentially reducing total production capacity of 17.9 mgd to 9.1 mgd. (David Taylor, Tr., March 12, 2015, pp. 68-69.)

812. Customer usage based on meter readings between 2004 and 2013 average 7.9 mgd, varying between 6 mgd and 10 mgd. (Exhs. B-2; B-16, p. 3, table 3; B-21, p. 14, figure 1.) [MDWS FOF 33.]

813. There are currently 9,865 water connections to the Upcountry System. As of June 30, 2014, there were 1,852 applicants on the County's waiting list for new water connections. MDWS contends that if all were connected to the Upcountry System, water demand would increase by approximately 7.5 mgd, or 95 percent of current usage of 7.9 mgd, *supra*, FOF 812. However, because of the high cost of these connections, approximately half of the applicants who have been offered new meters have declined, and MDWS anticipates that this trend will continue, leaving demand at about 3.75 mgd. For the purposes of planning for the development of infrastructure, however, MDWS relies upon the full amount of this projected need due to uncertainties in anticipating future needs. (David Taylor, WDT, ¶¶ 20-23; Taylor, Tr., 2/8/17, p. 375, l. 13 to p. 376, l. 25.) [MDWS on reopening, FOF 471.]

814. MDWS explained that its current 9,865 water connections use an average of 7.9 mgd, and it expects that the additional 1,852 applicants, if meters are granted, would increase usage by 7.5 mgd, or 95 percent, because some of those applicants are asking for multiple meters for subdivisions. Therefore, 1,852 applicants represent many, many more actual meters. Staff engineers went through each of the applications, did an estimate for each one, and came up with the increased usage of 7.5 mgd. (David Taylor, Tr., March 11, 2015, p. 67-69.)

815. MDWS also expects that by 2030 the population of the area served by the Upcountry System will grow by about 8,424, from 35,251 to 43, 675, with a predicted additional need for water of 1.65 mgd. (Michele McLean, WDT, ¶ 5; Michele McLean, Tr., March 12, 2015, pp. 120-127; David Taylor, WDT, ¶ 24; David Taylor, Tr., March 11, 2015, pp. 76-78; Exhs. B-1; B-2, amended table 5; B-16, table 3; Exhs. B-18; B-58.) [MDWS FOF 34-35.]

816. MDWS anticipates that it will need to develop between 4.2 mgd and 7.95 mgd to meet demands through 2030, including present use, expected increased demand due to

population growth, and a percentage of new connections from the current priority list for meters. (David Taylor, WDT, ¶ 25.)

b. Losses

817. The 1.1-mile Waikamoi Flume transports surface water from the intakes at Waikamoi, Puohokamoa, and Haʻipuaʻena streams to the Olinda WTP. Water is stored in the 30-million gallon Waikamoi Reservoirs (two, at 15 million gallons each) and the 100-million gallon Kahakapao Reservoir, *supra*, FOF 802.

818. Over the years, the Waikamoi Flume became so leaky that MDWS estimated it lost as much as 40 percent of total flow through cracks and holes along its whole length. (Exh. B-54, pp. 27-29; Exh. E-114, p. 8.) [Nā Moku/MTF FOF 907-908.]

819. MDWS could not measure actual losses, because it had no mechanism for quantifying water levels at either the intake or discharge sites of the Waikamoi Flume. (David Taylor, First Supplemental Declaration, ¶ 5.) [Nā Moku/MTF FOF 911.]

820. If the reliable capacity of the Olinda WTP is the reported 1.6 mgd, *supra*, FOF 801, then the flume could have wasted as much as 0.64 mgd (1.6 mgd x 0.40) at that level of operation. [Nā Moku/MTF FOF 910.]

821. MDWS has just completed replacing the entire Waikamoi Flume. (David Taylor, Tr., March 11, 2015, pp. 55-59.)

822. Because the new flume isn't going to be leaking, MDWS assumes that everything going in will come out. They measure the reservoir levels every day, and also know how much water is taken out to the water treatment plant. So MDWS will be able to calculate how much water is coming from the flume on days when the main intake from the dam is dry, which is most of the days. All of the water coming in will be from the flume, so MDWS will be able to quantify

how much water comes in from the flume most of the time. (David Taylor, Tr., March 11, 2015, p. 60.)

823. There is no way to accurately compare intake versus outtake of the Waikamoi Flume prior to versus completion of the replacement flume. (David Taylor, Tr., March 11, 2015, p. 60.)

824. Further, the two 15 million-gallon Waikamoi reservoirs as well as the 2 million-gallon on-site basin at the Olinda WTP have just been relined. (David Taylor, Tr., March 11, 2015, p. 54-55.)

c. Alternate Sources

825. MDWS has no plans to drill new production wells to serve the Upcountry areas at the present time. They are very expensive, use a lot of energy, and there are some legal and procedural difficulties:

1. Water is very heavy, so moving it to higher elevations takes a lot of energy. Because a lot of the Upcountry System is at 1,000 to 4,000 feet and the basal aquifer is roughly at sea level, moving water is projected to cost $1.64 per thousand gallons for distribution from the Kamole-Weir WTP, $4.07 per thousand gallons at the Piiholo WTP, and $5.93 per thousand gallons at the Olinda WTP. On top of pumping costs, increased reliance on ground water sources would require substantial initial capital expenditures and on-going maintenance. Ground water development also involves risks due to the uncertainty of the quantity and quality of water that will be present. MDWS's current charges for water only average about $4 per thousand gallons, so just the electrical costs is more than what MDWS charges overall for its entire operation. (David Taylor, Tr., March 11, 2015, pp. 62-65; David Taylor, Tr., March 12, 2015, pp. 17-19, 52; Exh. B-16, pp. 10, 14, 16.) [MDWS FOF 39-43.]

2. MDWS has entered into a Consent Decree in the case of Coalition to Protect East Maui Water Resources v. Board of Water Supply, County of Maui, Civil No. 03-1-0008(3), December 2003, which requires that MDWS conduct vigorous cost/benefit analyses of other water source options before developing ground water in the East Maui region. On several occasions, MDWS has tried but been unsuccessful in working

within the framework of the consent decree to develop new ground water sources. (David Taylor, WDT, ¶¶ 29-30; David Taylor, Second Supplemental Declaration, ¶¶ 26-28; David Taylor, Tr., March 11, 2015, pp. 64-65; Exhs. B-19, B-20, B-52.)

826. New raw water storage facilities, which would be fed by streams in times of water surplus for use during times of low flows, are an additional means by which MDWS could mitigate the effects of stream flow restoration:

1. Currently, MDWS is considering construction of a 100- to 200-million gallon reservoir at the Kamole-Weir WTP, which has no reservoir, *supra*, FOF 804, and has allocated $1.5 million in its FY2015 budget toward land acquisition for a possible reservoir. The total six-year estimated cost for the project is $25.25 million. No money has been allocated for design or construction. (David Taylor, First Supplemental Declaration, ¶¶ 10-11; David Taylor, Second Supplemental Declaration, ¶ 24; David Taylor, Tr., March 11, 2015, pp. 50-53; Exhs. B-16, p. 13 table 13; E-124.) [MDWS FOF 45-46.]

2. Like new basal groundwater source development, development of new raw water storage would require significant initial capital expenditures and on-going maintenance costs. (David Taylor, Tr., March 12, 2015, pp. 19-24; Exh. B-16, pp. 14, 16 table 4.) [MDWS FOF 47.]

827. Raw water storage at the Kamole WTP is more cost-effective than providing backup capacity by extensive additions of basal groundwater wells, which require high long-term energy expenditures. (Exh. E-147, p. 48.) [Nā Moku/MTF FOF 952-953.]

828. Reservoirs mitigate fluctuations in both stream flow and consumer demand, and mitigations in fluctuations in stream flow allow more of it to be used at the proper time; i.e., during drier times when it is most needed for irrigation, by making more water available without simultaneously taking directly from the water source being protected. (David Taylor, WDT, ¶ 10; Richard Mayer, Supplemental Declaration, ¶¶ 13-14.) [Nā Moku/MTF FOF 949-950.]

d. Economic Impact

829. A study conducted for the draft "Maui Water Use and Development Plan ("WUDP") Upcountry Final Strategies Report" (July 25, 2009) examined the impacts of amended IIFS on drought period reliable capacity at the Kamole-Weir WTP. (Exh. E-130.)

830. In 2014, MDWS also commissioned an engineering analysis of the impact to MDWS if the County's use of East Maui surface water were reduced or eliminated, based on documents provided by MDWS, including the July 25, 2009 Draft WUDP for MDWS's Upcountry System. (Exh. B-16.)

831. The 2014 review and analysis compared new groundwater sources versus construction of raw water storage reservoirs to mitigate Upcountry drought conditions. New reservoirs carry high capital costs but have lower operation and maintenance costs compared to groundwater wells. New wells carry relatively lower capital costs but also require transmission and storage improvements to be integrated into the existing water delivery systems, have risks associated with the uncertainty of the quantity and quality of water that will be present, and have higher operational costs due to the costs of pumping ground water from basal aquifers at sea level to the Upcountry system. (Exh. B-16, p. 14.)

832. Life-cycle cost comparisons were made, with new ground water sources and construction of storage reservoirs carrying similar life-cycle costs. Life-cycle costs incorporate capital, operating, and maintenance costs over a defined planning period and include inflationary effects. Over a 25-year period, both new ground water wells and reservoirs would cost about $33-$35/thousand gallons, for a total of $250 to $260 million for each strategy. (Exh. B-16, p. 15.)

833. The Kamole-Weir WTP has no storage reservoir, while both the Olinda and Piiholo WTPs have reservoirs, *supra*, FOF 802-804. The Kamole-Weir WTP has a production capacity of 6 mgd and an average production of 3.6 mgd, *supra*, FOF 801.

834. Under the MOU between EMI and MDWS, MDWS can receive 12 mgd with an option for an additional 4 mgd, for a total of 16 mgd. During low-flow periods when ditch flows are greater than 16.4 mgd, both will receive a minimum allotment of 8.2 mgd. If these minimum amounts cannot be delivered, both will receive prorated shares of the water that is available, *supra*, FOF 806-807. In recent periods of low Wailoa Ditch flow, EMI has not restricted the allotment of water to MDWS according to the terms of the agreement, and MDWS withdrawals have been limited only by the amounts of water available in the ditch and the physical limitations of the existing Kamole-Weir WTP intake structures. During drought conditions, MDWS may withdraw 6 mgd, and what remains is used by HC&S for irrigation. (Exhs. E-130, p. 4; Exh. B-16, p. 10.)

835. For the period 1922 to 1987, flows in the Wailoa Ditch exceeded 40 mgd more than 90 percent of the time and exceeded 20 mgd more than 99 percent of the time. (Exh. E-130, p. 4.)

836. Assuming a drought period exists if water available to MDWS is less than the 6 mgd capacity of the Kamole-Weir WTP, recent existing reliability was 4.5 mgd drought period yield, with raw water requirements assumed to be 5.0 mgd to provide 4.5 mgd of potable water capacity.[36] (Exh. E-130, p. 6.)

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[36] The study uses 4.5 mgd or 4.6 mgd for various reasons. 4.6 mgd will be used to simplify the discussion.

837. For the 23,680-day period of record from 1922 to 1987, assuming a daily withdrawal of 5.0 mgd from the Wailoa Ditch, there was deficient water on 54 days (0.23 percent of the time) with a maximum of 16 consecutive days of deficiency. (Exh. E-130, p. 7.)

838. For the ten-year period 2001 to 2011, the number of days when the Wailoa Ditch flow was less than 20 mgd was 50 days, and the longest continuous span of no flow was 5 days. (Exh. B-16, p. 11 table 12.)

