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BOARD OF LAND AND NATURAL RESOURCES

STATE OF HAWAI‘I

In the Matter of a Contested Case Regarding the Continuation of Revocable Permits (RPs) for Tax Map Keys (2) 1-1-001:044 & 050; (2) 2-9-014:001, 005, 011, 012 & 017; (2) 1-1-002:002 (por.) and (2) 1-2-004:005 & 007 for Water Use on the Island of Maui to Alexander & Baldwin, Inc. and East Maui Irrigation Company, LLC for the remainder of the 2021 RPs, if applicable, and for their continuation through the end of 2022	DLNR File No. CCH-LD-21-01 DECLARATION OF

DECLARATION OF MICHAEL H. KIDO

I, Michael H. Kido, under penalty of perjury hereby state the following is true and accurate to the best of my knowledge and belief:

1. The statements below are based upon my personal knowledge.

2. I earned a Master's Degree in Zoology from the University of Hawaii (UH) in 1973. I lectured at Kaua‘i Community College (UH) in zoology, biology, oceanography, chemistry and general science from 1982 through 1990. I worked as a research biologist for UH from 1990 retiring in November 2015. My primary research focus was in Hawaiian stream ecology. I established the Hawaii Stream Research Center and Long-term Ecological Ecological Research Site (LTER) in Limahuli Stream (Kauai) in 1996 within UH’s Center for Conservation Research and Training (UH-CCRT). I’ve prepared 67 papers, reports and studies on Hawaiian streams.

3. My early research in the 90's focused on the diet ecology of native Hawaiian stream gobiid fishes (*'o'opu*) publishing a series of scientific journal articles that provided previously undocumented spatial-temporal information on the algal-invertebrate assemblage living on the stream bottom being selected as foods by our five native *'o'opu* species. These projects provided a basis for the development of robust methodologies to monitor spatial-temporal changes in population densities of native stream animals as well as the algal-invertebrate availability of their preferred foods in Hawaiian stream environments. These data led to a better understanding of the natural ecological structure and function of Hawaiian stream environments related to the dynamics of flow variation from "mountain-to-sea." This research resulted in scientific articles quantifying stream monitoring assessment methodologies in the Hawaii Stream Bioassessment Protocol (1999), the Hawaii Stream Index of Biotic Integrity (HS-IBI) (2012), the Hawaii Watershed Health Index (2012) and application of these monitoring tools in natural and human-impacted streams on Kaua'i, O'ahu, Maui, Molokai and Hawai'i islands (2000 - 2019). These methods incorporated a core perspective that pristine (i.e. least human-impacted) Hawaiian streams that flow continuously from "mountain-to-sea" exhibit inherent high "biological integrity" within *ahupua'a.* In these stream systems native *'o'opu* and *'opae* are driven to find species-specific preferred habitat locations along this "mountain-to-sea" continuum upon entering the stream mouth as juveniles from the ocean. This "reference condition " of high biological integrity is used as a standard to which the biophysical condition encountered in any Hawaiian stream can be compared. The initial set of "reference streams" selected in 1998 included Hanakapiai (Kauai), Lower Hanawi (Maui) and Wailau (Molokai).

4. Of the 376 perennial streams in the state, I've been to approximately 125 of them conducting systematic biological integrity assessments on some 34 streams. I visited east Maui

streams in the late 1990s and in 2020 when diversion sites on East Maui streams impacted by EMI were visited.

5. On February 25, 26 and 27, 2020, I visited EMI diversion sites on Hoolawa Nui, Hoolawa Ili, Hoalua, Hanehoi, Oopuola, Waikamoi (Alo Tributary), Puohokamoa, Kolea, Waiohue, East Kopiliula, West Kopiliula and East Wailuaiki Streams.

6. Anthropogenic factors that degrade Hawaiian stream environments, moving them away from the reference biophysical condition, either disrupt the continuous flow to the ocean (dams - diversions), modify the natural stream channel (culverts, road- crossings, channelization for flood control, etc.), input chemical pollutants and run- off from impervious surfaces into stream environments or modify natural vegetated lands in the watersheds - riparian zones.

