# Water Quality Restoration for Kalihi Stream, Keehi Lagoon, and Moanalua Stream (TMDL)

For over 15 years, Keehi Lagoon (Point X), Moanalua Stream, and Kalihi Stream (Figure 1) have been listed as impaired due to excess nutrients and high turbidity (Table 1). These waterbodies have nutrient and turbidity levels that exceed the Hawaii State Water Quality Standards (WQS) developed and implemented for the support and propagation of aquatic life, recreation, and/or aesthetic enjoyment. Since these waterbodies are impaired, the Hawaii State Department of Health (HDOH) Clean Water Branch (CWB) is obligated to develop Total Maximum Daily Loads (TMDLs) to reduce the volume of pollutants entering the waterbody and enable the waterbody to meet the WQS. Keehi Lagoon (Point X), Moanalua Stream, and Kalihi Stream were listed as "high priority" in the 2022 Integrated Report (IR) and CWB has started to develop TMDLs for these waterbodies.

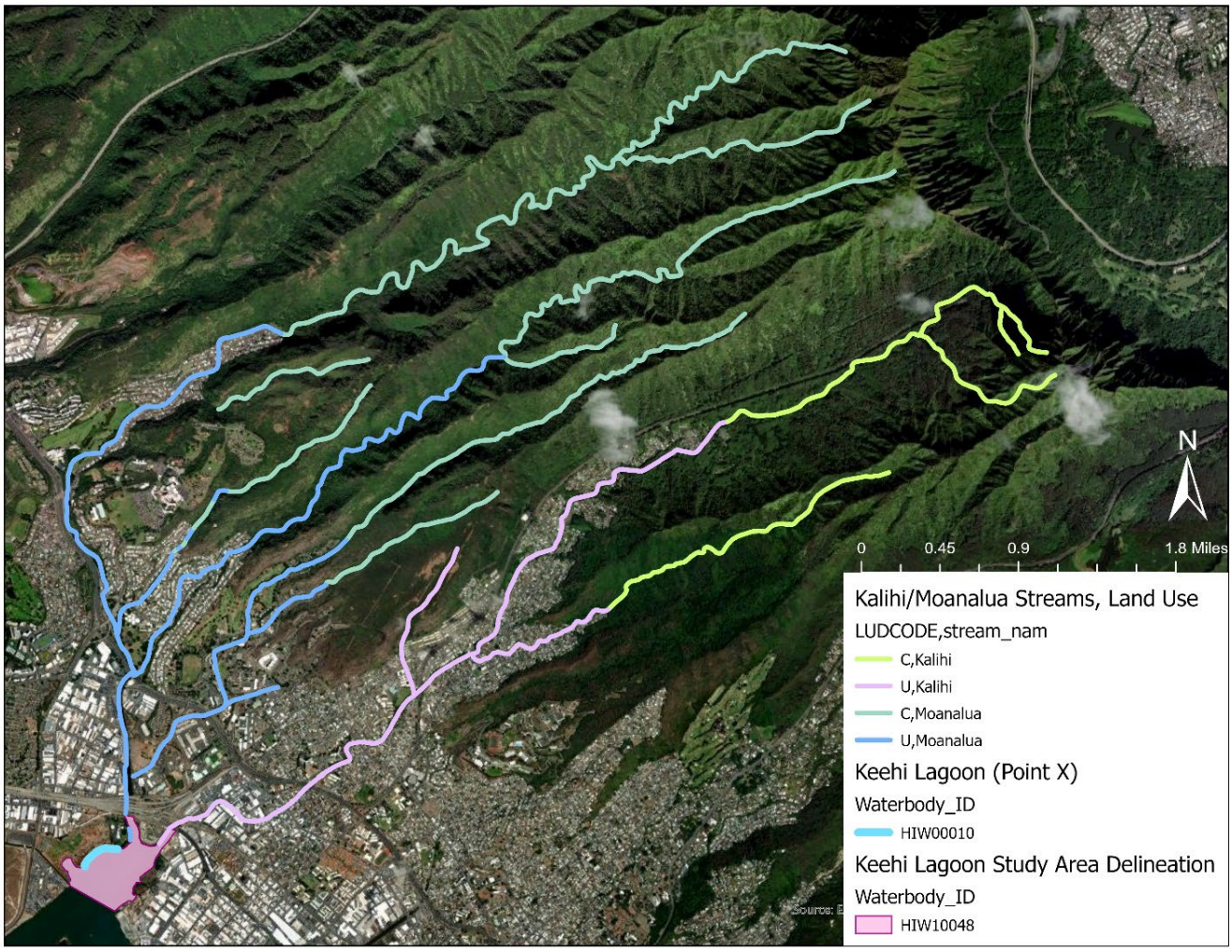


Figure 1: Water body reference map. Inland waterbodies are divided by which State Land Use area they run through (in this case conservation [C] or urban [U])

Table 1: Waterbodies and pollutants to be addressed with this TMDL project

| Waterbody | Assessment Unit ID | Parameters to be Addressed |
|---|---|---|