839. There would be little or no impact if Wailoa Ditch flows were reduced to 15 mgd. MDWS would not have full access to the 6 mgd capacity of the Kamole-Weir WTP for 5 days, the same as for the period 2001 to 2011, *supra*, FOF 838, and less than the maximum of 16 days for the period 1922 to 1987, *supra*, FOF 837. (David Taylor, Tr., March 11, 2015, pp. 145-146; Exh. B-16, p. 16.)

840. With a 20 mgd reduction in Wailoa Ditch flow and assuming a daily drought period withdrawal of 5.0 mgd, *supra*, FOF 836, there would not be sufficient water to provide reliable drought period capacity without some mitigating actions. For a 23,680 day period, *supra*, FOF 837, 5.0 mgd would not be able to be withdrawn for 822 days or 3.47 percent, with 54 consecutive days of deficiency. (Exh. E-130, p. 9.)

841. Note, however, that the deficiency only means that 5 mgd could not be withdrawn. Lesser amounts could still be withdrawn from the Wailoa Ditch. Furthermore, while the study defined drought period deficiency as being less than 4.6 mgd of a total capacity of 6 mgd, actual use from the Kamole-Weir WTP has been 3.6 mgd out of the total capacity of 6 mgd, *supra*, FOF 801.

842. With the addition of a 100-million gallon reservoir at the Kamole-Weir WTP, the drought period reliable yield with the 20 mgd reduction in Wailoa Ditch flow would be 4.6 mgd,

approximately equal to the existing WTP reliable yield without reductions in ditch flows. (Exh. E-130, p. 10.)

843. With a 200-million gallon reservoir, the drought period reliable yield with the 20 mgd reduction in Wailoa Ditch flow increases to 7.1 mgd, an increase of 2.4 mgd compared to a 100-million gallon reservoir and greater than the total capacity of 6 mgd of the Kamole-Weir WTP. (Exh. E-130, p. 10.)

844. Estimated costs of a 100- to 200-million reservoir at the Kamole-Weir WTP are $25.25 million, *supra*, FOF 826, and life-cycle costs over 25 years are estimated at $33 per thousand gallons or $250 million, *supra*, FOF 832. (Exh. B-16, p. 15.)

J. Future Land Use of the Central Maui Fields

845. The lands that had been utilized by HC&S for sugar cultivation are predominantly zoned as Agricultural District and are situated in the State Agricultural District. (McLean, WDT, 10/17/16, ¶ 4.) [MDWS on reopening, FOF 503.]

846. The use of land designated as Agricultural District is limited to agriculture; land conservation; agricultural parks; animal and livestock raising (including animal feed lots and sales yards); private agricultural parks; minor utility facilities; retention, restoration, rehabilitation, or improvement of buildings, sites, or cultural landscapes of historical or archaeological significance; or solar energy facilities. Accessory uses are allowed but must be "incidental or subordinate to, or customarily used in conjunction with" one of the allowed uses. (Maui County Code ("MCC") §§ 19.30A.050(A), (B).) [MDWS on reopening, FOF 505.]

847. The minimum lot area for property zoned Agricultural District is two acres, with a minimum width of 200 feet; the size of farm dwellings is limited to 10% of the total lot area with a maximum height of 30 feet; and while agricultural lots may be subdivided, there are limits on

the maximum number of subdivided lots. (MCC §§ 19.30A.030(A), (B), (D), (E), (G).)).) [MDWS on reopening, FOF 507.]

848. The Countywide Policy Plan ("CPP") was adopted in 2010 to provide an over-arching values statement and policy framework for development of the Maui Island Plan/General Plan 2030 and the community plans. The CPP sets forth "a series of broad themes and goals, each supported by more specific objectives, policies and implementing actions." (Aoki, WDT, 10/17/16, ¶ 5; Exh. B-064, p. 43.) [MDWS on reopening, FOF 508.]

849. Core principles of the CPP include:

a. to "protect the natural environment" to "improve the opportunity to experience the natural beauty and native biodiversity of the islands for present and future generations" through policies that "protect and provide ongoing care for important scenic vista, view plances, landscapes and open-space resources";

b. to "promote sustainable land use and growth management," with the objective to "improve planning for and management of agricultural land and rural areas" through policies that "protect prime, productive, and potentially productive agricultural lands to maintain the islands' agricultural and rural identities and economies," "discouraging developing or subdividing agriculturally designated lands when non-agricultural activies would be primary uses," and "conduct agricultural development planning to facilitate robust and sustainable agricultural activities"; and

c. to "strengthen the local economy," with objectives such as to "diversify and expand sustainable forms of agriculture" through policies that "prioritize the use of agricultural land to feed the local population and promote the use of agricultural lands for sustainable and diversified agricultural activities," "assist farmers to help make Maui County more self-sufficient in food production," "support ordinances, programs and policies that keep agricultural land and water available and affordable to farmers," and "support cooperatives and other types of nontraditional and communal farming efforts."

(Aoki, WDT, 10/17/16, ¶¶ 4-6; Exh. B-064, pp. 46, 61, 75.) [MDWS on reopening, FOF 509-511.]

850. Keeping HC&S/A&B's lands in agriculture would promote the CPP's core principle of maintaining open space and protecting scenic views. (Aoki, WDT, 10/17/16, ¶ 6.)

851. Long-term planning for the County of Maui is controlled by the Maui Island Plan/General Plan 2030 ("MIP"), which was officially adopted in 2012, and which is "a blue print that provides direction for future growth, the economy, and social and environmental decisions on the island through 2030" and which "established a vision, founded on core values that break down into goals, objectives, policies, and actions." (Aoki, WDT, 10/17/16, ¶ 7; Exh. B-065, p. 1-1.) [MDWS on reopening, FOF 512-513.]

852. One of the guiding principles of the Direct Growth Plan of the MIP states:

> Protect open space and working agricultural landscapes: In light of continuing urbanization, the protection of agricultural and open-space resources will depend on a healthy agricultural industry and progressive planning and regulation. Planning should utilize agricultural lands as a tool to define the edges of existing and planned urban communities, apply innovative site design, create buffers along roadways, provide visual relief and preserve scenic views.

(Exh. B-067, pp. 8-10.) [MDWS on reopening, FOF 517.]

853. The MIP recognizes that "preserving agricultural lands is important for the long term sustainability of Maui," and cites multiple reasons for the importance of maintaining agriculture, such as "agriculture creates a diversity of jobs, generates tax revenue, and produces a variety of crops for different local and export markets," "benefits Maui's tourism industry by providing green landscapes and enhancing the island's sense of place," and "protects land use options for future generations." (Exh. B-063, pp. 7-3, 7-7.) [MDWS on reopening, FOF 514.]

854. Goals of the MIP include:

a. "Maui will have a diversified agricultural industry contributing to greater economic, food, and energy security and prosperity," which will be pursued through policies that "strive to substitute food/agricultural product imports with a reliable supply of locally produced food and agricultural products," "encourage growing a diverse variety of crops and livestock to ensure the stewardship of our land while safeguarding consumer safety and "promote the development of locally-grown and ecologically-sound biofuels, aquaculture and forest products."

b. "Reduce the island's dependence on off-island agricultural products…" through policies that "support an incentive package for productive Agricultural Lands which aims to ensure agricultural viability for small and commercial-scale agricultural producers" and "actively look to acquire land and provide infrastructure to expand the agricultural park and establish new agricultural parks." (Exh. B-066, pp. 4-19, 4-20, B-063, p. 7-9.) [MDWS on reopening, FOF 519, 521.]

855. Objectives include to "significantly reduce the loss of productive agricultural lands" through policies that "strongly discourage the conversion of productive and important agricultural lands (such as sugar, pineapple and other produce lands) to rural or urban use…", "provide incentives for landowners to preserve and protect agricultural lands from development…", "support and promote the viability of Maui's agricultural businesses…", and "maintain or increase agriculture's share of the total island economy" through policies "encouraging the continued viability of sugar cane production, or other agricultural crops, in central Maui and all of Maui island." (Exhs. B-063, pp. 7-8, B-066, pp. 4-20.) [MDWS on reopening, FOF 515-516.]

856. Community plans set for the current and anticipated conditions of the designated region, and advance planning goals, objectives, policies, and implementation considerations to guide decision making for the region that is consistent with the Maui Island Plan/General Plan, while recognizing the unique values and attributes of Maui's different communities. (Aoki, WDT, 10/17/16, ¶ 12.) [MDWS on reopening, FOF 522.]

857. The central Maui fields fall within four Community Plan Districts:

a. The Makawao-Pukalani-Kula/Upcountry Maui Community Plan ("MPKCP") was adopted in 1996 and includes the town of Makawao, Pukalani, Kula, Ulupalakua, Haliimaile, Waiakoa, Keokea, Waiohuli, Kanaio, Olinda, Omaopio, and Pulehu, as well as the Kula Agricultural Park.

i. The MPKCP encourages policies that "provide for the preservation and enhancement of agricultural lands and operations, emphasizing the importance of promoting diversified agriculture to the region's economic base and lifestyle," "protect existing agricultural operations from urban encroachment," "preserve agriculture by actively promoting locally grown agricultural products," "encourage the continuation of sugar, pineapple, cattle ranching, and diversified agriculture as major agricultural activities in the region and at the same time encourage the pursuit of alternative agricultural activities," "encourage the development of cooperative agricultural development programs between the County and the Department of Hawaiian Home Lands to support diversified agricultural pursuits."

ii. In terms of land use, the MPKCP calls for the development of policies which "recognize the value of open space, including agricultural lands and view planes to preserve the region's rural character," "discourage speculation of agricultural lands," " encourage land use patterns that will…support the long term viability of agriculture," "encourage the use of mechanisms such as land trusts and farm trusts to preserve open space and agricultural activity," "make available agricultural lands for those who wish to farm," and "explore the development of an additional Ag park."

iii. The MPKCP's environmental recommendations encourage policies that would "preserve environmental resources by maintaining important agricultural lands as an integral part of the open space setting in each community," and "recognize agricultural lands as an essential ingredient to the upcountry atmosphere."

(Aoki, WDT, 10/17/16, ¶¶ 12-13, 15; Aoki, Tr., 2/8/17, p. 396, ll. 12-22; Exhs. B-068, B-069, pp. 18-20, 23, 26, 30.) [MDWS on reopening, FOF 523-528.]

b. The Paia-Haiku/North Maui Community Plan ("PHCP") was adopted in 1995 and includes the towns of Spreckelsville, Paia, Haiku, Kuau, Kuaiha, and Pauwela.

i. For land use, the PHCP promotes policies that "ensure that appropriate lands are available to support the region's current and future agricultural industries, including sugar, pineapple, diversified agriculture and aquaculture" and "identify prime or productive agricultural lands and develop appropriate regulations for their protection."

ii. Policies promoted by the PHCP for economic activity include "(m)aintain(ing) agriculture as the primary economic activity. Enhance opportunities for the cultivation and processing of local agricultural products and encourage the establishment of agricultural parks and support services (i.e., co-op facilities for distribution, marketing and sales) to enhance diversified agricultural activities," and " encourage the State Department of Agriculture to draft or propose a master plan to promote diversified agriculture by expanding agricultural programs, identifying the specific uses of those agricultural lands, and locating a site(s) for an agricultural park."

(Aoki, WDT, 10/17/16, ¶ 17; Exh. B-070, p. 14.) [MDWS on reopening, FOF 529-531.]

c. The Wailuku-Kahului/Central Maui Community Plan ("WKCP") was adopted in 2002 and includes the communities of Wailuku, Kahului, Waiehu, Waihee, Waikapu, and Puunene.

i. In terms of economic activity, the WKCP promotes policies that "support agricultural production so agriculture can continue to provide employment and contribute to the region's economic well-being" and "support the establishment of agricultural parks for truck farming, piggery operations, bee keeping and other diversified agricultural operations, within large unsubdivided agricultural parcels and in locations that are compatible with residential uses."

ii. In regards to the environment, the WKCP encourages policies that "preserve agricultural lands as a major element of the open space setting that which borders the various communities within the planning region. The close relationship between open space and developed areas is an important characteristic of community form."

iii. In regards to land use, the WKCP encourages policies that will "ensure that adequate lands are available to support the region's present and future agricultural activities," "identify prime or productive agricultural lands, and develop appropriate regulations for their protection."