7. The only comprehensive statewide inventory of streams in Hawai‘i, published in 1978 (43 years ago)(Timbol and Maciolek 1978), concluded that 53% of perennial streams in Hawaii were impacted by some form of water diversion primarily for agricultural or hydropower development. I have looked at stream diversions statewide and they generally fall into three categories: 1) concreted dam structures that impound water behind them with various designs of grated systems to divert water into ditch networks often used secondarily to trap additional water from side-tributaries; 2) cut-off trenches dug in to underlie the stream channel so that flow drops directly in the streambed through a grate into the ditch network and; 3) *taro loi* diversions where a portion of streamflow is directed into *auwai* at strategic natural bends in the channel sometimes with stream rocks loosely piled into walls to direct flow as in traditional systems. Dam structures are designed to take 100% of flow up to some predetermined flood level when the barriers are overtopped. *Taro loi* diversions I’ve seen never take more than 50% of natural flow with traditional systems as in Waipio Valley (Hawaii) diverting less than 30% with used water always returned to the stream.

8. The obvious negative ecological impact of hardened across-stream diversion structures (types 1 & 2 above), depending on where they are situated on the stream continuum, is to cut-off continuous flow from "mountain-to-sea" so that juvenile *ʻoʻopu* and *ʻopae* returning from the ocean are not be able to reach their preferred *mauka* habitat. Moreover, adults moving downstream from *mauka* locations to spawn are ensnared by flow into the ditch systems with no way out. The same fate faces newly hatched larvae trying to reach the ocean from spawning grounds located above diversion intakes. In streams I've visited where such diversion structures were in place for decades (e.g. Anahola-Hanalei-Wailua-Waimea-Wainiha (Kauai); Iao (Maui); Waipio-Wailoa (Hawaii)) populations of native stream animals are depauperate or nearly absent in often perfectly good *mauka* habitat upstream of the diversions.

9. Some of this biological impairment, depending on the magnitude/duration/ location of flow disruption, may be attributed to chronic impacts on natural fluvial processes which are critical to nutrient processing, downstream movement of sediments, substrate and nutrient export into the ocean. Streambed habitat downstream of diversion structures can be severely degraded by excessive soil-sediment-organic matter deposits to the point where little or no natural cobble- boulder substrate is visible which is the case in the lower reaches of the Waimea River on Kauai. Flow reduction below diversion structures also lowers the stream's water level and raises water temperature particularly during extended droughts. I have witnessed large numbers of dead *ʻoʻopu* in dried out stream habitat below the Wainiha River dam (Kauai) during such a prolonged drought. Upstream migrating *ʻoʻopu* will wait in shrinking available pools in habitat below diversions until they succumb to high temperatures and lack of oxygen. Flow reduction in stream habitat below diversion structures also enhances habitat for alien slow-water aquatic species like Poeciliid fishes (e.g. mosquito fish, swordtails,

mollies, etc.) which harbor lethal internal parasites that are transferred to *ʻoʻopu* species in locations where they coexist. The biological trajectory of chronic, unmanaged water diversion by hardened systems and accumulating human-impact is towards increasingly degraded biological integrity in the stream system as a whole characterized first by lowering population densities of native stream animals in their preferred habitat locations along the stream continuum, followed by the absence of sensitive species (i.e. *ʻoʻopu alamoʻo* and *ʻoʻopu-nopili),* ending in degraded habitat where alien aquatic species predominate.

10. My 2020 East Maui site visit confirmed that the EMI stream diversions are having a negative impact on native Hawaiian amphidromous stream fish and macroinvertebrates that require continuous streamflow connection from *mauka* watersheds to the ocean. Post larval individuals recruiting into streams from the ocean aggressively migrate to preferred habitat locations along the stream continuum from mountain-to-sea. Depending upon species, reproductively mature adults must also migrate from their preferred *mauka* habitat locations to downstream locations to spawn. Newly hatched larvae must subsequently enter the ocean in order to complete their post-larval development with the marine plankton community. After varying species-specific development periods they return to stream mouths changing into benthic (i.e. bottom-dwelling) juvenile fish ready to migrate upstream to preferred *mauka* locations to spend their adult lives. Major diversion structures I observed on East Maui streams typically incorporated a steel grate over a concrete-lined channel embedded directly into the streambed. Presumably all of the stream's natural baseflow (i.e. below flood stage) was intended to fall through the steel grate system into the diversion channel. The captured flow is then directed into a particular ditch system depending on location and elevation. Natural stream flow was diverted in this manner into the Wailoa, New Hamakua, Center, Spreckles, and Koolau Ditches at various