| Keehi Lagoon (Beach) | HIW10048 | Turbidity, Ammonium, Nitrate Nitrite, Chlorophyll-a |
| Keehi Lagoon (Point X) | HIW00010 | Total Nitrogen, Total Phosphorus, Chlorophyll-a |
| Moanalua Stream | 3-3-12.01 | Turbidity, Total Nitrogen |
| Kalihi Stream | 3-3-11 | Turbidity, Total Nitrogen, Total Phosphorus, Nitrate Nitrite |

## What is a TMDL?

A TMDL is a pathway to water quality restoration. This process (Figure 2) begins after a waterbody has been identified as impaired; meaning it does not meet WQS. This process can be broken down into a few general steps:

### 1. Identify Pollutant Sources

There are two types of sources that contribute to the pollutant load of a waterbody, point source and nonpoint source. Point source is a direct discharge into a waterbody and requires a National Pollutant Discharge Elimination System (NPDES) permit. Nonpoint sources constitute all other sources of pollution, such as agricultural runoff and natural background sources.

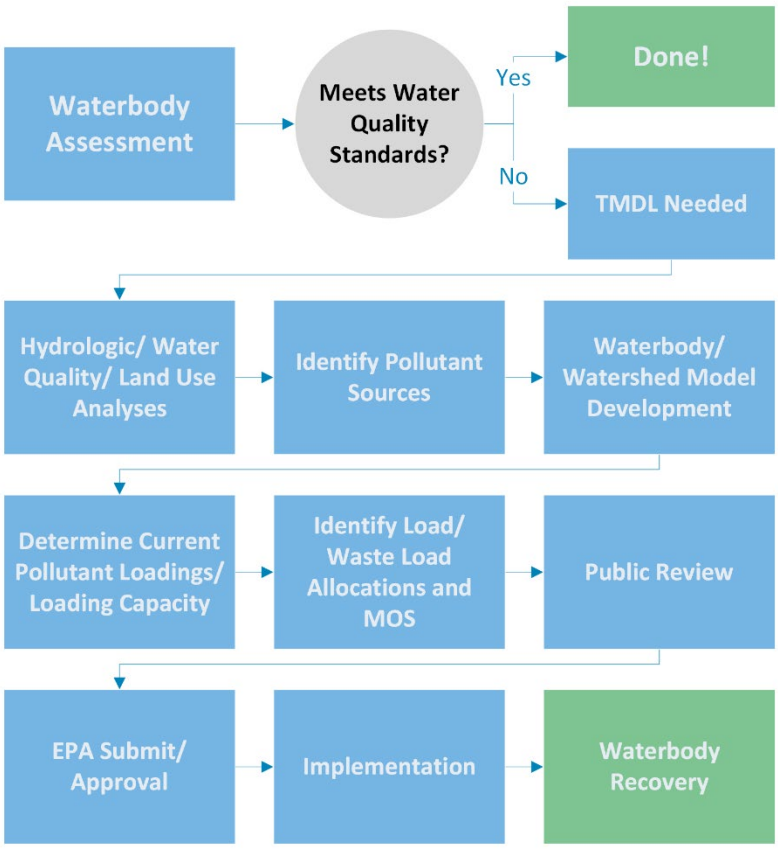


Figure 2: TMDL Development Process

### 2. Develop Waterbody/ Watershed Model

This involves hydrologic and water quality analysis of the waterbody as well as a land use analysis of the surrounding watershed(s). Understanding the relationship between land use, hydrology, and water quality in each waterbody is critical for TMDL development.