(Aoki, WDT, 10/17/16, ¶ 19; Exh. B-071, pp. 12-14, 26.) [MDWS on reopening, FOF 532-535.]

d. The Kihei-Makena/South Maui Community Plan ("KMCP") was adopted in 1998 and includes the towns of Kihei, Wailea, Makena, and Maalaea.

i. KMCP promotes land-use policies that would "prevent urbanization of important agricultural lands" and "allow special permits in the State Agricultural Districts to accommodate unusual yet reasonable uses including: (1) limited agriculturally related commercial, public and quasi-public uses serving the immediate community; (2) uses clearly accessory or subordinate to a principal agricultural use on the property; (3) public facility uses such as utility installations or landfills whose location depends on technical considerations; and (4) extractive industries such as quarrying, where the operation would not adversely affect the environment or surrounding agricultural uses."

ii. MCP promotes economic policies that "provide for the preservation and enhancement of important agricultural lands for a variety of agricultural uses, including sugar cane, diversified agriculture and aquaculture."

(Aoki, WDT, 10/17/16, ¶ 21; Exh. B-072, pp. 18-19.) [MDWS on reopening, FOF 536-538.]

858. The County of Maui has expressed that it "is in strong support of keeping the lands used by HC&S/A&B in agriculture." The County's position "is largely premised on the policies set forth in Maui Island Plan/General Plan 2030, the Countywide Policy Plan, and the various Community Plans, which promote a variety of interests including economic diversity, maintenance of view planes, open space and fire protection." (MDWS Opening Brief at 5; MDWS Rebbutal Brief at 6; Exhs. B-063, pp. 7-2 to 7-10, B-064, pp. 46, 60, 61, 75.) [HC&S on reopening, FOF 418.]

859. MTF states that "we do want to see agriculture on this land and we do support stream flow being set at a level that would allow that, but we do also think this an opportunity to provide for some of those instream uses that, unfortunately, had to be left at the door…" "You

can't have long-term, viable agriculture if you're not making a profit," and MTF supports commercial, for-profit agriculture. (Perez, Tr., 2/8/17, p. 435, ll. 14-18, p. 437, ll. 1-11.)

860. MTF's report Mālama 'Āina: A Conversation About Maui's Farming Future notes that "(t)he closure of the HC&S sugarcane enterprise is an opening to the next generation of diversified farm businesses," and that HC&S's "large, consolidated 35,000-acre block of central Maui farmland can be used to generate multiple income streams while growing food and fuel profitably for local consumption and value-added export." (Exh. E-160, preface and p. 1.) [HC&S on reopening, FOF 419.]

861. 22,254 acres of land irrigated with East Maui stream water are designated as Important Agricultural Lands ("IAL") pursuant to HRS Chapter 205, Part III. The IAL designation "is a commitment to keep these lands in productive agriculture over the long term." (Volner, WDT, 10/17/16, ¶ 12.) [HC&S on reopening, FOF 423.]

862. MTF states that "We know that there was a purchase and sale agreement as far back as in July (for 339 acres)…So to me that's just consistent with the overall business model that we're going to hold the land until we can either sell it or develop it. I think that the lands that are in important agricultural designation are—have a higher likelihood of staying in agriculture for a long time, which we would prefer and we would encourage, but those lands that are not in IAL designation, I consider that to be a temporary predevelopment phase and I don't think those lands should receive the same weight when we're considering setting stream flow standards." (Perez, Tr., 2/8/17, p. 433, l. 12 to p. 434, l. 6.)

K. EMI's Management of the Diversions and the Interim Restorations, and Any Issues Concerning the Integrity of the EMI Ditch System

863. The ways to reduce the amount of water that is collected and transported in the EMI ditch system were previously described:

a. There are primarily four ways to reduce the amount of water that is collected and transported in the EMI ditch system: 1) on streams that have controlled diversions, by closing or reducing the diversion intake gate openings; 2) on stream diversions that have sluice gates, by partially or completely opening the sluice gates; 3) on streams that have radial gates between the diversions and the ditch, by completely closing the radial gates; and 4) by partially or or completely closing the gates on the main control points on the ditches themselves to limit the amount of water that can pass each control point, the effect of which is to redirect any excess water into the stream crossed by the ditch where the control point is located, *supra*, FOF 525.

b. Controlled diversions have intake gate openings, which are typically constructed with wooden boards or metal plates, used to regulate how much water can flow from the stream into the diversion structure, *supra*, FOF 526.

c. Sluice gates are openings within the basin of the diversions that can be opened to discharge the water collected in the diversion back into the stream. Periodically opening sluice gates to flush out silt, gravel, and other debris that collects in the diversion structures is one of the normal means of maintaining the proper functioning of the ditch system. The effect of opening a sluice gate is to return water to the stream after it has entered the diversion structure. It may not always cause 100% of the water that entered the diversion to be discharged back into the stream, because during periods of heavy rainfall, water may back up in the diversion faster than it can be discharged through the sluice gate, in which case some water will still enter the ditch. During most flow conditions, however, completely opening the sluice gate will return practically all of the water to the stream, *supra*, FOF 527.

d. Radial gates are located along the tunnel reaches of the ditch and were designed to automatically open or close in relation to the water level in the tunnel. The gates are controlled by a float located in a float chamber in the tunnel that is connected to a cable that lifts or lowers the radial gate, depending on the water level in the tunnel. The operation of the gate can be adjusted by piping water to the float chamber and closing the drain valve on the chamber to raise the float to maintain the gate in the closed position, *supra*, FOF 528.

e. There are several main ditch control points on each of the ditches: 1) 6 on the Koolau Ditch; 2) 4 on the Spreckels Ditch; 3) 3 on the Manuel Luis/Center Ditch; 4) 2 on the Wailoa Ditch/Tunnel; 5) 4 on the New Hamakua Ditch; 6) 3 on the Lowrie Ditch; and 7) 2 on the Haiku Ditch, *supra*, FOF 529.

f. EMI manages the reduction in diversions through a combination of measures that involve adjusting the intake control gates on the streams with controlled diversions, opening the sluice gates at the diversion on streams that have sluice gates, adjusting the operation of radial gates on the streams that have radial gates, and partially or completely closing the gates on main ditch control points. The precise combination of measures at any point in time depends on the amount of water to serve the needs of HC&S and MDWS, and the amount of rainfall that is occurring in the watersheds that span the ditch system, *supra*, FOF 530.

864. The closures of intakes to meet the current level of reduced needs of HC&S and MDWS were also previously described:

a. At the time of the hearing, EMI had closed the intakes on all of the streams with controlled diversions, opened the sluice gates on the majority of the diversions that have sluice gates, closed the radial gates on a couple of streams with radial gates, and has closed the 6 main ditch control points on the Koolau Ditch. The sluice gates have been opened on Nuaʻailua Stream, Alo Stream, and Waikamoi Stream on the Center Ditch, and three of the four sluice gates of the main intakes on Honomanū Stream. One of the sluice gates on Honomanū Stream cannot be opened because it is inoperable, but water is released into the west tributary of Honomanū Stream (Uluwini Stream) further down at a control gate in the Spreckels Ditch, *supra*, FOF 531.

b. The effect of these measures is to rely principally on water entering the ditch system west of Piʻinaʻau Stream (i.e., from the Honomanū and Huelo license areas) to meet the current level of reduced needs of HC&S and MDWS. With these measures in place, water flows in the Wailoa Ditch at Maliko Gulch have been reduced to 20-25 mgd, *supra*, FOF 532.

c. The Wailoa Ditch is the highest of EMI's ditches. Nearly all the flows from the four license areas are from the Wailoa Ditch (83%). When the flow in the Wailoa Ditch is extremely low, there are little or no flows in the lower ditches. Under drought conditions, a different set of gate adjustments would be implemented, because EMI expects that it would not be possible to meet even the current lowered needs without importing water from further east, in the Nahiku and Keanae areas, where base flows are more reliable and there is a ground water contribution to the Koolau

Ditch, in order to maintain a consistent flow in the Wailoa Ditch, *supra*, FOF 533-534.

d. As irrigation requirements increase from the ongoing implementation of diversified agriculture, EMI expects to implement a selective opening of board gates, readjusting the opening of sluice gates, resetting of radial gates, and readjusting of main ditch control gates to increase the amount of water brought into the ditch system. These measures will be dictated by the flow levels needed at Maliko Gulch and the rainfall patterns throughout the East Maui watersheds, *supra*, FOF 535.

865. Also previously described is the state of implementation to restore the streams that EMI has agreed to fully and permanently restore (from west to east: Honopou, Hanehoi [and its tributary, Puolua], Pi‘ina‘au, Palauhulu, Waiokamilo, Kualani,[37] and East and West Wailuanui Streams):

a. EMI has: 1) closed the intakes and opened the sluice gates on the diversions on East and West Wailuanui Streams on the Koolau Ditch; 2) opened the sluice gate on Palauhulu Stream on the Koolau Ditch; 3) opened the sluice gates on the diversions on Hanehoi and Puolua Streams on the Haiku Ditch; and 4) opened the sluice gate and closed the radial gate on the Wailoa Ditch, made modifications to the intake on the New Hamakua Ditch, opened the sluice gate and closed the intake diversion on the Lowrie Ditch, and modified the diversion on the Haiku Ditch on Honopou Stream, *supra*, FOF 536.

b. Further measures to achieve the full and permanent restoration of these streams will be taken after EMI obtains all the necessary permits and government approvals. On September 16, 2016, EMI submitted its applications to abandon the following stream diversions: Honopou, Hanehoi (Puolua), Pi‘ina‘au, Palauhulu, Waiokamilo (and its easternmost tributary, East Waiokamilo Stream, previously misidentified as Kualani Stream), and East and West Wailuanui Streams. Other pending approvals and concurrences will be needed from the County of Maui, DLNR’s Office of Conservation and Coastal Lands, and the U.S. Army Corps of Engineers, *supra*, FOF 537.

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[37] Actually, the most eastern tributary of Waiokamilo Stream and now known as “East Waiokamilo Stream,” *supra*, FOF 596, 598.

866. The reduction in diversions does not by itself compromise the structural integrity of the EMI ditch system so long as the complete system, including the open ditches and roadways, continues to be maintained as a single, coordinated system. Consistently reduced flows will increase the amount of maintenance required of the open ditches in the system, because it will increase the surface areas that will need to be periodically cleared of vegetation, *supra*, FOF 538.

II. CONCLUSIONS OF LAW

A. Burden and Standard of Proof

1. "In the context of IIFS petitions, the water code does not place a burden of proof on any particular party; instead, the water code and our case law interpreting the code have affirmed the Commission's duty to establish IIFS that 'protect instream values to the extent practicable' and 'protect the public interest.'" *Waiāhole II*, 105 Hawai'i at 11, 93 P. 3d at 653.

2. The CCH was being held to establish IIFS and not to determine nor limit which parties may use waters available after the IIFS are established. HRS § 174C-71 (2) (D).

3. Legal conclusions made in this proceeding pertaining to a particular party's water rights, traditional and customary rights, water use requirements, alternative water sources, and system losses are made without prejudice to the rights of any party and the Commission to revisit these issues in any future proceeding.