elevations. In every case, this type of diversion structure was impassible by upstream migrating native fish and macroinvertebrates which would fall through the grate into the ditch and be transported into the irrigation system. Similarly, downstream migrating reproductively-mature adults seeking preferred low elevation spawning habitat (like the *'o'opu-nakea*) would be captured and transported away from the stream to die in the ditch system. Any larvae hatching in a stream location above a diversion structure would similarly meet their demise in the ditch system. In stream diversion locations where 100 % of flow is captured (e.g. Hoolawa Ili and Hoolawa Nui Streams at New Hamakua Ditch) the streambed was observed to be dry to varying distances below the diversion. The dry stream channel obviously acts as an effective type of physical barrier to migrating native fish and macroinvertebrates. Other examples of problematic features of diversion structures observed include pipe culverts that extend beyond the wall barriers and water flow-over barriers which do not provide water flow contact around hard structures. Upstream migrating native stream animals cannot negotiate these types of barriers to pass to *mauka* stream reaches. On February 25, 2020, I was able to observe the overall effects of water diversion on Hoolawa Stream, including three of its tributaries, at various elevations by the Wailoa, New Hamakua and Haiku Ditches. The EMI ditch system effectively disconnected flow to the ocean at several elevations along the natural stream continuum. At Hoolawa Nui (Intake W-19) the diversion structure took 100% of the water in the stream. The same was true for one branch of Hoolawa Nui at intake W-20. These conditions make it virtually impossible for native fish and macroinvertebrates to migrate past diversion structures (either swimming upstream, or downstream) to reach preferred habitat making them more susceptible to being captured by any intersecting ditches. Below both intakes, stagnant pools of water also created opportune mosquito breeding grounds. In the section of Hoolawa Stream historically diverted by the Haiku

Ditch (near the old Hana Highway) water was allowed more recently to flow past the diversion structure creating flowing stream habitat which presumably reaches the ocean. In this flow-restored reach I observed one juvenile *'o'opu-nakea* which I assumed fairly recently had recruited in from the ocean. In all stream reaches dewatered below by EMI diversion structures, I conducted limited visual reconnaissance in shallow water above diversions when possible walking along the stream bank with polarized glasses. I observed no native stream fish or macroinvertebrates in perfectly good habitat where high population densities should exist. In these reaches, underwater visual census (UVC) associated with systematic biomonitoring surveys should be conducted at some future time to determine the extent to which populations of native stream animals exist. Direct observation of stream diversion by the EMI ditch system conducted on select East Maui streams (2/25-2/27/20) substantiate my belief that the diversion structures deployed have: 1) severely disrupted natural flow regimes; 2) degraded ecological habitat making conditions conducive to alien aquatic species and; 3) limited the mountain-to-sea connectivity required by native stream fish and macroinvertebrate populations to persist. The result over time has been to severely degrade the biological integrity of East Maui streams which is characterized by the absence of robust populations of native fish and macroinvertebrates expected in their preferred ecological habitat along the stream continuum from mountain-to-sea.

11. East Maui stream environments are unique in Hawaii having very steep gradients flowing to the ocean from above 5000 ft through relatively young Haleakala lavas (Honomanu basalts) and accommodating elevation drops through multiple waterfalls some falling directly into the ocean at the coast. We will never know their complete ecological uniqueness since they have been severely dewatered for a century by intersecting EMI ditch systems often at three elevation locations along their stream continua. No comprehensive ecological studies or species

surveys have been conducted in these 'mountain-to-sea' systems; therefore, in any particular stream continuum – waterfall complex it is not known how assemblages of native stream animals are distributed or how their species abundances differ or where – when spawning occurs. Native stream insect populations are particularly vulnerable to stream dewatering and habitat alteration as is the case for now rare and / or threatened species like the native damselfly *Megalagrion nesiotes* which is currently only known from a single population on East Maui.

12. Rather than conducting such comprehensive ecological surveys in East Maui streams from mountain-to-sea, the Draft IFSAR Summary (Oct 2020) has relied upon a habitat modeling approach attempting to predict "habitat availability" for native stream species with select spot surveys at various locations. Despite all the effort and expense, we still do not know how native stream animals are distributed or have any idea what their population densities are in any particular East Maui stream location or where *'o'opu* spawning occurs along the stream continua. For example, when lower elevation ditches were discontinued and spot surveys were conducted in Kolea, Kaaiea, Nailiiliihaele, Holua and Ho'olawa streams only 2 native '*opae-kalaole* were observed in 20 point-quadrat and habitat surveys (Draft IFSAR Summary, Oct 2020). Based upon this sparse survey data and reliance upon habitat availability assumptions, The Draft IFSAR Summary (Oct 2020) concludes that "… the non-petitioned streams support limited to no recruitment and existing diversions have minimal impact on the life history of native aquatic biota". In actual fact, there really is no direct, comprehensive data to support this far-reaching conclusion.