### 3. Estimate Current Pollutant Loads

The waterbody assessment process determines the concentration of nutrients within the waterbody but, on its own, does not provide the volume of pollutant(s) entering the waterbody; this is what the watershed(s) and waterbody models determine. Estimating the current pollutant load is necessary to understand the extent of the pollution and to calculate the necessary reductions.

### 4. Determine Loading Capacity

The loading capacity is the amount of a pollutant the waterbody can assimilate while still meeting the WQS. This also uses the developed water quality models. The loading capacity is typically based off the numeric water quality criteria used in the waterbody assessment.

### 5. Assign Loads and Waste Load Allocations

A wasteload allocation is an assigned limit to the volume of a pollutant a singular point source is allowed to discharge into the waterbody. A load allocation is a limit given to each to nonpoint source. No individual source can exceed their load or waste load allocation if the water body is to meet WQS.

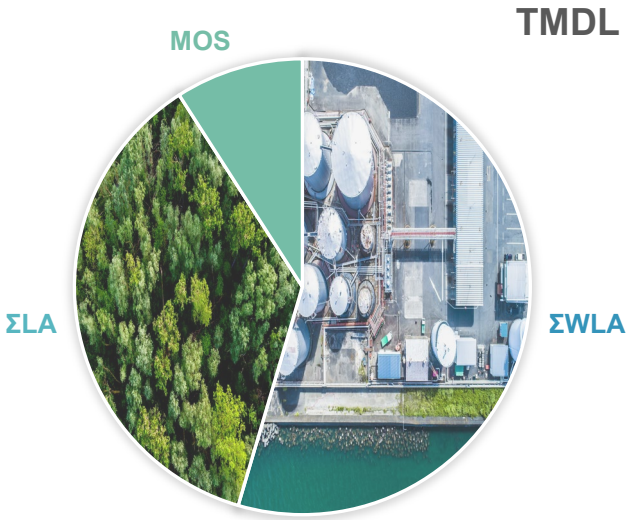


**Figure 3: Visual Representation of TMDL formula**

The TMDL formula is: **TMDL = ΣWLA + ΣLA + MOS**

Where **TMDL** is the loading capacity, **ΣWLA** is the sum of wasteload allocations, **ΣLA** is the sum of load allocations, and **MOS** is the margin of safety (Figure 3). The margin of safety is necessary to compensate for any uncertainty in the TMDL development and can vary between TMDL projects.

### 6. Receive and Address Public Comments

This process is explained and recorded in a TMDL report which is sent out for public comment. This is the community's formal opportunity to weigh in on the TMDL. The public can either provide written or verbal comments. The community may be given serval opportunities to provide feedback while the TMDL is being developed, but the public comment period is the largest and most formal. At the end of the comment period, CWB addresses all received comments and makes any necessary adjustments to the TMDL.

### 7. EPA approval and Implementation

Following the comment process, the TMDL is sent to the Environmental Protection Agency (EPA) for approval. Once the TMDL is approved, each source is responsible for making the required reductions. Waste load allocations are typically written into NPDES permits. Load allocations are not currently enforceable, so any nonpoint source reductions are typically spearheaded by the community.

## What does this mean for the community?

Water restoration is a community effort. Members of the community are encouraged to voice their water quality concerns, participate in community meetings, and provide feedback during public comment periods. Waste load and load allocations are issued to all pollutant sources and it is each sources' responsibility to reduce their current pollutant load to meet their allocation. Because load allocations are not enforceable through permits, necessary reductions are typically community-driven. The community will need to come together and decide how they want to reduce these pollutant(s) entering the waterbody in order to restore water quality.