4. The legislature shall provide for a water resources agency which, as provided by law, shall set overall water conservation, quality and use policies; define beneficial and reasonable uses; protect ground and surface water resources, watersheds and natural stream environments; establish criteria for water use priorities while assuring appurtenant rights and

existing correlative and riparian uses and establish procedures for regulating all uses of Hawaii's water resources. Art. XI, § 7, Hawai'i State Constitution.

5. It is recognized that the waters of the State are held for the benefit of the citizens of the State. It is declared that the people of the State are beneficiaries and have a right to have the waters protected for their use. HRS § 174C-2(a).

6. The state water code shall be liberally interpreted to obtain maximum beneficial use of the waters of the State for purposes such as domestic uses, aquaculture uses, irrigation and other agricultural uses, power development, and commercial and industrial uses. However, adequate provision shall be made for the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation. Such objectives are declared to be in the public interest. HRS § 174C-2(c).

7. "'Water' or 'waters of the State' means any and all water on or beneath the surface of the ground, including natural or artificial watercourses, lakes, ponds, or diffused surface water and water percolating, standing, or flowing beneath the surface of the ground." HRS § 174C-3.

8. "All waters of the State are subject to regulation under the provisions of this chapter unless specifically exempted. No provision of this chapter shall apply to coastal waters. Nothing in this chapter to the contrary shall restrict the planning or zoning power of any county under chapter 46." HRS § 174C-4 (a).

9. "No state or county government agency may enforce any statute, rule, or order affecting the waters of the State controlled under the provisions of this chapter, whether enacted

or promulgated before or after July 1, 1987, inconsistent with the provisions of this chapter. Nothing in this chapter to the contrary shall restrict the power of any county to plan or zone as provided in chapter 46." HRS § 174C-4 (b).

10. The Commission "shall have exclusive jurisdiction and final authority in all matters relating to implementation and administration of the state water code, except as specifically provided in this chapter." HRS § 174C-7.

11. "The commission shall have jurisdiction statewide to hear any dispute regarding water resource protection, water permits, or constitutionally protected water interests, or where there is insufficient water to meet competing needs for water, whether or not the area involved has been designated as a water management area under this chapter. The final decision on any matter shall be made by the Commission." HRS § 174C-10.

12. In setting an IIFS, the Commission "need only reasonably estimate instream and offstream demands." (*In re ʻĪao Ground Water Management Area High-Level Surface Water Use Permit Applications and Petition to Amend Interim Instream Flow Standards of Waiheʻe River and Waiehu, ʻĪao, and Waikapu Streams Contested Case Hearing* ("*Nā Wai ʻEhā*"), 128 Haw. 228, 258; 287 P.3d 129, 159 [(2012)].); (In re Water Use Permit Applications ("*Waiāhole I*"), 94 Haw. 97, 155 n.60; 9 P.3d 409, 467 (2000).

13. "In requiring the Commission to establish instream flow standards at an early planning stage, the Code contemplates the designation of the standards based not only on scientifically proven facts, but also on future predictions, generalized assumptions, and policy judgments." *Waiāhole I*, 94 Haw. at 155; 9 P.3d at 467.

B. Case Law

14. In *Ka Pa'akai O Ka 'Aina v. Land Use Commission*, 94 Hawai'i 31, 7 P.3d 1068 (2000) ("*Ka Pa'akai"*), the Hawai'i Supreme Court provided an analytical framework to effectuate the State's obligation to protect native Hawaiian customary and traditional practices while reasonably accommodating competing privates interests. In particular, the Court stated that findings and conclusions as to the following must be made:

a. The identity and scope of "valued cultural, historical, and natural resources" in the petition area;

b. The extent to which those resources - including traditional and customary native Hawaiian rights - will be affected or impaired by the proposed action; and

c. The feasible action, if any, to be taken to reasonably protect native Hawaiian rights if they are found to exist.

Id., 94 Hawai'i at 47, 7 P.3d at 1084.

15. In setting an IIFS, the Commission "need only reasonably estimate instream and offstream demands." ((*In re 'Īao Ground Water Management Area High-Level Surface Water Use Permit Applications and Petition to Amend Interim Instream Flow Standards of Waihe'e River and Waiehu, 'Īao, and Waikapu Streams Contested Case Hearing* ("*Nā Wai 'Ehā*"), 128 Haw. 228, 258; 287 P.3d 129, 159 (2012).); (*In re Water Use Permit Applications* ("*Waiāhole I*"), 94 Haw. 97, 155 n.60; 9 P.3d 409, 467 (2000).)

16. "In requiring the Commission to establish instream flow standards at an early planning stage, the Code contemplates the designation of the standards based not only on scientifically proven facts, but also on future predictions, generalized assumptions, and policy judgments." (*Waiāhole I*, 94 Haw. at 155; 9 P.3d at 467.)

C. IIFS Criteria

17. "The protection of instream uses statewide shall be guided by the following general principles:

> (1) The quality of the stream systems statewide shall be protected and enhanced where practicable. Accordingly, where practicable, streams should be maintained with water sufficient to preserve fish, wildlife, scenic, aesthetic, recreational, and other instream uses, and stream systems should be retained substantially in their natural condition...
>
> (4) In determining flow requirements to protect instream uses or in assessing stream channel alterations, consideration should be given to the maintenance of existing non-instream uses of economic importance and the preservation of stream waters for potential non-instream uses of public benefit.
>
> (5) In order to avoid or minimize the impact on existing uses when preserving, enhancing, or restoring instream values, the commission shall consider physical solutions, including water exchanges, modifications of project operations, changes in points of diversion, uses of water from alternative sources, or any other solutions."

Haw. Admin. Rule § 13-169-5.

18. "'Instream flow standard' means a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses." (HRS § 174C-3.)

19. "'Interim instream flow' standard means a temporary instream flow standard of immediate applicability, adopted by the Commission without the necessity of a public hearing, and terminating upon the establishment of an instream flow standard. " (HRS § 174C-3.)

20. "In considering a petition to adopt an interim instream flow standard, the commission shall weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses." (HRS § 174C-71(2)(D).)

21. "'Instream use' means beneficial uses of stream water for significant purposes which are located in the stream and which are achieved by leaving water in the stream. Instream uses include, but are not limited to:

a. Maintenance of fish and wildlife habitats
b. Outdoor recreational activities
c. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation
d. Aesthetic values such as waterfalls and scenic waterways
e. Navigation
f. Instream hydropower generation
g. Maintenance of water quality
h. The conveyance of irrigation and domestic water supplies to downstream points of diversion
i. The protection of traditional and customary Hawaiian rights."

(HRS § 174C-3.)

22. "'Noninstream' use means the use of stream water that is diverted or removed from its stream channel and includes the use of stream water outside the channel for domestic, agricultural, and industrial purposes." (HRS § 174C-3.)

23. "'Domestic use' means any use of water for individual personal needs and for household purposes such as drinking, bathing, heating, cooking, noncommercial gardening, and sanitation." HRS § 174C-3.

24. "Interim instream flow standards may be adopted on a stream-by-stream basis or may consist of a general instream flow standard applicable to all streams within a specified area." HRS § 174C-7(2)(F).

25. The value of water that is diverted, only to be lost due to avoidable or unreasonable circumstances, is unlikely to outweigh the value of retaining the water for instream uses. Therefore, the Commission should consider whether system losses experienced by diverters are unreasonable, and whether reduction of such losses is reasonably practicable. *Nā Wai ʻEhā*, 128 Hawaiʻi at 257-258, 287 P.3d at 158-159.

26. The availability of alternative water sources is a consideration in the weighing of instream values with noninstream purposes when establishing IIFS, because the availability of alternative sources diminishes the "importance" of diverting stream water for noninstream use. *Nā Wai ʻEhā*, 128 Hawaiʻi at 259, 287 P.3d at 160.

27. The Commission may prioritize amongst public trust resources and balance between competing interests and to conserve potable aquifer water, that could be used for drinking water, instead of allowing the potable water to be used for agriculture because the Commission is entitled to consider the future water needs of Hawaiʻi and its people in fulfilling the State's obligation to protect, control and regulate the use of Hawaiʻi's resources for the benefit of its people. *In Re Water Use Permit Applications*, No. 28108, 2010 WL 4113179 at 11 (Haw. App. Oct. 13, 2010) (mem. op.) ("*Waiahole III*").

D. Instream Uses

1. Maintenance of Fish and Wildlife Habitats

28. The best scientific information currently available indicates that 64% of median base flow (BFQ_{50}) generally represents the flow necessary to restore 90% of the habitat in a stream (H_{90}). Absent any physical barriers to upstream or downstream migrations or interruptions in connectivity, the H_{90} flow is believed to provide suitable conditions for growth, reproduction, and recruitment of native stream animals as well as protection of traditional and

customary native Hawaiian gathering rights, which are affected by the size of native animal populations in a stream.

29. Certain streams, because of the presence of biological diversity, the potential for habitat restoration, and a history of stream diversions, would greatly benefit from IIFS set at H_{90}.

30. Other streams, because of the geomorphology of the stream or the presence of groundwater input through the presence of streams, are gaining streams and no additional release of water past the diversions are believed necessary to maintain habitat below the diversions at this time. To allow for some movement of biota, these streams should allow for a minimum connectivity flow across diversion structures to allow for passage of biota upstream. This minimum connectivity flow would be twenty percent (20%) of the instream flow.

31. The Commission's expectation is that restoring flows to streams that are spread out geographically will: 1) provide greater protection against localized habitat disruptions; 2) produce a wider benefit to estuarine and near-shore marine species; and 3) result in more comprehensive ecosystem function across the entire East Maui watershed.

2. Outdoor recreational activities

32. Streams in East Maui, specifically Makapipi, Hanawī, Waikamoi, East Wailuaiki, West Wailuaiki, Wailuanui, Waikamilo, Ohia, Honomanū, Waikamoi, Hanehoi, and Honopou, have significant outdoor recreational activities that consist primarily of: camping, hiking, fishing, hunting, swimming, and scenic views.

33. These recreational activities will not be impaired by the proposed actions in this decision but instead they will likely be improved by increasing stream flows.

3. Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation

34. East Wailuaiki, West Wailuaiki and Waiohue Streams have estuaries.

35. All streams except for Waiaaka and Ohia Streams have palustrial wetlands in the upper watershed of the hydrological unit and have not been affected by diversions.

36. Restoration of streamflow is likely to improve these ecological functions of estuaries.

4. Aesthetic values such as waterfalls and scenic waterways

37. Nineteen streams in east Maui currently have aesthetic values, primarily constituted of waterfalls, some including plunge pools, and to a lesser extent springs. The streams include: Makapipi, Hanawī, Kapaula, Waiaaka, Pa‘akea, Waiohue, Kopiliula , West Wailuaiki, East Wailuaiki, Wailuanui, Waiokamilo, Palauhulu, Pi‘ina‘au, Honomanū, Punalau, Ha‘ipua‘ena, Puohokamoa, Waikamoi, and Honopou.

38. Restoration and increased streamflow from previously diverted streams would increase aesthetic values in certain streams.

5. Navigation

39. Navigation is not a use in East Maui streams.

6. Instream hydropower generation

40. Instream hydropower generation is not a use in East Maui streams.

7. Maintenance of water quality

41. Streams that appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act § 303(d), include: Hanawī, Pua‘aka‘a, East Wailuaiki, West Wailuaiki, Ohia, Honomanū, Punalau, Ha‘ipua‘ena, Puohokamoa, and Waikamoi streams.

42. Of the ten streams that are on the 2006 List of Impaired Waters in Hawaii, six streams will have their flows increased which could benefit water quality in these streams.

8. The conveyance of irrigation and domestic water supplies to downstream points of diversion

43. Twelve of the streams have registered stream diversions that were declared for domestic or irrigation purposes other than for use by EMI or MDWS. These stream are: Honopou, Hanehoi, Waikamoi, Haʻipuaʻena, Honomanū, Nuaʻailua, Piʻinaʻau, Ohia, Waiokamilo, Waiohue, and Makapipi.