13. The Draft IFSAR Summary (2020) has other shortcomings. For example, it is too reliant upon the 1990 Hawaii Stream Assessment which is merely a compilation - summary of information existing at the time. No actual scientific data were collected for the Report. The

Draft IFSAR Summary (2020) also propagates a negative opinion on the value of alien riparian vegetation which inputs allocthonous organic material into stream environments and is said to "…disrupt the food-web of freshwater ecosystems". To the contrary, organic matter deposits in streams from native or alien plant sources are usually only a problem when natural stream flow regimes are disrupted (e.g. by diversions) and the stream is unable to process the coarse material into finer material which can be exported into the ocean as nutrients (especially nitrogen). I have studied this in Limahuli Stream (Kauai) which has a predominately alien riparian zone that seasonally inputs large quantities of branches, fruits, leaves, etc. which accumulate in the streambed during low flows, but is pulverized by higher flows and transported downstream to the ocean as organic nutrient. This is thus an important function of Hawaiian streams supplying a steady source of processed organic nutrients to estuaries and nearshore ocean environments. Additionally, waterfalls and so-called "natural barriers" are portrayed in the Draft IFSAR Summary (2020) as impediments to migrating native stream animals which in reality they are not as systematic biomonitoring surveys conducted upstream of these locations would reveal.

14. As we lose more robust functional Hawaiian streams to water diversion, watershed alterations and climate change impacts like drought, every Hawaiian stream becomes critically important to continued native *'o'opu* and *'opae* larval production. As these amphidromous species do not return to the same stream from which they emerged, the impact to native fish and macroinvertebrate assemblages in any particular stream can be cumulative across a broad geographic region especially in streams draining large watersheds that have substantial continuous flow to the ocean. Of the East Maui streams impacted by EMI diversions, this would include 'O'opuola, Nailillihaele, Kailua and Ho'olawa Streams. Nailillihaele and Kailua Streams may be of special ecological importance because of their close proximity and common estuarine

habitat in Kailua Bay. These streams should be completely restored to natural flows with all on-site diversion infrastructure removed. Native *'o'opu* and *'opae* larval production from these four restored streams would be significant contributors to replenishing the developing cohorts of native freshwater species among the plankton populations drifting in the marine waters around islands. This passively drifting marine plankton community is the only source of potential larval '*o'opu,* '*opae* and *hihiwai* recruits available to populate any particular Hawaiian stream. Without this continuous larval production you perpetuate a vicious cycle of diminishing potential for repopulating native stream animals into all Maui Nui streams.

15. It is my belief that when water is restored to these streams and the diversion structures completely removed, given the amphidromous ecology of native Hawaiian stream animals, their populations will recover in the restored stream systems over time. This does not mean, however, that the past and present ecological harm caused by long-term water diversion was (is) insignificant. The present ecological condition of East Maui streams impacted by ditch diversions is evidence of this.

16. As mentioned earlier, it is important that all East Maui Streams affected by the EMI diversions be comprehensively surveyed using underwater visual census (UVC) rather than the reliance on habitat modeling. Actual instream survey data collected by Skippy Hau (DAR Comments 2020) indicates the presence of native '*o'opu* and *'opae* in Nailiiliihaele and 'O'opuola Streams and amphidromous Tahitian prawns (*Macrobrachium lar*) in Ho'olawa, Kailua, Kolea and Kaiea (Kaaiea) Streams (DAR Comments 2020). These actual survey data indicate that to some extent amphidromous species are recruiting into East Maui streams and maturing into adults. Restoring flows by removing diversions, therefore, can only be restorative and ecologically beneficial to biological integrity in East Maui streams in the long term. Absent

actual instream survey data, it is not reasonable to disparage the baseline biological condition of a particular stream, its ecological restoration potential including contributions to regional stream health or the presence of rare and / or threatened insect species. It would also be of important scientific value to systematically monitor the ecological recovery of East Maui streams to which natural flows are restored. To accomplish this research and biomonitoring survey with dedicated personnel, specific funding should be allocated to HI-DAR's Maui office under Skippy Hau.

17. I declare under penalty of perjury that the foregoing is true and correct.

Dated: _____ November 17, 2021

Michael H. Kido

Michael H. Kido