44. Huelo and Hanehoi Streams in particular provide water to a large number of domestic users, approximately thirty families totaling approximately one hundred people.

45. The diversion of streams for irrigation and municipal domestic water supplies are addressed as noninstream uses.

46. Use of the streams for conveyance of water for the cultivation of taro are addressed under the protection of traditional and customary Hawaiian rights.

9. The protection of traditional and customary Hawaiian rights

47. The maintenance of instream flows is important to the protection of traditional and customary Hawaiian rights for gathering, recreation, and the cultivation of taro through the recognition of appurtenant rights.

48. One of the public trust purposes is native Hawaiian and traditional and customary rights, including appurtenant rights. *Waiāhole I*, 94 Hawaiʻi at 136-138, 9 P.3d at 448-450.

49. Traditional and customary Hawaiian rights are personal rights "customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupuaʻa tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to

1778, subject to the right of the State to regulate such rights." Haw. State Constitution, Article XII, § 7.

a. Traditional and customary Hawaiian rights

50. Traditional and customary Hawaiian rights are personal rights "customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupuaʻa tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights." Haw. State Constitution, Article XII, § 7.

51. In *Public Access Shoreline Hawaiʻi v. Hawaiʻi County Planning Commission*, 79 Hawaiʻi 425, 903 P.2nd *1246* (1995), ("*PASH*"), the Hawaiʻi Supreme Court of Appeals stated:

> The State's power to regulate the exercise of customarily and traditionally exercised Hawaiian Rights . . . necessarily allows the State to permit development that interferes with such rights in certain circumstances . . . . Nevertheless, the State is obligated to protect the reasonable exercise of customarily and traditionally exercised rights of Hawaiians to the extent feasible.

Id. at 450 n.43, 903 P.2d at 1271 n.43. Therefore, not all appurtenant rightsholders have traditional and customary Hawaiian rights, because appurtenant rights are property rights held by any owner of the appurtenant lands, while traditional and customary Hawaiian rights are personal rights.

52. The Intermediate Court of Appeals in *State v. Pratt*, 124 Hawaiʻi 329, 243 P.3d 289 (App. 2010) ("*Pratt*"), summarized the cases concerning the protections for customary and traditional native Hawaiian access, water, and gathering rights from *Kalipi v. Hawn Trust Co., Ltd.*, 66 Haw. 1, 656 P.2d 745 (1982), to *State v. Hanapi*, 89 Hawaiʻi 177, 970 P.2d 485 (1999).

See *Pratt*, 124 Hawai‘i at 342, 243 P.3d at 302. The Court expressed an “essential characteristic of protected native Hawaiian rights” as follows:

> Hawai‘i law protects practices “associated with the ancient way of life” that have been continued, without harm to anyone. *Kalipi*, 66 Haw. at 10, 656 P.2d at 751. Put another way, the rights must have been “customarily and traditionally held by ancient Hawaiians.” *PDF v. Paty*, 73 Haw. at 619, 837 P.2d at 1271. *PASH* reiterated the threshold requirement that “it is established that the application of a custom has continued in a particular area” and “stress[ed] that … non-traditional uses are not permitted.” 79 Hawai‘i at 442, 447, 903 P.2d 1263, 1268. *PASH* reaffirmed that November 25, 1892 is the date by which Hawaiian usage must have been established in practice to fall within the protection of the law.

Id., 124 Hawai‘i at 352-53, 243 P.3d at 312-13.

53. The Hawaii Supreme Court, in affirming the Intermediate Court of Appeals’ decision in *Pratt*, clarified that consideration of the exercise of native Hawaiian rights requires a balancing of the respective interests and the harm and consideration of the totality of the circumstances. *State v. Pratt*, 127 Hawai‘i 206, 217, 277 P.3d 300, 311 (2012)(*Pratt II*).

54. *Pratt II* is instructive for the reminder that even when a customary and traditional practice has been shown to exist in an undeveloped area, that all of the circumstances must be considered in deciding whether to retain the exercise of such traditional and customary practice. *Id.*

55. In order for traditional and customary Hawaiian rights to be protected by the constitution and state law, it must meet the following minimum criteria:

a. it is being exercised by descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 (Haw. State Constitution, Article XII, § 7);

b. the claimed right is constitutionally protected as a customary or traditional native Hawaiian right as codified in article XII, § 7 of the Hawai‘i Constitution, or §§ 1-1 or 7-1, HRS; and

c. the exercise of the right occurred on undeveloped or less than fully developed land.

Pratt, 124 Hawaiʻi at 349, 243 P.3d at 309.

56. A claimed right is constitutionally protected as a customary or traditional native Hawaiian right under article XII, § 7 of the Hawaiʻi Constitution, or §§ 1-1 or 7-1, HRS if the following is shown:

   a. the practice must be related to extended family needs; the purpose must be to fulfill a responsibility related to subsistence, religious or cultural needs of one's family or extended family;

   b. the traditional or customary native Hawaiian practice must be traceable to at least November 25, 1892;

   c. the practice cannot be for a commercial purpose; and

   d. the manner in which the practice is conducted must be consistent with tradition and custom and the practice must be conducted in a respectful manner.

Pratt, 124 Hawaiʻi at 349-55, 243 P.3d at 309-315.

57. The record is not clear whether any person holds traditional and customary Hawaiian rights in the East Maui area, whether for gathering rights or for farming in traditional and customary ways. There was testimony that at least some Nā Moku members and their ʻohana gathered for subsistence and cultural purposes in the East Maui area, and wetland taro was being grown or attempted to be grown with traditional and customary practices, sometimes by members who have lived in the area for generations. (*See*, Edward Wendt, WDT, ¶ 2; Edward Wendt, Tr., March 9, 2015, p. 8; Terrance Akuna, Tr., March 10, 2015, pp. 17-19; Norman Martin, Tr., March 9, 2015, pp. 113-114; Jerome Kekiwi, Tr., March 9, 2015, p. 202; Joseph Young, Tr., March 9, 2015, pp. 222-223; *see* FOF 657-660.)

58. No evidence was presented that the native Hawaiian customary and traditional gathering rights were traceable to at least November 25, 1892.

59. For purposes of this contested case only, it is assumed that there are persons who can show that they possess native Hawaiian customary and traditional gathering rights that can be traced to at least November 25, 1892.

60. As indicated above, IIFS will be set in this case in certain streams to achieve at least one of the following: full habitat restoration; habitat restoration to H_{90}; ensuring connectivity flow over diversions to allow passage of stream biota.

61. The restoration of stream flows in this manner is intended to both restore the stream life and to provide additional opportunities for the exercise of customary and traditional gathering rights.

b. Appurtenant rights

62. There are no designated surface water management areas under HRS §§ 174C-45 and -46 in the East Maui region from which the EMI Ditch System diverts water.

63. Water rights in non-designated areas are governed by the common law. *Koolau Agr. Co. v. Commission on Water Resource Management* ("*Koolau*"), 83 Hawai'i 484, 491, 927 P.2d 1367, 1374 (1996).

64. Appurtenant rights are rights to the use of water utilized by parcels of land at the time of their original conversion into fee simple land, when title was confirmed by the Land Commission Award and title conveyed by the issuance of a Royal Patent. *Reppun v. Board of Water Supply* ("*Reppun*"), 65 Haw. 531, 551; 656 P.2d 57, 71 (1982).

65. The "use of the water acquired as appurtenant rights may only be used in connection with that particular parcel of land to which the right is appurtenant." *Reppun*, 65 Haw. at 551, 656 P.2d at 71 (*citing McBryde Sugar Co. v. Robinson,* ("*McBryde*") 54 Haw. 174, 504 P.2d 1330, aff'd upon rehearing, 55 Haw. 260, 517 P.2d 26 (1973)).

66. The amount of water accompanying the appurtenant right is determined by its use on the property at the time of the Mahele. *See Reppun*, 65 Haw. at 551, 656 P.2d at 71.

67. When "the same parcel of land is being utilized to cultivate traditional products by means approximating those utilized at the time of the Mahele, there is sufficient evidence to give rise to a presumption that the amount of water diverted for such cultivation sufficiently approximates the quantity of the appurtenant water rights to which that land is entitled." *Reppun*, 65 Haw. at 554; 656 P.2d at 72.

68. Surface water rights are limited to the base flows. "(T)itle to water was reserved to the State for the common good when parcels of land were allotted to the awardee under the mahele. Thus 'storm and freshet' water is the property of the State." *McBryde*, 54 Haw. at 199-200, 504 P.2d at 1345.

69. The use of stream water where the mode of irrigation approximates that which has historically been utilized for the cultivation of taro, although the method may not necessarily be the most efficient means of irrigation, is not unreasonable as a matter of law where there is no demonstration of unnecessary waste or proof that any more efficient means of cultivation is available to them. *Reppun*, 65 Haw. at 553, 656 P.2d at 72.

70. Parties with appurtenant rights were harmed by the EMI Ditch diversions.

71. Water, up to the restoration of full stream flow, should be provided to satisfy claimed appurtenant rights.

E. Noninstream Uses

1. HC&S

a. Agriculture

72. Article XI, § 3 of the Hawa'i Constitution provides:

> The State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands. The legislature shall provide standards and criteria to accomplish the foregoing.
>
> Lands identified by the State as important agricultural lands needed to fulfill the purposes above shall not be reclassified by the State or rezoned by its political subdivisions without meeting the standards and criteria established by the legislature and approved by a two-thirds vote of the body responsible for the reclassification or rezoning action.

73. The people of Hawaii have a substantial interest in the health and sustainability of agriculture as an industry in the State. "There is a compelling state interest in conserving the State's agricultural land resource base and assuring the long-term availability of agricultural lands for agricultural use to achieve the purposes of:

1. Conserving and protecting agricultural lands;
2. Promoting diversified agriculture;
3. Increasing agricultural self-sufficiency; and
4. Assuring the availability of agriculturally suitable lands pursuant to article XI, § 3 of the Hawaii Constitution."

HRS § 205-41.

74. The people of Maui County support agriculture for lands in central Maui as indicated in the Maui Island General Plan and various community plans for several communities in this area.

75. The conversion from sugarcane to diversified agriculture irrigation is similar to the conversion that was taking place in leeward O‘ahu at the time of the Waiāhole Ditch Contested Case. One of the differences is that in this Contested Case it is the Commission's burden to provide evidence of "the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses," in its balancing of instream and

noninstream values. HRS § 174C-71(2)(D). Furthermore, in establishing IIFS, the standard of proof for the Commission is less than for water-use permit applicants: "In requiring the Commission to establish instream flow standards at an early planning stage, the Code contemplates the designation of the standards based not only on scientifically proven facts, but also on future predictions, generalized assumptions, and policy judgments," *supra*, COL 18.

76. In Waiāhole, the Commission on remand from Waiāhole I clarified the terms "arable," "cultivated," and "planted" as follows:

> Arable land is land that is able to be cultivated but not necessarily in cultivation. Cultivated land goes through the cycle of being plowed, planted, harvested, plowed under and left to rest (either with or without cover crops), then plowed and planted, etc. Planted means when the plants are actually present. So you may be planted three or four months a year, but you're in cultivation continuously throughout the year. (CWRM, "Findings of Fact, Conclusions of Law, and Decision and Order, In re Water Use Permit Applications: On First Remand ("D&O II")," at 74, December 28, 2001.)

77. In Waiāhole II, the Hawai'i Supreme Court responded as follows:

> It is the Water Commission's daunting task to synthesize the evidence and reach a conclusion while balancing various interests and accounting for the public trust. In the instant case, the Water Commission considered testimony that each planted acre, depending on the crop, require(s) anywhere between 1,800 to 54,000 gallons of water per day, and averaging 7,500 gallons per day. In diversified agriculture, farmers plant only one-third to one-half of their cultivated acres at any given time. In addition, because rotating the fields in diversified agriculture makes it difficult to specify the water need for a particular acre, the Water Commission decided to consider average water use for cultivated acres. Based on the evidence presented, the Water Commission concluded that 2,500 gallons of water per cultivated acre per day was sufficient for diversified agriculture. Inasmuch as the Water Commission articulated its reasoning with sufficient clarity in its D&O II, we cannot say that the Water Commission's decision was clearly erroneous. The Water Commission's allocation off 22,500 gallons of water per cultivated acre per day appears to be based on the best

information currently available. *Waiāhole II*, 105 Hawai'i at 22, 93 P.3d at 664.)

78. In this Contested Case, the Commission has evaluated the best information currently available from HC&S and articulated its reasoning with sufficient clarity to meet the standard articulated in Waiāhole II. Moreover, in establishing IIFS, the standard of proof for the Commission is less than for water-use permit applicants, *supra*, COL 107.

79. At the reopened hearing, although HC&S was only diverting 20 mgd for its own use and for use by the County, the planned future uses set forth in the Diversified Agricultural Plan is consistent with the use of lands under an IAL designation as well as article XI, § 3 of the Hawai'i Constitution.

b. System losses

80. This decision anticipates that not all of HC&S' projected irrigation water needs under its Diversified Agricultural Plan will be met based on the median base flow from the petitioned streams that can continue to be diverted.

81. It will be HC&S' responsibility to allocate the water it may get under a lease from the Board of Land and Natural Resources between irrigation water and system losses. The Commission encourages HC&S to seek to make its storage and delivery of water to its fields more efficient to increase the productive yield of the irrigation water from East Maui.

c. Alternative sources

i. Ground water

82. A&B has correlative rights to the brackish water underlying its lands, but it does not own the water, which is a public trust resource, as is the surface waters that are diverted by the EMI Ditch system. (COL 30.)

83. Considering whether alternative water sources are practicable innately requires prioritizing among public trust resources. (COL 27-29.)

84. Both surface and brackish groundwater are nonpotable public trust resources available for nonpotable use—agriculture.

85. There are no absolute priorities among trust purposes, and resource protection is not a "categorical imperative." Reason and necessity dictate that the public trust may have to accommodate offstream diversions inconsistent with the mandate of protection, to the unavoidable impairment of public instream uses and values. (*Waiāhole I*, 94 Hawai'i at 141-42, 9 P.3d at 453-54.)

86. Brackish ground-water usable pump capacity is 115 mgd to 120 mgd, limited by a likely increase in aquifer salinity levels, especially in the summer months when pumping would be at its highest.

87. Historically, pumped groundwater constituted between 20 to 30 percent of total use when HC&S was cultivating sugarcane. The sustainable level of groundwater usage will be significantly reduced from historic levels in the the implementation of the Diversified Agricultural Plan as a result of reduced recharge of the groundwater aquifer due to lower levels of irrigation of overlying lands from diverted east Maui streams, the uncertain tolerance of diversified agricultural crops to brackish water, and the higher costs of pumping groundwater.

ii. Additional reservoirs

88. An additional large reservoir is not a reasonably practicable alternative to meet HC&S' needs. A large reservoir would be: cost prohibitive; cause safety concerns to surrounding communities; potentially result in significant impacts to the surrounding environment; and be of limited value to HC&S during the dry summer months when it would be

needed the most because of low-flow conditions because it is more efficient to apply ditch water directly to fields to minimize system losses.

89. Although HC&S did not study the alternative of building a larger number of smaller reservoirs, building more small reservoirs is not a reasonable alternative because it would not have the same benefit as having a larger reservoir at the highest elevation, which would be the eastward end of the agricultural lands.

iii. Recycled wastewater

90. Neither the ATA Report nor the Verification Study support the use of recycled wastewater as an alternative to EMI Ditch water. Both studies only considered the use of recycled wastewater for use on HC&S' Nā Wai 'Ehā fields. It would be too costly and difficult for the County and HC&S to design and construct a system to transport reclaimed water to the East Maui fields most impacted by the reduction in water from East Maui more analysis is needed to determine if this is viable.

iv. Maui Land and Pine

91. It is not reasonable to remove the water being pumped into the EMI Ditch by Maui Land and Pine from the amount needed by HC&S for its use. EMI was only conveying the water pumped into the EMI Ditch by Maui Land and Pine. No water was being diverted by EMI for use by Maui Land and Pine. Because EMI has not been using the pump and has no intent to use it in the future, no deduction is required to account for less water being needed to be diverted by EMI.

2. Maui Department of Water Supply (MDWS)

a. Municipal use

92. MDWS provides two types of surface water to its users: 1) potable water from its Olinda, Piiholo, and Kamole WTPs, with a combined capacity of 13 mgd and an average daily production of 7.7 mgd; and 2) non-potable water from HC&S's Hamakua Ditch at Reservoir 40 for the Kula Agricultural Park, with two reservoirs with a total capacity of 5.4 million gallons and average daily use of 3.5 mgd. (FOF 90, 92-93, 96, 98, 102.)

93. Current unmet demand is approximately 3.75 mgd, and by 2030, there is a predicted additional need for 1.65 mgd. MDWS anticipates it will need to develop between 4.2 mgd and 7.95 mgd to meet demands through 2030. (FOF 437, 439-440.)

94. MDWS is a purveyor of domestic water uses of the general public, particularly drinking. In this capacity, MDWS serves one of the purposes of the public trust, *supra*, COL 46.

95. "Domestic use" as defined in the Code is distinct from "domestic uses of the general public." In the Code, "'(d)omestic use' means any use of water for individual personal needs and for household purposes such as drinking, bathing, heating, cooking, noncommercial gardening, and sanitation (emphasis added)." (HRS § 174C-3.) The purpose of this definition in the Code is to exempt individual users from the permit provisions of the Code: "(N)o permit shall be required for domestic consumption of water by individual users..." (HRS § 174C-48 (a).) On the other hand, "domestic uses of the general public" acknowledges "the general public's need for water," and "the public trust applies with equal impact upon the control of drinking water reserves (quotation marks in original deleted)." *Waiāhole I*, 94 Hawai'i at 136-138; 9 P.3d at 448-450.

96. MDWS is also a non-riparian diverter of East Maui stream waters, and under the common law, its continuing use of stream waters is permissible if the use is reasonable and beneficial and will not actually harm the established rights of others.

97. The Public Trust Doctrine applies in all situations, whether or not in a water management area, and whether or not the common law applies. *Waiāhole I*, 94 Hawai'i at 133, 9 P.3d at 445.

98. For MDWS's use of East Maui stream waters, there is a potential conflict between the public trust doctrine and the common law. Under the public trust doctrine, there is a presumption in favor of trust purposes, and competing water uses must be weighed on a case-by-case basis. Under the common law, MDWS's use must not actually harm the established rights of others. While some appurtenant and riparian rights holders are also likely to have traditional and customary Hawaiian rights in their exercise of appurtenant rights and also have a presumption in their favor, they do not have priority over MDWS as a purveyor of domestic water uses of the general public, and competing uses must still be weighed on a case-by-case basis according to any appropriate standards provided by law.

b. System losses

99. The 1.1-mile Upper Waikamoi Flume, which serves the Olinda WTP, was estimated to lose as much as 40 percent of total flow through cracks and holes along its whole length. Actual losses could not be measured, because MDWS had no mechanism for quantifying water levels at either the intake or discharge sites of the flume. If reliable capacity of the Olinda WTP is the reported 1.6 mgd, then the flume could have lost as much as 0.64 mgd (1.6 mgd x 0.40) at that level of operation. (FOF 441-444.)

100. MDWS has just completed replacing the entire flume, as well as completely relining the two 15 million-gallon Waikamoi reservoirs and the 2 million-gallon on-site basin at the Olinda WTP. (FOF 445, 448.)

101. With the new flume, MDWS will be able to calculate how much water is coming from the flume on days when the main intake from the dam is dry, which is most of the days. (FOF 446.)

c. Alternative sources

102. New reservoirs, which would be fed by streams in times of water surplus for use during times of low flows, are not alternatives to using stream waters but a means of mitigating the impacts of reduced availability of stream waters. Reservoirs mitigate fluctuations in both stream flow and consumer demand, and mitigations in fluctuations in stream flow allow more of it to be used at the proper time. (FOF 450, 452.)

103. New production wells are not an alternative to serve the Upcountry areas in the immediate and intermediate future. Water is heavy, so moving it to higher elevations such as where much of the Upcountry System is located, at 1000 to 4000 feet, from basal aquifers at sea level is projected to cost $1.64 per thousand gallons for distribution from the Kamole-Weir WTP, $4.07 per thousand gallons at the Piiholo WTP, and $593 per thousand gallons at the Olinda WTP. MDWS's current charges for water only average about $4 per thousand gallons, so just the electrical costs to pump the water is more than what MDWS charges overall for its entire operation. On top of pumping costs, there would be substantial initial capital expenditures and on-going maintenance. (FOF 449.)

104. MDWS has also entered into a Consent Decree, which requires that MDWS conduct vigorous cost/benefit analyses of other water source options before developing ground

water in the East Maui region, and has tried unsuccessfully on several occasions to work within the framework of the consent decree to develop new ground water sources. (FOF 449.)

3. Economic Impact

a. HC&S

105. The County of Maui has expressed that it "is in strong support of keeping the lands used by HC&S/A&B in agriculture." The County's position "is largely premised on the policies set forth in Maui Island Plan/General Plan 2030, the Countywide Policy Plan, and the various Community Plans, which promote a variety of interests including economic diversity, maintenance of view planes, open space and fire protection." (MDWS Opening Brief at 5; MDWS Rebuttal Brief at 6; Exhibit B-063, pp. 7-2 to 7-10; Exhibit B-064, pp. 46, 60, 61, and 75.)

106. MTF supports commercial agriculture in Central Maui. (Albert Perez, Tr., 2/8/17, p. 435, ll. 13-14, p. 437, ll. 1-11.) MTF's report, *Malama Aina: A Conversation About Maui's Farming Future* notes that "[t]he closure of the HC&S sugarcane enterprise is an opening to the next generaltion of diversified farm businesses," and that HC&S's "large, consolidated 35,000-acre block of central Maui farmland can be used to generate multiple income streams while growing food and fuel profitably for local consumption and value-added export." (Exhibit E-160, preface and p. 1.)

107. MTF supports the use of East Maui stream water for "true agriculture."

108. Nā Moku agrees that the former sugar lands should be kept in agriculture.

109. Accordingly, the parties to this contested case do not dispute that keeping HC&S's former sugar lands in agriculture is in the public's best interest.

110. Keeping HC&S's former sugar lands in agriculture would promote the Countywide Policy Plan's core principle of maintaining open space and protecting scenic views. (Kathleen Ross Aoki, WDT 10/17/16, ¶ 6.)

111. 22,254 acres of land irrigated with EMI water are designated as Important Agricultural Lands ("IAL") pursuant to HRS Chapter 205, Part III. The IAL designation "is a commitment to keep these lands in productive agriculture over the long term." (Volner WDT 10/17/16, ¶ 12.)

112. Keeping the East Maui fields in agriculture is important to the long-term sustainability of Maui; and a diversified agricultural industry contributes to greater economic, food, and energy security and prosperity and protects open space and working agricultural landscapes.

113. In this early stage of transforming from sugarcane to diversified agriculture cultivation on A&B's East Maui fields, the forecasted water requirements continue to evolve and will not become final until every acre has been planted back in another agricultural use.

114. Diversified agricultural uses will also be subject to change, because some potential partners and lessees are expected to rotate multiple crops that could potentially have different crop coefficients. And it is unknown whether every single one of these diversified agricultural uses will come to fruition because so many basic questions about the company's potential agricultural operations remain unanswered.

115. The estimated water requirements will change not only because some potential partners and lessees are expected to rotate multiple crops that could potentially have different crop coefficients but also because water requirements could change significantly through the use of regenerative agricultural methods.

116. Finally, the acreage estimated to need irrigation—26,996 acres—is bound to shrink in the future from Maui's urban growth. The designation of "Important Agricultural Lands" is a commitment to keep these lands in productive agriculture over the long term, and 22,254 acres are so designated.

117. Thus, it is not improbable that diversified agriculture will be maintained over the long term on these acres although likely not on all the acres currently estimated to be in diversified agriculture.

118. The maintenance of diversified agriculture on the central Maui agricultural lands, including those designated as IAL, will require a consistent, reliable, and affordable source of water.

119. It can be expected that well water, because of the cost to pump the water and the unknown amount of sustainable level of groundwater usage, will not provide all of the water needed to maintain diversified agriculture in the East Maui Fields.

120. In order for the East Maui Fields to successfully remain in agriculture, a portion of the water needs under the Diversified Agricultural Plan must come from surface water.

b. MDWS

121. Under the MOU between EMI and MDWS, MDWS can receive 12 mgd with an option for an additional 4 mgd, for a total of 16 mgd. During low-flow periods when ditch flows are greater than 16.4 mgd, both will receive a minimum allotment of 8.2 mgd. If these minimum amounts cannot be delivered, both will receive prorated shares of the water that is available. In recent periods of low Wailoa Ditch flow, EMI has not restricted the allotment of water to MDWS according to the terms of the agreement, and MDWS withdrawals have been limited only by the amounts of water available in the ditch and the physical limitations of the existing

Kamole-Weir WTP intake structures. During drought conditions, MDWS may withdraw 6 mgd, and what remains is used by HC&S for irrigation.

122. There would be little or no impact if Wailoa Ditch flows were reduced by 15 mgd. MDWS would not have full access to the 6 mgd capacity of the Kamole-Weir WTP for 5 days, the same as for the period 2001 to 2011, and less than the maximum of 16 days for the period 1922 to 1987.

123. With a 20 mgd reduction in Wailoa Ditch flow and assuming a daily drought period withdrawal of 5.0 mgd, there would not be sufficient water to provide reliable drought period capacity without some mitigating actions. The deficiency only means that 5 mgd could not be withdrawn. Lesser amounts could still be withdrawn from the Wailoa Ditch. Furthermore, while the study defined drought period deficiency as being less than 4.6 mgd of a total capacity of 6 mgd, actual use from the Kamole-Weir WTP has been 3.6 mgd out of the total capacity of 6 mgd.

124. With the addition of a 100-million gallon reservoir at the Kamole-Weir WTP, the drought period reliable yield with the 20 mgd reduction in Wailoa Ditch flow would be 4.6 mgd, approximately equal to the existing WTP reliable yield without reductions in ditch flows.

125. With a 200-million gallon reservoir, the drought period reliable yield with the 20 mgd reduction in Wailoa Ditch flow increases to 7.1 mgd, an increase of 2.4 mgd compared to a 100-million gallon reservoir and greater than the total capacity of 6 mgd of the Kamole-Weir WTP.

126. Estimated costs of a 100- to 200-million reservoir at the Kamole-Weir WTP are $25.25 million, and life-cycle costs over 25 years are estimated at $33 per thousand gallons or $250 million.

F. Balance of Instream v. Noninstream Uses

127. In setting interim instream flow standards, the Commission is required to weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses. HRS § 174C-71(2)(D).

128. In setting these interim instream flow standards the Commission prioritized the instream uses that allowed the stream species to flourish, traditional and customary native Hawaiian rights, both appurtenant and gathering rights, to be actively practiced, and non-municipal domestic uses to be supported.

129. The Commission also recognized that there are streams for which restoration of flow would not result in significant biological or ecological gains and that the water may be better used for noninstream uses. For those streams, a connectivity flow to allow for movement of instream biota, would be sufficient.

130. The Commission also recognized that there is significant value in the noninstream uses which include municipal use, which includes domestic use, and agricultural use. The value of the noninstream uses goes beyond mere economic value to the users, it supports uses that range from households, schools and hospitals to small truck farms and large agricultural concerns. It also ensures the continued presence of agriculture in central Maui, a value which has been incorporated by the community through its inclusion in the Maui Island Plan/General Plan 2030, the Countywide Policy Plan, and the various Community Plans.

1. Water for streams with high biological value

131. Some of the Petitioned streams have the potential to benefit greatly from the restoration of flow to a minimum H_{90} level based on the biological diversity and habitat that

already exists under diverted conditions. These streams should be restored to allow the stream species to flourish and reproduce, benefitting not only the natural environment but also allowing for better opportunity for the exercise of traditional and customary native Hawaiian rights.

132. The streams that would most benefit from having IIFS set at H_{90} or above are:

a. Pi'ina'au –potential to sustain a large and diverse population of native stream species if flow is restored to the stream;

b. Wailuanui – flow restoration would likely increase habitat availability for the rich diversity of native species represented in the stream while also creating connectivity and suitable depths for native species in the currently dry or shallow sections dewatered by the diversions;

c. Honomanū – despite limited available habitat quite a few native stream animals are present in the stream. Flow restoration would likely improve the diversity in the streamand improve ecological function of the estuary;

d. Waikamoi - habitat restoration would be benefitted by flow restoration. Although Waikamoi has been found to maintain 50 to 75 percent of habitat under diverted conditions, the presence of terminal waterfalls limits the species that are able to migrate upstream.

e. Nua'ailua – little flow restoration would be needed to achieve full habitat availability, even under diverted conditions.

f. East Wailuaiki – because of the diversity of native stream animals and the apparent health of the stream, flow restoration has the potential to sustain larger populations of native stream animals with little restoration required.

g. Kopiliula – since Kopiliula Stream already has a diversity of native stream animals under diverted conditions, it has the potential to carry a full complement of native stream fauna if allowed continuous mauka to makai flows.

h. Waiohue – has a good diversity of native stream animals and groundwater input below the diversion.

133. None of these streams have registered diversions declared for taro cultivation nor is there taro cultivation known to occur on these streams.

134. Certain streams, because of the high biological value or other factors, should have all flow restored to the stream. These streams include West Wailuaiki and Honomanū Streams.

135. West Wailuaiki Stream presents a unique research opportunity to collect valuable information regarding the impact of full restoration of a stream versus habitat restoration (H_{90}). East and West Wailuaiki lie in close proximity to each other with similar biological values and similar habitat and biota. The Commission intends for these two streams to be studied in the future in combination with one another to see the impact, if any, of full restoration versus habitat restoration.

136. Honomanū Stream is a gaining stream from above the Lower Kula ditch to Spreckles Ditch. Below the Spreckles Ditch it becomes a losing stream most likely as a result of the diversion. Despite having several diversions on it, Honomanū Stream has a high biological rating with a potential for high natural habitat gains with the restoration of flow to the dry reaches. The Lower Kula Ditch diversion provides water for the MDWS system that is used for domestic and agricultural use. Honomanū Stream should have full streamflow restoration below the Lower Kula Ditch. No out of watershed transfers will be allowed below the Lower Kula Ditch.

137. No out of watershed transfers means that water will not be diverted outside the watershed under all circumstances, including during storm events.

2. Conveyance of water to kalo growing areas or for community use

138. The following streams will have all diversions ceased to allow for all water to flow to the taro growing areas or for community and non-municipal domestic use: Honopou, Huelo (Puolua), Hanehoi, Pi'ina'au, Palauhulu, Waikamilo, Wailuanui, Ohia, Waianu, Kualani, and Makapipi.

139. All diversions for these streams shall be modified so that no out of watershed transfers will occur from these streams.

140. In requiring the release of all water from these streams for the use of appurtenant rights users, the IIFS will be set at zero (0) below the taro loi complexes and the domestic use diversions. The users will determine the amount of water that will remain in the stream or that will be returned to the stream from the taro loi.

141. Similarly, the amount of water that each loi will be allowed to use will be determined by the users. The users are encouraged to use the "spirit of mutual dependence" in the use of water within the loi complexes and amongst users on the same stream.

142. The "spirit of mutual dependence is based on the following description in *Reppun*:

> Perhaps the essential feature of the ancient water system was that water was guaranteed to those natives who needed it, provided they helped in the construction of the irrigation system. Because agriculture was a matter of great importance to the Hawaiians, they were, in general, willing to contribute their efforts to the water system. The konohikis aimed to secure equal rights to all makaainana and to avoid disputes. Beneficial use of water by the makaainana were also essential to the continued delivery of water. The natives were subject to compulsory maintenance work on the auwais under the supervision of the konohiki. The konohiki, on the other hand, was reluctant to impose unreasonable

> burdens on the tenants because they were normally free to leave a particular plot if unhappy with the konohiki. Hence a "spirit of mutual dependence and helpfulness prevailed, alike among the high and low, with respect to the use of water."

Reppun, 65 Haw. at 540, 656 P.2d at 64.

143. The "spirit of mutual dependence," as discussed in *Reppun*, recognizes the importance of water and agriculture to the lives of the king, the konohiki, and the tenants of the land, and encourages the cooperation of all members in the use and application of water. *Reppun*, 65 Haw. at 540, 656 P.2d at 64.

144. The Commission's intent is to not regulate, at this time, where and how much water will be used for traditional kalo agriculture or how the water will be apportioned amongst the kalo loi. Our decision provides an opportunity to refine our knowledge of kalo water requirements as well as corresponding relationships with habitat status. It also provides time and flexibility for the leadership within the affected local communities to develop community-based allocation and management processes for the appropriate use of water from the kalo streams.

145. This approach does not automatically set precedents for other areas, but provides a model of water use that integrates traditional culture with modern natural resource management. In this model, there is a responsibility to sustain the native fauna that live in that stream as well as to provide for other traditional and cultural gathering activities

3. Water for streams that have barriers to biological or ecological improvements

146. The streams that are set at connectivity flow are:

a. Kapaula – a gaining stream that is diverted once at Koʻolau Ditch. There is a poor diversity of native stream animals, likely in part due to the terminal waterfall at the end of the stream. The biological rating is low. Increasing streamflow is not anticipated to enhance overall productivity of the stream.

b. Pa‘akea – a gaining stream that is diverted once at the Ko‘olau Ditch. The lower reach of the stream has good streamflow, most likely from spring input. Most of the native stream animals were observed in the first plunge pool and lower reach leading to the ocean. While flow restoration may increase flow connectivity, it is not likely to enhance overall productivity of the stream or any substantial increase to estuarine habitat.

c. Pua‘aka‘a – a tributary of a Kopiliula Stream with one diversion at the Ko‘olau Ditch. The stream habitat availability model predicts that the stream already maintains over 50 percent of the natural habitat under diverted conditions.

d. Puohakamoa – is a one of the sources of water for MDWS’ system which has a dry and losing reach in the headwaters but is generally a gaining stream. The biological value is moderate with very little native species.

e. Ha‘ipua‘ena – there are five diversions of which 2 are for the MDWS system. It is generally a gaining stream which had 50 percent to 75 percent of the natural habitat for all species below Wailoa Ditch under diverted conditions. The terminal waterfall limits access by certain native species which, in part, warrants a moderate biological rating.

f. Nua‘ailua – mostly a gaining stream which is only diverted at Spreckles Ditch. Diverted base flow is about 90 percent of the natural base flow conditions which would provide close to 100 percent of natural habitat for species.

g. Waiaaka – there is a single diversion of the stream at the Koolau Ditch. There is very little habitat above the ditch with most of the hydrologic unit below the ditch. The stream provides 100 percent of the expected natural habitat availability even under diverted conditions.

h. Hanawī – there is a single diversion at the Koolau Ditch. This is a gaining stream mostly as a result of ground water gains from spring input below the diversion. Hanawī provides excellent instream habitats and a diversity of native stream animals exist in the stream. Little benefit would be achieved from the release of more water past the diversion.

147. None of these streams have registered diversions declared for taro cultivation nor is there taro cultivation known to occur on these streams.

4. Noninstream use of water for municipal and agricultural uses

148. The Commission, in the context of a proceeding to set IIFS, does not have the authority to determine how much water may be used for noninstream use by HC&S or MDWS. That is under the authority of the Board of Land and Natural Resources ("Board") pursuant to HRS § 171-58, subject to the IIFS set by the Commission.

149. Recognizing that the noninstream uses, especially municipal use, are valued uses, the Commission has set IIFS to allow for the MDWS to continue to divert water through its Upper and Lower Kula pipelines.

150. In not requiring full restoration of all streams, the Commission has allowed for the some streams to continue to be diverted so that the Board may continue to license the diversion of water not needed to meet the IIFS from these streams for noninstream use. The available water would also include freshets and stormwater which are not included in the calculation of the IIFS.

151. The ditch system remains a valuable asset that delivers noninstream public trust benefits such as drinking water, as well as other reasonable and beneficial offstream uses. The reduction in diversions does not by itself compromise the structural integrity of the ditch system so long as it continues to be maintained as a single coordinated system. The Commission considered factors that contribute to the operational capacity of the existing ditch system by allowing some water diversions from streams in the higher elevation eastern portion of the watershed.

152. While the Commission recognizes that the water that may be licensed by the Board from the petitioned east Maui streams may not be sufficient to satisfy the full implementation of the Diversified Agricultural Plan, it is expected that a sufficient amount of noninstream water would be available to provide the initial phase of allowing the lands already designated as important agricultural lands in central Maui to be developed for diversified agriculture.

III. DECISION AND ORDER

a. This CCH was being held to establish IIFS and not to determine nor limit which parties may use waters available after the IIFS are established. Legal conclusions made in this proceeding pertaining to a particular party's water rights, traditional and customary rights, water use requirements, alternative water sources, and system losses are made without prejudice to the rights of any party and the Commission to revisit these issues in any proceeding involving the use of water from any of the East Maui streams that are the subject of this contested case hearing. The burden of proof with respect to such issues will be upon the petitioner rather than upon the Commission.

b. In considering a petition to adopt IIFS, the Commission must weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses.

c. It is the Commission's duty to establish IIFS that protect instream values to the extent practicable and to protect the public interest.

d. The public interest includes not only protecting instream values but also preserving agricultural lands and assuring adequate water supplies for Maui.

The Commission needs only to reasonably estimate instream and offstream demands, and may base the IIFS not only on scientifically proven facts but also on future predictions, generalized assumptions, and policy judgments.

e. The IIFS of the following streams are amended from their previous IIFS, at the approximate locations specified, with final locations approved by the Commission, if necessary, after implementation by Commission staff.

f. The streams restored to natural, undiverted base flows ("full restoration") represents all the water that was historically available to the communities along each specific stream before the EMI Ditch system was built. If, under current climate, rainfall, and stream flow conditions, such stream flows are insufficient to meet all irrigation and domestic uses, it is incumbent upon such users to develop a system of reasonable sharing, including adequate stream flows for resuscitation of stream life. These streams will have IIFS of zero (0), as explained above.

g. The IIFS are the estimated 64% of median base flows (BFQ_{50}), also known as (H_{90}) flows, for stream restoration, and the numbers are only estimates, to be eventually confirmed by actual flows from which the H_{90} can be established.

h. The following chart shows the name of the stream, the restoration status, BFQ_{50}, amended IIFS (cfs), and IIFS location, if applicable, for each stream:

Stream Name	Restoration Status	BFQ_{50} at IIFS (cfs)[38]	IIFS Value (cfs)	IIFS Location
Makapipi	Full	1.3	n/a	Above Hana Highway
Hanawī	Connectivity	4.6	0.92	Below Hana Highway
Kapaula	Connectivity	2.8	0.56	On diversion at Koolau Ditch
Waiaaka	None	0.77	0.77	Above Hana Highway
Pa‘akea	Connectivity	0.9	0.18	At Hana Highway
Waiohue	Full	5.0	n/a	At Hana Highway
Pua‘aka‘a	Connectivity	1.1	0.2	Above Hana Highway
Kopiliula	H_{90}	5.0	3.2	Below Hana Highway
East Wailuaiki	H_{90}	5.8	3.7	At Hana Highway
West Wailuaiki	Full	6.0	n/a	Above Hana Highway
Wailuanui	Full	6.1	n/a	At Hana Highway
‘Ōhi‘a/Waianu	None	4.7	n/a	None.
Waiokamilo	Full	3.9	n/a	Below diversion at Koolau Ditch

[38] Based on Gingerich WDT, Table: Summary of Median Basee Flow and Potential Habitat at Median Base Flow in Diverted Stream Reaches, Northeast Maui, Hawai‘i.

Palauhulu	Full	11	n/a	Above Hana Highway
Pi‘ina‘au	Full	14	n/a	Above Hana Highway
Nua‘ailua	Connectivity	0.28	2.2	To be determined
Honomanū	H_{90}	4.2	4.2	Above Hana Highway
Punalau/Kōlea	H_{90}	4.5	2.9	Above Hana Highway
Ha‘ipua‘ena	Connectivity	4.9	1.36	Below Hana Highway
Puohokamoa	Connectivity	8.4	1.1	Below Hana Highway
Wahinepe‘e	None	0.9	0.9	Above Hana Highway
Waikamoi	H_{90}	6.7	3.8	Above Hana Highway
Hanehoi	Full	2.54	n/a	Upstream of Lowrie Ditch
Huelo (Puolua)	Full	1.47	n/a	Downstream of Haiku Ditch
Honopou	Full	6.5	n/a	Below Hana Highway

i. It is intended that diversion structures only need to be modified to the degree necessary to accomplish the amended IIFS and to allow for passage of stream biota, if needed.

j. This Order does not require that every diversion on every tributary be removed or modified, the Commission is only looking at modifications to main stem and major diversions to accomplish the amended IIFS set forth above. The Commission also recognizes that it is not the purpose of this proceeding to determine how the diversions will be modified. That issue will be before the Commission in a subsequent process.

k. The intent of the Commission is to allow for the continued use and viability of the EMI Ditch system and will not require the complete removal of diversions unless necessary to achieve the IIFS.

l. Monitoring of the IIFS will be through 12-month moving averages. This method recognizes that requiring a specific amount of flow at all times at a specific location is incompatible with the objectives of providing sufficient flow to meet irrigation and domestic requirements and/or providing sufficient habitat for growth, reproduction, and recruitment of native stream animals.

m. Approximately one year from the date of this Order the staff and parties shall provide a status update on the implementation of the amended IIFS.

n. The Commission has no authority over DAR and therefore requests that the Board authorize DAR to monitor whether or not the flows implemented for East Wailuaiki of H_{90} and full restoration of West Wailuaiki have resulted in any difference in the biology or ecology of these two streams as compared to the other.

o. Nā Moku shall report on:

1. The inflow quantity and outflow quantity of water from the taro loi complexes and the flow of water remaining in the taro streams; and
2. Nā Moku members as "konohiki" for the streams that they use for irrigation and/or domestic uses, including managing their uses so that the downstream IIFS for habitat restoration are met.

p. EMI shall report on:

1. Modifications to diversions to meet the amended IIFS.
2. Water deliveries at Honopou Stream and Maliko Gulch, and any changes EMI ascribes to the amended IIFS.
3. Changes in stream diversions and ditch settings as HC&S's irrigation requirements increase.

q. HC&S shall report on:

1. Surface, pumped, and total water usage.
2. Crops and acreage planted.

3. Changes in its initial diversified agriculture plan, including major changes in type of crops planned and reduction of planned irrigation acres through changes in use or sales of land.

r. MDWS shall report on:

1. The amount of water in the Upper and Lower Kula Ditches before Waikamoi Stream.

2. The status of plans for a 100-million or 200-million gallon reservoir at the Kamole WTP.

DATED: Honolulu, Hawaii, June 20, 2018.

SUZANNE D. CASE

BRUCE S. ANDERSON, Ph.D.

WILLIAM D. BALFOUR

/s/ Kamana Beamer
KAMANA BEAMER

MICHAEL G. BUCK

NEIL HANNAHS

Excused
PAUL J. MEYER

COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII

PETITION TO AMEND INTERIM INSTREAM FLOW STANDARDS FOR HONOPOU, HUELO (PUOLUA), HANEHOI, WAIKAMOI, ALO, WAHINEPEE, PUOHOKAMOA, HAIPUAENA, PUNALAU/KOLEA, HONOMANU, NUAAILUA, PIINAAU, PALAUHULU, OHIA (WAIANU), WAIOKAMILO, KUALANI, WAILUANUI, WEST WAILUAIKI, EAST WAILUAIKI, KOPILIULA, PUAKAA, WAIOHUE, PAAKEA, WAIAAKA, KAPAULA, HANAWI, AND MAKIPIPI STREAMS	)	Case No. CCH-MA13-01 CERTIFICATE OF SERVICE

CERTIFICATE OF SERVICE

On June 20, 2018, a copy of the foregoing document was served on:

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/s/ Kathy Yoda
KATHY YODA
Commission on Water Resource Management

PACIFIC OCEAN
PACIFIC OCEAN
HUELO LICENSE
G.L. 3578
Expires June 30, 1981
Government Water 64.49%
Private Water 35.51%
HONOMANU LICENSE
G.L. 3695
Expires June 30, 1986
Government Water 47.39%
Private Water 52.61%
KEANAE LICENSE
G.L. 3349
Expires June 30, 1971
Government Water 79.19%
Private Water 20.81%
NAHIKU LICENSE
G.L. 3505
Expires June 30, 1976
Government Water 95.02%
Private Water 4.98%
KOOLAU FOREST RESERVE
KOOLAU FOREST RESERVE
MAKAPUU
HAIKU DITCH
LOWRIE DITCH
NEW HAMAKUA DITCH
WAILOA DITCH
SPRECKELS DITCH
MANUEL LUIS DITCH
KOOLAU DITCH
KOKOMO
PAIA
MAKAWAO FOREST RESERVE
EAST MAUI DITCH SYSTEM
NAHIKU TO MALIKO
EAST MAUI IRRIGATION COMPANY, LIMITED
PAIA, HAWAII
GRAPHIC SCALE IN FEET
0 1000 2000 3000 4000 5000
DATED: APRIL 1970
REVISED: JUNE 5, 2003
FEBRUARY 28, 2004
LEGEND
Gulches or Streams
Roads
Land Boundary Line
Ditches
Tunnels
Water Development Tunnels
Jeep Roads
Trails
Reservoirs
Water License Boundary Line
Water Measuring Station
Rain Gage
Triangulation Station
Ditch Trail Station
Intakes
LAND HOLDINGS
Government
East Maui Irrigation Company, Limited - Fee
E. M. I. Co., Ltd. et al - Undivided Fee
E. M. I. Co., Ltd. et al - Multiple Claim Fee
Alexander & Baldwin, Inc. - Fee
REVISED MAP PREPARED BY
RONALD M. FUKUMOTO ENGINEERING, INC.
C-1

DIAGRAM OF HAWAIIAN COMMERCIAL & SUGAR CO. DITCH SYSTEM WITH DITCH & RESERVOIR CAPACITIES